

FREQUENCY OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) COLONIZATION AMONGST HOSPITAL STAFF IN TEACHING HOSPITALS OF PESHAWAR

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ABSTRACT

Objective: This study explicates the Nasal and Armpit colonization of Methicillin Resistant Staphylococcus aureus (MRSA) among the staff working in teaching hospitals of Peshawar versus general community living in university of Peshawar.

Material & Methods: This cross sectional study was carried out from March 2015 to August 2015 in Microbiology section, Pathology Department of Khyber Medical College (KMC), Peshawar. Initially, the samples were inoculated on different culture medias. Blood and Chocolate Agar to look whether β -hemolysis occurs. Mannitol Salt Agar (MSA) used as selective media for *S. aureus* isolation and incubated for 24-48 hrs at 35°C. The presence of *S. aureus* was confirmed on its growth on medias, colony morphology, gram staining and biochemical tests. It was further processed on Mueller Hinton Agar (MHA) putting antibiotics disc Cefoxitin to confirm MRSA observing zone of inhibition around the disc according to CLSI guidelines.

Results: A total of 600 samples were collected, 300 samples (150 Nasal + 150 Armpit swabs) from hospital staff and same number from general community. Among the collected sample 48.80% subjects with *S. aureus* isolates. The total prevalence of MRSA carriage was 46.80% in District Peshawar. Among MRSA carriers 62.7% were detected positive in healthcare workers (HCWs), while 37.22% were carrier in general population of district Peshawar. Prevalence of MRSA among healthcare workers is almost double as compared to general population in district Peshawar.

Conclusion: In this study it is observed that healthcare professionals are more exposed to MRSA colonization as compared to general population. Significantly high prevalence of MRSA among healthcare workers is almost double as compared to general population in District Peshawar. Early diagnosis and strict surveillance are needed to prevent its rapid spread.

Key Words: Methicillin Resistant Staphylococcus aureus (MRSA), health care worker (HCWs), general population (GP).

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INTRODUCTION

The Staphylococci are gram-positive cocci, usually arranged in grape like clusters. On the basis of enzyme coagulase and their ability to clot blood plasma, Staphylococci are divided into coagulase-positive

Staphylococci named *S. aureus* and coagulase-negative Staphylococci include *S. epidermidis* and *S saprophyticus*^{1,2}.

MRSA strains were first reported in 1960s³. MRSA is now recognized globally as important nosocomial pathogen⁴. Serious infections due to MRSA act as challenge to the physicians, being associated with increase morbidity and mortality⁵. Risk factors which contribute to MRSA infection and colonization include misuse of antibiotics, prolonged hospitalisation^{6,7}. Infected and colonized patients serve as reservoir and transmission occurs primarily through contaminated hands of health care workers⁸.

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Frequency of methicillin resistant staphylococcus aureus (MRSA).....

In 2008, CDC (Center of Disease Control) estimated that MRSA was responsible for 15,249 deaths in the US only^{9,10}. MRSA Infections have evolved as a major portion among hospital-acquired infections mainly because of immune-compromised state in these patients^{11,12}. Hospital-acquired infections add to the imbalance between resource allocation for primary and secondary health care by diverting scarce funds to the management of potentially preventable conditions¹³. MRSA infections are emerging as a serious health problem in our set up so joint efforts is required by responsible authorities to meet the challenge of MRSA on the forefront¹⁴.

Nasal carriage of MRSA plays an important role in the development of S. aureus infections and is a major reservoir for MRSA¹⁵. The nose (external nares) and armpit are considered as potential anatomical areas from where S. aureus can spread to other parts of the body¹⁶. S. aureus nasal carriers can be distinguished as: persistent carriers, intermittent carriers and non-carriers¹⁷.

MATERIAL AND METHODS

A cross sectional study was designed at the department of Pathology in Microbiology section, Khyber Medical College, Peshawar. The study period was from March 2015 to August 2015. This study included all the isolates of MRSA that were recovered from healthcare professionals working in teaching hospitals of Peshawar, MRSA isolates from general population of Peshawar, both genders were inducted in the survey. The general public and healthcare workers who had no history of using immunosuppressant drugs, with no history of chronic diseases such as malignancy, diabetes and other states that compromise the immune system, repeated and contaminated specimens were excluded from the study.

The specimen processing for this study was carried out in following steps:

(1) Collection of specimens from nasal cavity and armpit in aseptic condition using disposable sterile swabs saline moistened. Inoculation of the clinical specimens were carried out using the culture media plates recommended for this procedure. Sheep Blood Agar, Chocolate Agar, Mannitol Salt Agar (MSA) and Nutrient Agar are used in our study. While the incubation is carried out at 35 to 37 degrees centigrade for 24 hrs.

(2) Identification of S. aureus were carried out through standard microbiological methods that include gram staining and colony morphology (Gram-Positive organisms arranged in clusters blue in color, round in shape under microscope). The confirmation criteria

for deciding upon the presence of S. aureus is the golden yellow colonies (Mannitol fermenter) on MSA and complete beta-hemolysis on sheep blood agar. We took a specimen from growth obtained on MSA and then spread it uniformly on MHA while implanting the 30 µgm Cefoxitin antibiotic disc on MHA (CM337-Oxoid, England), we observe the zone of inhibition around the disc if it is less than 22mm the organism prove to be MRSA positive as per CLSI recommendations.

RESULTS

A total of 600 samples were collected from health care workers in teaching hospitals and from general population in district Peshawar. Two samples each from nasal mucosa and arm pit were collected for determination of MRSA carriage. One hundred and fifty subjects were randomly selected from health care workers (HCW) working in Teaching hospitals of Peshawar. While 150 samples from general population (GP) living in University of Peshawar were subjected for the detection of MRSA colonization. There were 48.80% subjects with Staph aureus isolates and 51.20% were negative for Staph aureus. In HCWs 68.60% were posi-

Table 1: Correlation of staphylococcus aureus between HCWs and GP

Staph	Positive	Negative	Ch.Sq	P. value
HCWs	201	99	79.25	0.005
GPs	92	208		
Total	293	307		

Table 2: Correlation of MRSA between HCWs and GP

Staph	Positive	Negative	Ch.Sq	P. value
HCWs	86	214	11.59	0.005
GP	51	249		
Total	137	463		

Table 3: Distribution of MRSA Positive Cases in HCWs and GPs

Site	Positive	GP	Ch.Sq	P. value
Nasal	51	27	0.53	0.467
Armpits	35	24		
Total	86	51		

Table 4: Unit wise distribution of MRSA Colonization

Units	No. of patients & percentage
Surgery & Allied	50 (58.10%)
Medical & Allied	36 (41.90%)
Total	86 (100%)

tive for *S. aureus* growth. In general population 31.40% were detected *S. aureus*.

In this study the frequency of MRSA colonization were 137(46.8%) and 156(53.8%) were MSSA (Methicillin Sensitive staphylococcus *S. aureus*). Number of MRSA carriers 86/137(62.80%) in health care workers and 51/137(37.20%) in general population. The result shows high significant P value among HCWs and GP of district Peshawar. The correlation of *S. aureus* and MRSA between health care workers and general population is shown in Table 1 and 2 respectively. Distribution of MRSA positive cases in health care workers and general population is shown in Table 3.

MRSA carriage detected as positive in different site of the body in HCWs the nasal specimen were 59.30% and in armpit the ratio were 40.70%. The nasal and armpit specimen in General Population were positive for MRSA in 52.90% and 47.10% respectively in district Peshawar. A total of 150 respondents were investigated for MRSA colonization in Khyber Teaching Hospital, Lady Reading Hospital and Hayatabad Medical Complex, Peshawar, KP. The MRSA carriage in HCWs of surgery and allied were 50 out of 86 (58.10%) and for the Medical and allied 36/86 (41.90%), Table 4.

DISCUSSION

Studies shows that MRSA epidemiology are not uniform in different parts of Pakistan like the other countries of the world. Due to increased level of its colonization and infections, the treatment have become more difficult progressively. Most commonly isolated pathogen in nosocomial infections MRSA are responsible for high mortality and morbidity in Pakistan and in all over the world. In present study the results 46.80% MRSA among 293 *S. aureus* isolates from 600 samples. The total frequency of MRSA colonization were 137/293(46.8%) while 86/137(62.80%) in health care workers and 51/137(37.20%) in general population shows high significant P value among HCWs prevalence were more than double as compare to general population in district Peshawar. In first step a total of 48.80% (293/600) samples were isolated as *S. aureus* and in second step total frequency of MRSA colonization were detected. While in third step frequency of MRSA colonization in health care workers and in general population were calculated. Factors contributing to high prevalence of MRSA carriage in HCWs of teaching hospitals in district Peshawar, (1) Most of health care workers including Nurses, Paramedics and Doctors are unaware about MRSA protocol so they were not following the MRSA protocol during handling with the patients in the hospitals. (2) There are no preventive

infection control measures in hospitals. (3) There is no isolation units and trained staff for those patients who is suffering from nosocomial diseases including MRSA.

In this study the HCWs of three major hospital of Peshawar district and general population were screened for MRSA colonization. The study observed high prevalence in nasal mucosa both in HCWs and in general population as compared to colonization in armpit. In Pakistan, the studies reported MRSA up to 1999 the prevalence is low round about (5.0-22.3%). After that time, there is a progressive rise occur in prevalence of MRSA (> 35.0%). When we look in to Pakistani literatures in Islamabad one study observed (39.0%) prevalence in hospital sittings. In Lahore many studies on MRSA colonization in hospital sittings observed (31.1%), (35.6%) and (38.5%) were mostly nasal carriage than any other areas of the body. In Karachi and Rawalpindi, the prevalence of MRSA were 43.0% and 42.1% respectively. While in Gujranwala the frequency were quite high 68.5% results in study of DHQ Hospital, Gujranwala City^{19,20,21} indicate that MRSA carriage ratio is extremely variable in different cities and population of Pakistan.

The MRSA frequency reported from different countries of the worlds like in United Kingdom 42.5%, United State of America 59.0%. In Ireland 54.7%, Sweden 2.1%, Netherland 1%. In Iran 37.2% and in India 52.9% isolates were reported as MRSA positive respectively. These figures show variables results all over the world^{22,23,24}. In hospital of Kashan (Iran) the nasal carriage of staphylococcus *S. aureus* organism were 38% (38 out of 100) and among these 52.6% were MRSA positive cases¹⁸. Although it is very difficult to explain variable data in respect to both place and time of study, the variation is most probably due to drug pressure in hospitals, our community and differential clonal expansion of organism.

The MRSA carriage ratio were higher in health care staff working in surgery and allied units as compared to medical and allied units. MRSA colonization ratio in HCWs of Khyber Teaching Hospital were 53.63(59/110) while in Lady Reading Hospital and Hayatabad Medical Complex were 75% and 60% respectively. Unfortunately HCWs working in Intensive care units, operation theaters coronary care units and burn/plastic surgery shows high percentage of MRSA carriage.

Frequency of methicillin resistant staphylococcus aureus (MRSA).....

The higher prevalence of MRSA colonization among healthcare professionals in hospitals of Peshawar indicate that the hygiene conditions are quite poor and there are no precautionary measures taken by these professionals when coming in contact with patients. This is due to the fact that general population has had lower prevalence of MRSA colonization in this study.

The armpit carriage ratio of MRSA in hospitals staff is also high, shows greater prevalence of MRSA colonization among healthcare workers as compare to general population. These results also suggesting that the primary area of attack for these organisms is the nasal cavity. The results indicate that healthcare professionals in Peshawar are not fully equipped to protect themselves from MRSA colonization while working. This is the reason that how MRSA infections are transmitted easily from patients to healthcare professionals and vice versa.

CONCLUSION

Healthcare professionals are more exposed to MRSA colonization as compared to general population. Significantly high prevalence of MRSA among healthcare workers is almost double as compared to general population in district Peshawar.

RECOMMENDATIONS

Early diagnosis and strict surveillance are needed to prevent its rapid spread. Simple hand washing with soap and water can decrease the MRSA colonization and other nosocomial organisms. Improve the sterilization and disinfection procedures in the hospitals. Monitoring committees for MRSA cases in every teaching hospitals of Peshawar should be formed. Health care workers strictly follow the MRSA protocol during their duty hours. Infected patients isolation and proper disposal of bodily secretions are important to prevent from MRSA carriage and infection.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- Asgar M:** Idea.
- Asgar N:** Data collection.
- Mumtaz S:** Critical review and bibliography.
- Khan SA:** Statistics.
- Ihsanullah:** Data collection.
- Munir AH:** Statistics.
- Shoaib SL:** Bibliography.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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