

METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS: A STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

This study was carried out to find the frequency of Methicillin Resistant *Staphylococcus aureus* (MRSA) in a tertiary care hospital. This is a cross sectional descriptive study performed in Pathology Department, Nawaz Sharif Social Security Hospital, Multan Road, Lahore, during the period January, 2008 to December, 2008. Two hundred and thirty three consecutive, non-duplicate strains of *Staphylococcus aureus* were isolated from a variety of clinical specimens of pus/ pus swab, throat swab, sputum, urine, semen, ear swab, vaginal swab, blood, pleural fluid and cerebrospinal fluid were studied for Methicillin resistance. Standard methodology using modified Kirby- Baur disk diffusion method was adopted. Oxacillin (1 μ g disk) was used to detect Methicillin resistance. An inhibition zone of less than 10mm was taken as indicative of MRSA. Out of 233 *Staphylococcus aureus* isolates, 81 (34.76%) were found to be Methicillin resistant. The yield of MRSA was highest from pus/ pus swab and sputum samples (40.0%), followed by throat swab (35.71%), urine, blood and pleural fluid (33.33%), semen (30.43%), vaginal swab (27.27%), ear swab (24.0%), and cerebrospinal fluid (20.0%). The high prevalence of MRSA in our setup should not go without serious concern. Implementation of strict aseptic techniques and suitable antimicrobial policy may reduce the spread of MRSA in our environment.

Keywords: *Staphylococcus aureus*; oxacillin; Methicillin Resistant *Staphylococcus aureus* (MRSA); Frequency; Tertiary care hospital).

INTRODUCTION

Staphylococcus aureus is recognized as one of the commonest bacterial pathogen in the community as well as in the hospital. Methicillin, a penicillinase resistant semi-synthetic penicillin was introduced in the early 1960's. This drug provided temporary response which ended with the emergence of Methicillin resistance *Staphylococcus aureus* (MRSA). This was discovered shortly after it became available for clinical use¹. MRSA are also known as Oxacillin resistant *Staphylococcus aureus* (ORSA).

The basic mechanism of resistance in most cases of MRSA is the production of an additional Penicillin Binding Protein, PBP2' or PBP2a, mediated by the mec A gene. This mec A gene is an additional gene found in Methicillin resistant staphylococci and with no allelic equivalent in Methicillin susceptible staphylococci. There are several additional genes that affect the expression of Methicillin resistance in *Staphylococcus aureus*, but these are found in susceptible as well as resistant strains². Some countries have reported Methicillin resistant Staphylococci to be as high as 50% of all nosocomial *Staphylococcus aureus* isolates³. There is increasing evidence that MRSA is becoming a significant endemic pathogen in our

hospitals. Present study was carried out to find out the current frequency of MRSA in our hospital settings.

MATERIALS AND METHODS

A total of two hundred and thirty three consecutive, non-duplicate strains of *Staphylococcus aureus* were included in the present study. These were isolated from a variety of clinical samples like pus/ pus swab, throat swab, sputum, urine, semen, ear swab, vaginal swab, blood, pleural fluid and cerebrospinal fluid irrespective of the age and sex of the patient from January, 2008 to December, 2008 at Nawaz Sharif Social Security Hospital, Multan Road, Lahore. This is one of the busy Tertiary Care Hospitals of Lahore.

The organisms were identified as *Staphylococcus aureus* by Gram stain, Catalase, Slide/ Tube coagulase, DNAase production and mannitol fermentation. Tube coagulase tests were observed every 0.5 hour for 4 hours and incubated overnight if still negative. Fermentation of mannitol was detected by the reduction of the indicator phenol red resulting in a yellow color around the colony⁴. The modified Kirby-Baur disk diffusion method was used for susceptibility testing. All isolates were inoculated onto Mueller Hinton agar

with 5% NaCl. To determine Oxacillin (Methicillin) resistance, 1µg Oxacillin disk was applied on these plates. The plates were examined after overnight incubation at 35°C. The organism was considered to be Methicillin resistant when the diameter of the zone of inhibition was < 10mm. *Staphylococcus aureus* NCTC 6571 was included as control strain. Study and control strains were stored in nutrient agar slopes at 4°C until required and were checked for purity before use⁵.

RESULTS

Out of a total of 233 strains of *Staphylococcus aureus* isolated from different clinical specimens, eighty-one (34.76%) were found to be resistant to Methicillin. Majority of these isolates were recovered from pus/pus swabs and sputum samples (40.0%) and the least from cerebrospinal fluid (20.0%). The pattern of MRSA distribution from different clinical specimens is depicted in Table 1.

DISCUSSION

Since the emergence of Methicillin resistance, MRSA is becoming endemic in many hospitals and treatment options have become compromised. Infections with MRSA are associated with high morbidity and mortality than similar infections with Methicillin sensitive strains⁶.

The frequency of MRSA infections is variable worldwide as shown in a comparison table (Table 2). In different areas of Pakistan, the reported studies upto the year 1999 show comparatively low prevalence (5.0-22.3%) of MRSA.^{3,7,8} After that period, there is a progressive increase in MRSA prevalence (> 35.0%) in our setup.^{1,6,9-13} Frequency of MRSA isolates in these studies range from comparable to that in the present study to much higher than that in the present one.

Table 1: Distribution and frequency of MSSA and MRSA according to specimens.

Samples	No of Isolates	MSSA		MRSA	
		No	%	No	%
Pus/pus swabs	85	51	60.0	34	40.0
Throat	28	18	64.28	10	35.71
Sputum	20	12	60.00	08	40.0
Semen	23	16	69.56	07	30.43
Urine	21	14	66.66	07	33.33
Ear	25	19	76.0	06	24.0
Vaginal swab	11	08	72.72	03	27.27
Blood	09	06	66.66	03	33.33
Pleural fluid	06	04	66.66	02	33.33
CSF	05	04	80.00	01	20.0
Total	233	152	65.24	81	34.76

Table 2: A comparison of the reported prevalence of MRSA within and outside Pakistan.

Studies Within Pakistan	Qureshi and Hannan ⁷	Place Rawalpindi	Year of study 1987	% MRSA 13.8
	Ashiq and Tareen ⁸	Karachi	1987-88	5.0
	Siddiqi et al ³	Sargodha	1999	22.3
	Hafeez et al ¹	Karachi	1999-2000	35.6
	Ahmad et al ⁶	Gujranwala	2005-07	68.5
	Khattoon et al ⁹	Lahore	2000	39.0
	Anwar and Bokhari ¹³	Lahore	2001-02	31.1
	Hussain et al ¹⁰	Islamabad	2004-05	43.0
	Perwaiz et al ¹¹	Karachi	2004-05	43.0
	Ali et al ¹²	Rawalpindi	2005	34.7
	Present study	Lahore	2008	34.76
Outside Pakistan	Mehdinejad et al ¹⁴	Iran	2004-06	37.2
	Sader et al ¹⁵	UK	2005	42.5
	Moran et al ¹⁶	USA	2006	59.0
	Majumder et al ¹⁷	India	2000-01	52.9
	Vriens et al ¹⁸	Netherlands	1992-2001	< 1.0

This high frequency of MRSA is probably due to self medication and continued injudicious use of antimicrobial agents.

Frequency of MRSA similar to the present study has been observed by Anwar and Bokhari¹³ in Lahore (31.1%), Hafeez et al¹ in Lahore (35.6%), Khattoon et al⁹ in Lahore (38.5%) and Hussain et

al¹⁰ in Islamabad (39.0%). Slightly higher frequency of MRSA has been observed by Hafeez et al¹¹ in Karachi (43.0%) and Ali et al¹² in Rawalpindi (42.1%). While a very high figure of 68.5% was observed by Ahmad et al⁶ in Gujranwala. This may be either due to specially high frequency of MRSA among the patients admitted in DHQ Hospital, Gujranwala during the study period or particular type of patients selected for the study.

The frequency of MRSA reported from different countries show that in Iran 37.2% isolates,¹⁴ in UK 42.5% isolates,¹⁵ in Ireland 54.7% isolates,¹⁵ in USA 59.0% isolates¹⁶ and in India 52.9% isolates¹⁷ were MRSA. These figures again highlight the fact that frequency of MRSA is variable yet high in other parts of the world also. However, studies from Sweden show that only 2.1% isolates and Netherland that less than 1% isolates were MRSA.¹⁸ These figures are much lower than that in the present study. Low frequency observed in these countries may be due to restricted use of antibiotics combined with strict screening programmes for MRSA followed by isolation of these patients. Another reason may be inclusion of community acquired cases in these studies.

From the above discussion it is apparent that MRSA are widespread nosocomial pathogens of the late 20th century as well in the current decade of 21st century. Also emergence of MRSA infections is a growing problem in our setup. Therefore there is a need for early recognition of these isolates in our hospital as well as community environment. This will help in avoiding morbidity as well as mortality due to these environment.

In **conclusion** the high prevalence of MRSA should not go without our serious concern. Implementation of strict aseptic techniques and suitable antimicrobial policy may reduce the spread of MRSA in our community.

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