ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Prevalence and Antibiotic Susceptibility Pattern of Methicillin Resistant *Staphylococcus aureus* (MRSA) in Pus Samples in a Tertiary Care Hospital.

Sandhiya R, Lakshmipriya R*, and Esthermary

Department of Microbiology, ESIC medical college & PGIMSR Chennai, Tamil Nadu, India.

ABSTRACT

Methicillin resistant *Staphylococcus aureus* (MRSA) is an important nosocomial pathogen. This study was conducted to know the prevalence of methicillin resistance and its antibiotic susceptibility pattern among *Staphylococcus aureus* isolates from pus samples sent from various clinical departments. A total of 250 pus samples were analyzed. The isolates were identified by standard microbiological methods. Screening for methicillin resistance was done using standard protocols and techniques. Prevalence of *Staphylococcus aureus* infection was found to be 37% from culture positive pus samples. Among them 71.2% were found to be MRSA. Prevalence of coagulase negative *Staphylococcus* and their methicillin resistance were found to be 9.6% and 89.5% respectively. All the MRSA isolates were found to be susceptible to vancomycin. MRSA is prevalent worldwide and is causing increase in morbidity and mortality along with difficulty in treatment. The high prevalence of MRSA emphasizes the need for proper antibiotic sensitivity testing for proper management of infection. Control measures should be taken to limit the spread of MRSA infections.

Keywords: *Staphylococcus aureus*, MRSA, pus sample, multi drug resistance.

Corresponding Author

ISSN: 0975-8585

INTRODUCTION

S.aureus is one of the most common pathogen isolated from pus samples with prevalence rate ranging from 4.6% to 54.4% [1-3]. Methicillin resistance was reported soon after a year following its launch. MRSA has emerged as an important nosocomial pathogen worldwide since the time it was first isolated in 1961 from U.K. At present MRSA strains have become resistant to other antibiotics like macrolides, aminoglycoside etc [4]. The predisposing factors for this alarming emergence of MRSA are irrational and excessive use of antibiotics, prolonged hospital stay, lack of carrier screening, IV catheterization, hospitalization in intensive care unit [5,6]. Therefore understanding about prevalence of MRSA and their antibiotic susceptibility pattern is absolutely necessary in guiding the clinicians for choosing appropriate antibiotics for empirical therapy. Hence this study was conducted to establish the prevalence rates of MRSA infection and their *in vitro* antibiotic susceptibility pattern in a tertiary care centre, India.

MATERIALS AND METHODS

The present study was carried out in a tertiary care hospital in Chennai from January 2013 to June 2013. A total of 250 samples sent from various departments were included in this study. The pus samples were collected using sterile cotton swab or by direct aspiration of pus. The samples were processed immediately in the bacteriology lab. Direct Gram's stained smears were observed. The samples were inoculated on to blood agar, macconkey agar and mannitol salt agar. The culture plates were incubated at 37^{o}c for 24 to 48 hours. The isolates were identified using standard methods and confirmed by tube coagulase test.

The antibiotic susceptibility testing was done by Kirby Bauer method in Mueller Hinton agar (MHA). *S.aureus* ATCC 29213 (oxacillin susceptible) and *S.aueurs* ATCC 43300 (oxacillin resistant) strains were used as control. A zone of inhibition of less than 10mm with oxacillin disc (6µg/ml) was considered as methicillin resistant and confirmation of MRSA was done on MHA with 4% NaCl. The other antibiotics tested were ciprofloxacin (5µg), levofloxacin (5µg), amoxicillin-clavulanic acid (20/10µg), amikacin (30µg), clindamycin (2µg), cefotaxime (30µg), cefpirom (30µg), cefixime (5µg), cephalexin (30µg), vancomycin (30µg) and linezolid (30µg). *S.aureus* strain ATCC 25923 was used as control strain.

RESULTS

A total of 250 pus samples were processed for culture and sensitivity, out of which 197 (78.8%) were culture positive and 53(21.2%) were culture negative. The most common pathogen isolated was *S.aureus* from 73 samples (37.05%). The other microorganisms isolated were *Pseudomonas* spp., coagulase negative *Staphylococcus, Proteus* spp., *Escherichia coli*, *Acinetobacter spp*., *Klebsiella* spp., diphtheroids, *Enterococcus* spp., *Citrobacter* spp., *Streptococcus* spp.

ISSN: 0975-8585

TABLE 1: PREVALENCE OF MICROORGANISMS ISOLATED FROM PUS SAMPLES

S.NO	ORGANISM	NO: OF ISOLATES	% OF ISOLATES
1	*Staphylococcus aureus*	73	37.05
2	Coagulase negative *Staphylococcus*	19	9.64
3	*Proteus* spp	11	5.58
4	Diphtheroids	15	7.6
5	*Escherichia coli*	19	9.64
6	*Klebsiella* spp	10	5.07
7	*Psedomonas* spp	29	14.72
8	*Acinetobacter* spp	17	18.62
9	*Enterococcus* spp	1	0.51
10	*Citrobacter* spp	1	0.51
11	*Streptococcus* spp	2	1.01

TABLE 2: PREVALENCE OF METHICILLIN RESISTANCE

S.NO	ORGANISM	NO: OF MRSA ISOLATES	% OF MRSA ISOLATES
1	*S.aureus*	52	71.24
2	Coagulase negative *Staphylococcus*	17	89.47

Among the 73 isolates of *S.aureus*, methicillin resistance was seen in 52 isolates (71.24%) and among 19 isolates of coagulase negative *Staphylococcus*, methicillin resistance was found among 17 isolates (89.47%). Antibiotic susceptibility testing was done for MRSA isolates with various antibiotics and all MRSA strains were found to be sensitive to vancomycin and linezolid. All the strains were found to be resistant to cefixime and cephalexin. Most of the strains were multi drug resistant.

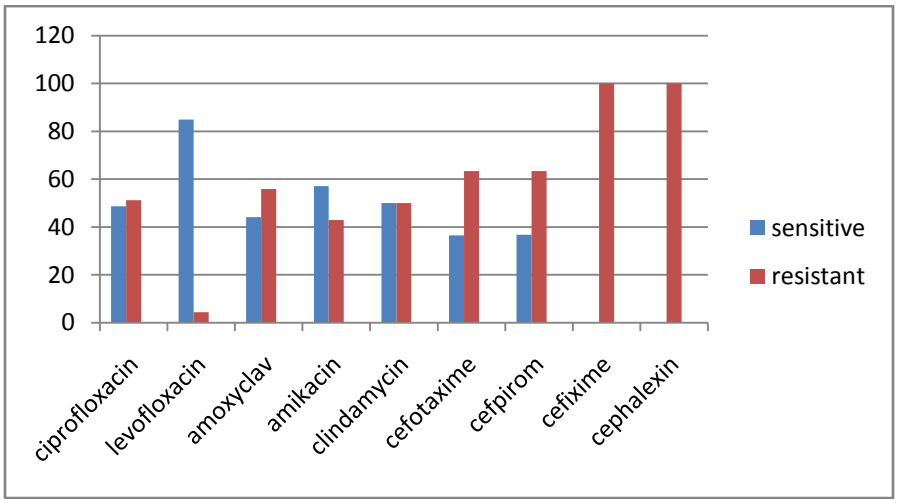
TABLE 3: ANTIBIOTIC SUSCEPTIBILITY PATTERN OF MRSA ISOLATES

S.NO	ANTIBIOTIC	% SENSITIVE	% RESISTANCE
1	Ciprofloxacin	48.7	51.3
2	Levofloxacin	85	15
3	Amoxyclav	44.1	55.9
4	Amikacin	57.1	42.9
5	Clindamycin	50	50
6	Cefotaxime	36.58	63.4
7	Cefpirom	36.8	63.2
8	Cefixime	0	100
9	Cephalexin	0	100

Antibiotic susceptibility testing was done for MRSA isolates with various antibiotics and all MRSA strains were found to be sensitive to vancomycin and linezolid. All the strains were found to be resistant to cephalexin. Most of the strains were multi drug resistant.

ISSN: 0975-8585

FIGURE 1: ANTIBIOTIC SUSCEPTIBILITY PATTERN OF MRSA ISOLATES



DISCUSSION

MRSA is an important nosocomial pathogen causing higher morbidity and mortality. The important reservoirs of MRSA in hospitals include infected patients, carriers, hospital staffs and health care workers [7]. During earlier times these MRSA strains were more commonly found among intensive care unit patients and in other clinical departments, but now it has emerged in the community level also [8].

In our study a total of 250 pus samples were processed, out of which 73 (37.05%) were *S.aureus* followed by *Acinetobacter* spp (18.6%), *Pseudomonas* spp (14.7%), *Esch.coli* (9.64%), CONS (9.64%), Diphtheroids (7.6%), *Proteus* spp (5.6%), *Klebsiella* spp (5.1%), *Streptococcus* spp (1%), *Enterococcus* spp (0.5%), *Citrobacter* spp (0.5%). Among the *S.aureus* isolated 52 (71.24%) were found to be MRSA. The worldwide prevalence of MRSA is 20% to 32.8% [9, 10]. However in a study conducted by Qureshi from Pakistan a high isolation rate of MRSA of up to 83% from pus samples was reported which co-relates with our study.

The antibiotic susceptibility testing of *S.aureus* isolates showed varied patterns. Majority of the MRSA strains were multi drug resistant when compared to methicillin sensitive *S.aureus*. All the MRSA strains were sensitive to vancomycin and linezolid [12, 13]. This study showed 100% resistance to cephalexin which is close to a study conducted by Anupurba *et al* and Udaya shankar *et al* [13, 6].

In our study MRSA strains were found to be more resistant to ciprofloxacin (51.3%) than levofloxacin (15%) and it also showed to be more susceptible to amikacin (57.1%) when compared to ciprofloxacin (48.7%). This is comparable to a study conducted by Lakshmi K *et al* [14]. This increase in resistance pattern to ciprofloxacin may be attributed to the irrational and excessive use of these antibiotics. As all the MRSA isolates are susceptible to vancomycin and

linezolid, these antibiotics can be used as the drug of choice for treating MRSA infections. Therefore, periodic surveillance of nosocomial infections and regular monitoring of antibiotic susceptibility pattern is necessary.

CONCLUSION

The emergence of MRSA is alarmingly high and is found to be more prevalent in hospital set up. But in recent times MRSA has emerged in community level also. This not only causes difficulty in treatment aspect but also necessitates the need for taking preventive measures to restrict the spread of MRSA strains in the community. The MRSA strains are found to be multi drug resistant and sensitive only to vancomycin and linezolid. This scenario narrows down the choice of antimicrobials available for MRSA to more toxic drugs like vancomycin, linezolid etc. Therefore it is mandatory to screen the samples and hospital staffs for MRSA and have an antibiotic policy for the hospital. Apart from this the knowledge about MRSA must be imparted to the medical and Para medical staffs to limit the spread of MRSA. Most importantly the irrational use of antibiotic and supply of antibiotics over the counter should be avoided and treatment should be based on in vitro antibiotic susceptibility testing.

REFERENCES

[1] Giacometti A, Cirion O, Schimizzi AM et al. Clin Microbiol 2000; 38 (2): 918-22.
[2] Swanston WH. West Indian Med J 1999; 48(1): 20-2.
[3] McDonald M.. Aust NZJ Surg 1997; 67 (10): 682-5.
[4] Jevons M. Br Med J 1961; 1: 124-125.
[5] Anupurba S, Sen MR, Nath G, Sharma BM, Gulati AK, Mohapatra TM. Indian J Med Microbiol 2003; 21:49-51.
[6] Doebbeling BN. J Chemotherapeutics 1995; 7 (Suppl.3):99-103.
[7] Nickersin EK, West TE, Day NP, Peacock SJ. 2009; 9:130-135.
[8] Barid D. Staphylococcus: 14th edn. Collee JG, Fraser AG, Marmion BP, Simmons A, Editors. (Churchill Livingstone: New York); 1996. p. 247.
[9] Udaya Shankar C, Harish BN, Umesh Kumar PM, Navaneeth BV. Indian J Med Microbiol 1997; 15:137-138.
[10] Mehta AP, Rodrigue C, Seth K, Jani S, Hakimiyar A, Fazalbhoy N. Indian J Med Microbiol 1998; 16:31-34.
[11] Qureshi AH, Rafi S, Qureshi SM, Ali AM. Pak J Med Sci 2004; 20:361-4.
[12] Rajaduraipandi K, Mani K R, Panneerselvam K, Mani M, Bhaskar M, Manikandan P. Indian J Med Microbiol 2006; 24:34-8.
[13] Anupurba S, Sen M R, Nath G, Sharma B M, Gulati A K, Mohapatra T M. Indian J Med Microbiol 2003; 21:49-51.
[14] Lakshmi K, Chitralekha S, Renuga S, Illamani V. Res J Pharm Biol Chem Sci 2013; 4(3):622-626.