Prevalence of Methicillin Resistance Staphylococcus Aureus and Antibiotic Susceptibility Pattern among Patients Admitted at Navodaya Medical College, Hospital and Research Center, Raichur

Rajeshwari R. Surpur[*], Venkatesh M Patil[†], Achut Rao[#], Sneha Hegadi[‡], Kalpana[‡]

{[*]Associate Professor, [#]Professor, [‡]Tutor, Dept of Microbiology} {[†]Associate Professor, Dept of Pharmacology}

Navodaya Medical college Raichur, Karnataka, INDIA.

[*]Corresponding Address:

rajsurpur@yahoo.in

Research Article

Abstract: **Background:** Methicillin resistant Staphylococcus aureus [MRSA] is an important nosocomial pathogen, the incidence of which is increasing every year especially in high risk group. The emergence of MRSA has posed a serious therapeutic challenge .AIM: To know the prevalence and antibiotic susceptibility pattern of MRSA in Navodaya Medical College, Hospital and Research Center, Raichur. Materials and Methods: The study included 244 strains of Staphylococcus aureus from various clinical specimens like pus, sputum, swabs, blood, urine, high vaginal swab admitted to Navodaya Medical Hospital. Methicillin resistance was detected using Cefoxitin disc diffusion method and subsequently antibiotic sensitivity testing was performed for MRSA isolates by Modified Kirby Bauer disc diffusion technique. Results: A total of 134 strains were found to be Methicillin resistant .Multi drug resistance was observed in many MRSA strains. No strain was resistant to Vancomycin. Conclusion: Regular surveillance of hospital associated infections and monitoring of antibiotic sensitivity pattern is required to reduce MRSA prevalence.

Key words: MRSA, Multidrug resistance, Hospital acquired infections.

Introduction

Staphylococcus aureus is responsible for causing a variety of human infections, which may range from minor skin diseases to life threatening infections [1].It colonizes healthy individuals and has been reported as major cause of community in hospital acquired infections [2]. Staphylococcus aureus infections used to respond to beta lactams and related group of antibiotics but emergence of MRSA has posed a serious therapeutic challenge.[3] Infected and colonized patients in hospitals mediate the dissemination of MRSA strains and hospital staff is the main source of transmission .This lead to serious endemic and epidemic MRSA infections[4]. The possible predisposing factors that increase the chance of emergence and spread of MRSA are prolonged and repeated hospitalization, indiscriminate use of antibiotics, lack of awareness, intravenous drug abuse and presence of indwelling medical devices[5]. Control of MRSA is essential to curtail the introduction and spread of infection. MRSA strains are difficult to eradicate as they are multidrug resistant leaving glycopeptides as the drug of choice[1]. Resistance has been reported to these drugs from various parts of country.[6,7] The knowledge of prevalence of MRSA and their antimicrobial susceptibility pattern is a must for appropriate treatment of these infections. The present study was conducted to know the prevalence of MRSA in our hospital.

Materials and Methods

Our study included a total of 244 coagulase positive Staphylococci isolated from a total of 1000 cases from various clinical specimens like sputum, pus, blood, urine, high vagianl swabs and swabs from peripheral IV sites admitted in Navodaya hospital. All the isolates were identified by standard procedures[8] like Gram staining, catalase test, mannitol fermentation, slide and tube coagulase test. These confirmed Staphylococcus aureus isolates were subjected to Cefoxitin disc diffusion test. Cefoxitin, a cephamycin is a more potent inducer of the mecA regulatory system than are the penicillins. MRSA strains exhibiting inducible resistance to Methicillin grow much more readily in the presence of Cefoxitin than Oxacillin due to enhanced induction of PBP 2a by Cefoxitin .CLSI has recommended Cefoxitin disc diffusion method for detection of MRSA.A 0.5 Mac Farland standard suspension of the isolate is made and lawn culture done on MHA plate. A 30 microgram Cefoxitin disc is placed and plates are incubated at 37^0 C for 18 hrs and zone diameters measured. The zone diameter must be measured in reflected light. An inhibition zone of < /= 21 mm is reported as Methicillin resistant and >/= 22 mm is considered as Methicillin

susceptible. Recent studies indicate that disc diffusion testing using Cefoxitin disc is far superior to most of the phenotypic methods like Oxacillin disc diffusion and Oxacillin screen agar testing. All the MRSA strains were subjected to antibiotic susceptibility testing by standard modified Kirby Bauer disc diffusion method. Antibiotics tested were Penicillin (10 mcg units), Amoxyclav (30 mcg), Ampicillin (10 mcg), Cephalexin (30 mcg), Erythromycin (15mcg), Ciprofloxacin (5mcg), Gentamicin (10 mcg), Amikacin (30 mcg), Linezolid (30 mcg), Vancomycin (30 mcg), Norfloxacin (10 mcg), Cotrimoxazole(25 mcg). Norfloxacin was put for urine samples and Erythromycin was not used in these samples. Zone diameters were measured following CLSI guidelines.[9] ATCC strain 29213 was used as reference strain.

Results

The distribution pattern of 244 Staphylococcus aureus strains isolated from various specimens and MRSA number and percentage is showed in Table I and the antibiogram of all MRSA and MSSA strains is shown in Table II. Out of 244 S.aureus strains, 134 strains were MRSA. The prevalence of MRSA strains was different among various clinical specimens. In sputum 38 (59.37%), swabs 15(71.42%), pus 23(47.91%), blood 19 (43.18%), swabs from bed sores 6 (75%), vaginal swabs 2 (50%), urine 31(56.36%). Out of 244 strains of Staphylococcus aureus, 134(54.91%) were MRSA and 110 (45.09%) were MSSA. MRSA strains were resistant to following antibiotics: Penicillin 134(100%), Amoxyclav 93(69.40%), Cephalexin 82(61.19%), Erythromycin 73(70.87%), Gentamicin 99(73.88%), Amikacin 73(54.47%), Ciprofloxacin 89(66.41%), Norfloxacin 18(58.06%), Cotrimoxazole 98(73.13%), Linezolid 8(5.97%). Vancomycin was sensitive to all strains.

Table 1: Distribution pattern of Staphylococcus aureus & MRSA

Specimens	Total	S. aureus	MRSA	%
Sputum	300	64	38	59.37
Swabs	80	21	15	71.42
Pus	210	48	23	47.91
Blood cultures of NS cases	150	44	19	43.18
Swabs from bed sores	20	8	6	75
Vaginal swabs	12	4	2	50
Urine samples	228	55	31	56.36
TOTAL	1000	244	134	54.91

Table 2: Antibiotic resistance pattern of MRSA and MSSA

Antibiotics	No of strains	No of MRSA	%	No of strains	No of MSSA	%
Penicillin	134	134	100	110	82	74.54
Amoxyclav	134	93	69.40	110	61	55.45
Cephalexin	134	82	61.19	110	23	20.9
Erythromycin	134	73	70.87	86	36	41.86
Gentamicin	134	99	73.88	110	46	41.81
Amikacin	134	73	54.47	110	18	16.36
Ciprofloxacin	134	89	66.41	110	48	43.63
Norfloxacin *	31	18	58.06	24	2	8.33
Cotrimoxazole	134	98	73.13	110	64	58.18
Linezolid	134	8	5.97	110	0	0
Vancomycin	134	0	0	110	0	0

Discussion

The present study shows a high prevalence of MRSA (54.91%).Other studies have shown a high prevalence of MRSA in various hospitals situated in different parts of the country ranging from 40.6% by Muralidharan S *et al* [3] , 54.85% by Anuprabha S *et al* [5] , 59.3% by Tiwari HK *et al* [7] and 52.9% by Majumdar *et al* [10] . A high prevalence of 63.04% was reported by Basavaraj H.C *et al* [11] and similarly Vidhani *et al* [12]reported 51.06% prevalence of MRSA .A low prevalence of 31.4% [4] , 32.8% in 1994 [13] , 24% in 1996 [14] , 32% in 1997 [15] was reported. Shipa Arora *et al* [16] reported 46% MRSA and multidrug resistance was observed in 73% MRSA strains. MRSA strains were found to be more resistant to other antibiotics than MSSA strains. The other contemporary reports state higher resistance rates for Aminoglycosides and Fluoroquinolones. Ciprofloxacin resistance was as high as 90% and 98.9% by Pulimood *et al* and Qureshi *et al* [14, 17]

as compared to our study which is 66.41% .It was 46% resistance to Ciprofloxacin by Rajadurai pandi *et al* [4]. Pulimood *et al* [14] observed 8% resistance to Gentamicin as against 63.6% by Rajadurai pandi *et al* [4] . In our study Gentamicin resistance was 73.88%.Gentamicin resistance is on a high since 1996. An increase of Gentamicin resistance from 0% before 1996 to 80% after 1996 has been reported Price MF *et al* [18].Qureshi *et al* [17] had reported a Gentamicin resistance of 97.8% which is higher compared to our study and Rajadurai pandi *et al* [4] reported 63.2 % resistance to Gentamicin. Resistance pattern to other antibiotics were also similar to our study. In present study Linezolid and Vancomycin were most sensitive drugs.

Conclusion

Cefoxitin disc diffusion test is better predictor of Methicillin resistance in Staphylococcus aureus. Detecting mec A gene characterization by PCR/PBP 2a is recognized as gold standard for detection of MRSA. However, use of PCR assay is generally limited to reference laboratories. So our study clearly showed+ Cefoxitin DD is an easier to read test with greater accuracy for detection of MRSA. Resistance to most Beta lactams and some other classes of antibiotics poses a problem in treating an infection with MRSA. Vancomycin, a glycopeptide seem to be only antibiotic as drug of choice to treat MDR MRSA infections. The high prevalence of MRSA and glycopeptides use, both thought to be the risk factors for VRSA, make the widespread dissemination of this organism an alarming and realistic problem when it emerges. So glycopeptides must be kept reserved for life threatening infections caused by MDR MRSA.

The most effective way to prevent MRSA infection is by doing continuous surveillance of antibiotic resistance profiles of local S.aureus isolates to formulate antibiotic policies and effective infection control practices.

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