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RESEARCH ARTICLE

Prevalence and antimicrobial susceptibility of methicillin resistant staphylococcus in a tertiary Care hospital in kashmir.

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Abstract

Introduction:-

Gram-positive organisms are the most common bacterial pathogens causing serious infections such as complicated skin and soft tissue infection[1], bacteremia and infective endocarditis[2]. The grave concern is the growing incidence of methicillin resistant Staphylococcus aureus (MRSA), a drug resistant pathogen, for which therapeutic options are limited[3].

Staphylococcus aureus (S.aureus) is one of the most important pathogens affecting humans, and is a leading cause of hospital and community acquired infections, manifesting from minor skin diseases to life threatening infections [4,5] . It is an opportunistic bacterium frequently part of human micro flora, causing disease when the immune system becomes compromised [6]. About 20% of the population is always colonized with S. aureus, 60% are intermittent carriers, and 20% never carry the organism [7]. *S. aureus* has been very adapt at acquiring resistance to antimicrobial drugs, which is an important health, as well as economic problem. Organisms that have acquired resistance to methicillin are called as methicillin resistant S. aureus (MRSA) and were first reported in Britain in 1961 within a year of introduction of methicillin i.e 1959-196 [8] ,as *Staphylococcus aureus* with exogenous cassette DNA containing the methicillin-resistant gene mecA (SCCmec) [9] .MRSA produce a novel penicillin binding protein (PBP) (PBP 2a or PBP 2´) in addition to the usual PBPs . This is the primary mechanism of staphylococcal methicillin resistance and is referred to as intrinsic resistance. PBP 2a has a low affinity for β-lactam antibiotics and is thought to function in their presence to confer resistance to the bacteria. MRSA is now a problem in hospitals worldwide and is increasingly recovered from nursing homes and the community. In Indian hospitals, based on antibiotic sensitivity tests, 30 to 80% MRSA, has been reported [10] .

MRSA is of serious concern not due its sole resistance to methicillin, but also because of resistance to many other antimicrobials that are used on a regular basis in hospitals. Current therapeutic options for MRSA are limited to few expensive drugs like vancomycin, linezolid, teicoplanin, daptomycin and streptogramins. Both endemic and epidemic MRSA infections occur globally as infected and colonized patients in hospitals mediate the dissemination of these isolates and hospital staff assists further transmission [11]. This study has been carried to determine the prevalence and antibiotic susceptibility of staphylococcus aureus in order to utilize the information to formulate antibiotic policy and appropriate control measures.

Material and methods:-

This was a retrospective and prospective study done in a tertiary care hospital in Kashmir. Blood agar and nutrient agar plates were used as non selective media and mannitol salt agar plate as *selective media* for isolation of *S. aureus*. Staphylococcus strains were identified based on Gram's stain morphology, colony characteristics, and positive catalase and coagulase tests. The isolates were from clinical samples including pus, urine, blood and body fluids. Antimicrobial susceptibility testing was done by the disk diffusion technique and testing for methicillin resistance was performed using the cefoxitin disc diffusion method recommended by the Clinical and Laboratory Standard Institute[12]. The isolates were screened for susceptibility to a panel of antibiotics using Mueller-Hinton agar (BD, India) medium. The antibiotic discs (BD, India) containing the following antibiotic concentrations (in µg) as per CLSI guidelines were used : ampicillin (10 µg), cefoxitin (30 µg), cefotaxime (30 µg), ceftriaxone (30 µg), cefoparazone/sulbactum (75 µg /30 µg), cefepime (30 µg), vancomycin (30 µg), gentamicin (10 µg), amikacin (30 µg), erythromycin (15 µg), ciprofloxacin (5 µg), clindamycin (2 µg), trimethoprim-sulphamethoxazole (1.25 µg /23.75 µg), and linezolid (30 µg). were tested.

The inhibition zone diameters were measured to the nearest millimeter and recorded. Each bacterial isolate was classified as susceptible (S), intermediate (I) and resistant (R) to antibiotic according to the zone diameter interpretation standard recommended by the Clinical Laboratory Standards Institute (CLSI). The isolates were considered methicillin resistant if zone of inhibition was 10 mm or less. *S. aureus* ATCC 25923, *S. aureus* ATCC 29213 were used as quality control strains (Sanofiaventis, India) to check antibiotic discs and accuracy of the testing procedure. The data obtained was recorded on Microsoft excel (2007 version) and analyzed. The results were explained in frequency (number) and in percentage (%).

Results:-

The total Staph aureus isolates collected in the present study were 140, out of which 58 (41.4%) were methicillin resistant.

The distribution of MRSA among various clinical samples is shown in Table 1:

Samples	MRSA(n=58)	Total(n=140)
Blood	12(20.6%)	36(25.7%)
CSF	1(1.7%)	3(2.1%)
Pus	3(5.1%)	9(6.4%)
Sputum	2(3.4%)	5(3.6%)
Swab	36(62.1%)	67(47.9%)
Tracheal Tip	1(1.7%)	3(2.1%)
Urine	3(5.1%)	17(12.1%)

MRSA = Methicillin resistant Staphylococcus aureus

Highest numbers of samples were obtained from wound swabs and least from CSF, Tracheal-tip, urine.

Distribution of MRSA as per age of patients:

MRSA were most commonly isolated from the age group 21-30 followed by age group of 51-60 followed by age group of 11-20, 41-50, 31-40 and least no of cases were seen in the age group of 61-70.(Tabled – 2)

Age group in years	MRSA
0-10	0
11-20	10
21-30	29
31-40	3
41-50	3
51-60	13
61-70	0

The antibiotic susceptibility pattern of MRSA is shown in table 3.

Table 3: Antibiogram of MRSA

Antibiotic	MRSA Isolates(n=58)		MSSA Isolates (n=82)	
	Number	% age	Number	% age
Ampicillin	6	10.3%	28	34.1%
Cefotaxime	17	29.3%	41	50%
Ceftriaxone	24	41.37%	57	69.5%
Vancomycin	56	96.5%	82	100%
Gentamicin	18	31.03%	75	91.4%
Amikacin	53	91.3%	77	93.9%
Erythromycin	19	32.7%	67	81.7%
Clindamycin	16	27.5%	69	84.1%
Ciprofloxacin	33	56.8%	62	75.6%
Linezolid	58	100%	82	100%
Trimethoprim/ Sulphamethoxazole	19	32.7%	74	90.2%

Discussion::-

Methicillin Resistance in S. aureus is a major problem in hospitals worldwide and is increasingly recovered from nursing homes and the community. There is a growing concern about MRSA with reduced susceptibility to vancomycin, which is currently the most extensively used antibiotic for its treatment. The prevalence of MRSA varies in different parts of India and is not uniform. In India, the importance of MRSA as a problem has been recognized relatively late [13]. In our study we included 140 isolates of staph aureus out of which 58 isolates proved to be Methicillin resistant giving the prevalence in our study to be 41.4%. Reports from a Delhi hospital showed a prevalence 38.44% in 2008 [14]. Verma S et al 2000 [15] in their study reported the frequency of MRSA in the range of 6.9-80.89 per cent. In a study at Aligarh, India [16] it was shown that 35.1% of S. aureus isolates were resistant to methicillin. In certain areas in Nigeria such asIlorin [17], the prevalence of MRSA was found to be 34.7% and Jos [18][26] 43.0%. In contrast, the prevalence of MRSA was found to be low in France (6%), Ireland (5%) and United Kingdom(2%) [19]. However, a high prevalence of 83% MRSA was reported from Pakistan [20]. This confirms the high regional variations in the findings from different countries and cities. The difference in prevalence of MRSA may be because of the factors like healthcare facilities available in the particular hospital and rationale antibiotic usage which varies among hospitals in different parts of the world.

In our study, most of the MRSA were isolated from swabs (62.1%) followed by blood specimens (20.6%); urine(5.1%). 3-5% of the isolates were each from pus, CSF etc . This is in accordance with other studies [21,22] where throat swabs and wound swabs were the main source of MRSA. Besides Sangeeta Joshi et al [23] in their study isolated most of the MRSA from swabs obtained from skin and soft tissue infections, followed by blood specimens, which also is in accordance with our study.

The present study showed high resistance of MRSA to ampicillin, cefotaxime, and clindamycin. This was in accordance with other studies [4,22]. MSSA isolates show higher sensitivity than MRSA strains to gentamicin (31.03% vs 91.4%), erythromycin (32.7% vs 81.7%), co-trimoxazole (32.7% vs 90.2%) and clindamycin (27.5% vs 84.1%).

In our study there was 100% sensitivity of both MRSA and MSSA to Linezolid which is presently the one of the most effective drugs used in the treatment of MRSA infections. There was also 96.5% sensitivity to vancomycin, the most widely used antibiotic for treatment of MRSA Infections. Vancomycin-intermediate and vancomycin resistant S. aureus strains have been reported recently from various parts of the country [24,25,26]. In our study reported also, we reported 3.5% resistance to vancomycin among MRSA. Although this is low when compared to a recent study [27], but nevertheless is an alarming sign. Therefore regular monitoring of vancomycin sensitivity should be done to prevent rapid emergence of resistance.

Conclusion:-

This study highlights the need for continuous surveillance of antibiotic sensitivity pattern of Methicillin resistant Staphylococcus aureus(MRSA) with a view to selecting appropriate therapy and keep a close vigil on the changing

trends of antibiotic susceptibility patterns so that effective antibiotic policies can be made in the hospitals. Also Implementation and monitoring of infection control committee needs to be emphasized so as to prevent the rampant use of antibiotics and minimize the emergence of resistance to commonly used antibiotics.

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