Prevalence of Methicillin Resistant Staphylococcus aureus in Children

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ABSTRACT

Background: Methicillin resistant *Staphylococcus aureus* (MRSA) has been reported world wide and is becoming a clinical threat. These strains are responsible for out break of nosocomial infection. MRSA strains in the Hospital are difficult to eradicate because of the multidrug resistance. This study was done to assess the prevalence of methicillin resistant *Staphylococcus aureus* (MRSA) in pediatric patients visiting Kanti children's Hospital.

Methods: The study was conducted in the Department of Microbiology, Kanti children's Hospital, and Kathmandu, Nepal during the period of February 2004 to July 2004. A total of 210 clinical samples including pus/ swabs from eye, ear, throat, vaginal, burn and wound were collected from admitted and Out –patients. All the collected samples were processed using standard protocols and analyzed for the presence of *Staphylococcus aureus.* All identified *Staphylococcus aureus* isolates from different clinical samples were subjected to *in-Vitro* antimicrobial susceptibility test by Kirby-Bauer disc diffusion method.

Results: A total of 210 clinical samples including pus/ swabs from eye, ear, throat, vaginal, burn and wound were collected from admitted and Out –patients. Among the 210 samples processed for the study, *S. aureus* isolates were obtained from 65 samples which constituted 45(69.23%) were from outpatients and 20(30.77%) were from hospitalized patients. Of 65 *S. aureus* isolates, 19 (29.23%) were found to be MRSA which constituted 13(68.42%) from admitted patients and 6 (31.57%) from outdoor patients. Among the other antibiotics tested, 58.46%, 30.16%, 26.15% and 21.53% of *S. aureus* isolates showed resistant to ampicillin, cloxacillin, tetracycline and ciprofloxacin respectively. All the MRSA isolates showed 100% resistant to ampicillin and cloxacillin, followed by cotrimoxazole (92.1%), tetracycline (40.5%) and ciprofloxacin (34.7%).However, 100% isolates of MRSA were sensitive to vancomycin **.**

Conclusion: Vancomycin seemed to be the only antimicrobial agent which showed 100% sensitivity and may be used as the drug of choice for treating multidrug resistant MRSA infections. However, regular monitoring of vancomycin sensitivity and routine testing of other newer glycopeptides like teicoplanin should be carried out.

Key words: multidrug resistant; prevalence; Staphylococcus aureus

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INTRODUCTION

Methicillin resistant *Staphylococcus aureus* (MRSA) strains were initially described in 1961 and emerged in the last decade as one of the most important nosocomial pathogens.[1] Infected and colonized patients provide the primary reservoir and transmission is mainly through hospital staff.[2] The risk factors which contribute to MRSA are excessive antibiotic usage, prolonged hospitalization, intravascular catheterization and hospitalisation in intensive care unit.[3] With the increased incidence of MRSA, the effectiveness of penicillin and cephalosporins is questioned. In fact many stains of MRSA exhibit resistance to both β lactams and aminoglycosides.[4] Hence, knowledge of prevalence of MRSA and their antimicrobial profile becomes necessary in the selection of appropriate empirical treatment of these infections. This work was carried out to determine the prevalence of MRSA infections and their *in vitro* susceptibility pattern to various antimicrobial agents in Kanti children's Hospital, Kathmandu, Nepal.

METHODS

The study was conducted in the Department of Microbiology, Kanti children's Hospital, Kathmandu, Nepal to study the prevalence of methicillin resistant *Staphylococcus aureus* and antibiotic susceptibility pattern of isolated organism. A total of 210 clinical samples including pus/ swabs from eye, ear, throat, vaginal, burn and wound were collected from admitted and out-patients during the period of February 2004 to July 2004. All the collected samples were inoculated on Mannitol salt agar (MSA) and incubated at 37°C for 24 hours. Colonies formed on MSA were picked up and Gram stained. For conformational identification of *Staphylococcus aureus*, catalase test, coagulase (slide and tube) test and DNase test were also perfomed.[5] All identified *Staphylococcus aureus* isolates from different clinical samples were subjected to *in-Vitro* antimicrobial susceptibility test by Kirby-Bauer disc diffusion method.[6]

The antibiotics used in this study were methicillin (5mcg), tetracycline (30mcg), ciprofloxacin (5mcg), cotrimoxazole (25 mcg), ampicillin (10 mcg), cloxacillin (5 mcg) and vancomycin (30 mcg). With a view of screening MRSA from the *S. aureus* isolates firstly methicillin, tetracycline, ciprofloxacin, ampicillin and cloxacillin were used. Furthermore, the MRSA isolates were further subjected to different antibiotics including vancomycin. The accuracy of the over all testing procedure was monitored by using *Staphylococcus aureus* ATCC 25923 as reference strain.

RESULTS

Isolation of *Staphylococcus aureus*

Among the 210 samples processed for the study, *S. aureus* isolates were obtained from 65 samples which constituted 45(69.23%) were from outpatients and 20(30.77%) were from hospitalized patients (Table 1).

Antibiotics susceptibility pattern of *Staphylococcus aureus* isolates

Of 65 *S. aureus* isolates, 19 (29.23%) were found to be MRSA which constituted 13 (68.42%) from admitted patients and 6 (31.57%) from outdoor patients. Among the other antibiotics tested, 58.46%, 30.16%, 26.15% and 21.53% of *S. aureus* isolates showed resistant to ampicillin, cloxacillin, tetracycline and ciprofloxacin respectively (Table 2).

All the MRSA isolates showed 100 % resistant to ampicillin and cloxacillin, followed by cotrimoxazole (92.1%), tetracycline (40.5%) and ciprofloxacin (34.7%). However, 100% isolates of MRSA were sensitive to vancomycin (Table 3).

DISCUSSION

Our findings showed that 19 (29.23 %) isolates of *S.aureus* were methicillin resistant. Other antibiotics were used

Table 1. Isolates of *S. aureus* in Admitted and out patients of different age groups						
Age (year)	Out Patients			Admitted Patients		
	No. of samples taken	No. of *S.aureus* isolates	Percentage of *S.aureus* isolates	No. of samples taken	No. of *S. urues* isolates	Percentage of *S.aureus* isolates
0-3	75	30	40 %	43	13	30.23 %
4-6	18	5	27.7 %	15	3	20 %
7-9	14	6	42.85 %	3	0	0 %
10-12	22	2	9.09 %	10	3	30 %
13-15	8	2	25 %	2	1	50 %
Total	137	45		73	20	

Table 2. Antibiotic susceptibility pattern of Staphylococcus aureus isolates

Antibiotics	Total S.aureus isolates	Sensitive		Resistance	
		No.	%	No.	%
Methicillin	65	46	70.77	19	29.23
Tetracycline	65	48	73.84	17	26.15
Ciprofloxacin	65	51	78.46	14	21.53
Ampicillin	65	27	41.53	38	58.46
Cloxacillin	65	45	69.23	20	30.16

Table 3. Antibiotic susceptibility patterns as shown by the MRSA Isolates

Antibiotics	Resistant	Sensitive
Vancomycin (30 mcg)	-	100 %
Ciprofloxacin (5 mcg)	34.7 %	65.3 %
Tetracycline (30 mcg)	40.5 %	59.5 %
Cotrimoxazole (25 mcg)	92.1 %	7.9 %
Ampicillin (10 mcg)	100 %	0 %
Cloxacillin (5 mcg)	100 %	0 %

so as to interpret the resistant pattern of *S.aureus* in regard with MRSA in which higher percentage of *S. aureus* isolates were found to be resistant to ampicillin (58.46%) followed by gentamicin (36.92%), cloxacillin (30.16%), tetracycline (26.15%) and ciprofloxacin (21.53%).

It has been observed that ciprofloxacin was the most effective drug (78.46%) for *S.aureus* followed by tetracycline (73.84%). This finding was higher in comparision to the finding of Pokharel *et al* (13%). Fraise *et al* (17%) in Nursing homes in major UK city, Tanaka *et al* (22%) at Tottori University Hospital, Japan and Rajbhandari *et al* (54.9%) in Kathmandu, Nepal.[7-10] There might be several risk factors for acquisition of MRSA. Patients having a history of previous hospitalization, increased length of hospitalization, acutely ill in an ICU, chronic disease state, prior and prolonged antibiotics therapy, exposure to colonized or infected patient, presence of wound and use of invasive indwelling devices (including endotracheal tubes) are some of the important risk factors associated with the acquisition of MRSA. However, this finding was agreement with another study conducted by Lamichhane *et al* (31.43%) in Kathmandu, Nepal.[11]

The drug resistance of MRSA was highest with ampicillin (100%) and cloxacillin (100%) followed by cotrimoxazole (92.1%), tetracycline (40.5%) and ciprofloxacin (34.7%). However, all MRSA strains were sensitive to vancomycin.

A similar type of study in India showed that vancomycin and Ciprofloxacin were the most effective drug for *Staphylococcus aureus*.[12] The study in Shiraz-Iran also found that vancomycin (100%) was the most effective drug followed by chloramphenicol (94%) and ciprofloxacin (87%) for treating MRSA infections.[13]

MRSA from different clinical samples at Kanti Children's Hospital showed 100% resistance to penicillin, ampicillin, cloxacillin, and cephalexin. However, all the MRSA isolates were sensitive to vancornycin (100%) Lamichhane *et al*.[11]

Rajbhandari et al also studied antibiotic sensitivity pattern of MRSA and found that 100% strains of MRSA at Bir Hospital were sensitive to vancomycin.[10]

Hence, vancomycin is the drug of choice for MRSA infection. Vancomycin seems to be the only antimicrobial agent which showed 100% sensitivity and may be used as the drug of choice for treating multidrug resistant MRSA infections. However, regular monitoring of vancomycin sensitivity and routine testing should be carried out. Further, the regular surveillance of hospital associated infections including monitoring antibiotic sensitivity pattern of MRSA and formulation of definite antibiotic policy may be helpful for reducing the incidence of MRSA infection.

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