

The prevalence of Methicillin Resistant Staphylococcus Aureus (MRSA) in the infected wound of patient and nasal colonization of medical staff in the Oral and Maxillofacial surgery ward

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Abstract:

The study conducted at the department of Oral and Maxillofacial surgery in Dhaka Dental College Hospital, BSMMU, Shaheed Shohrawardi Hospital, Dhaka Medical College Laboratory, Dhaka, Bangladesh with a view to determine the current trend and status of MRSA infection and carrier stage as well as its prevalence and risk factors both in patients & hospital staff. On study 31.3% patients were infected by MRSA and 12.2% staffs were colonized by MRSA. During study total staphylococcus identified 64.5% were MRSA and 35.5% were MSSA in patients and among the staffs out of the staphylococcus identified, 15.9% were MRSA and 84.1% were MSSA. Higher age group is identified as a predictor for risk of MRSA infection. In other group previous hospitalization, increased length of hospital stays and history of taking broad spectrum antibiotic were found to be associated with occurrence of MRSA infection. In patients, vancomycin was the single drug found to be highly sensitive against staphylococcus and MRSA as well. Next in the place were Gentamicin and Ceftriaxone. Erythromycin and penicillin seems to be the least sensitive. Among the medical staff, most staphylococcus was sensitive to Gentamicin, Ciprofloxacin, Ceftriaxone and Vancomycin.

Key words : MRSA, MSSA, Staphylococcus.

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Introduction:

MRSA is a strain of staphylococcus aureus resistant to methicillin, oxacillin & cephalosporin. It rapidly develops resistance to many other antimicrobial agents and its prevention of infection is more important than other pathogen.

Risk factors for prevalence of MRSA are: previous and prolonged hospitalization, advanced age, prior or prolonged antibiotic therapy, malnutrition and chronicity of infected wound.¹

Infected & colonized patient provides the primary reservoir and transmission is mainly through hospital staffs carrying the organisms in the skin and anterior nares.²

In maxillofacial surgery ward many patients are admitted with abscess, cellulitis, facial space infection, chronic osteomyelitis, postoperative wound infection etc. Above infected patient gives history of prolong facial infection with discharging sinus and prolonged injudicious use of antibiotics and previous hospitalization. So it is a suitable condition to get emergence of MRSA in the department.

Materials and Methods:

It was a cross sectional study carried out at the Oral and Maxillofacial surgery department of Dhaka Dental College & Hospital, BSMMU, Shaheed Shohrawardi Hospital, Dhaka Medical College Laboratory, Dhaka during the period of January 2005 to December 2006). Patient were selected with wound infection (Preoperative and postoperative) and hospital personnel irrespective of age and sex who fulfilled the inclusion and exclusion criteria. Specimens as swab were taken from the infected wound of admitted patients and nasal swab were taken from the medical staff. The results of the experiments were recorded systemically. Statistical analysis was performed using Chi-square (χ^2) test and "t" test.

Laboratory Procedure

Isolation of organisms from specimen:

a) Gram staining : All the specimens were stained by Gram staining & examined under microscope.

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b) Culture: All the specimens were inoculated into Blood agar, MacConkey agar and additional selective media ie, Mannitol salt agar (MSA) for staphylococci was also used. The plates were incubated aerobically at 37^{0c} C for 18-24 hours. Single isolated colonies of different bacteria were picked up & subcultured in order to get pure colonies.

c) Isolation & identification of organism: Identification of organism was done on the basis of growth character, colony morphology, Gram staining, motility test & different biochemical tests eg. Catalase test, Coagulase test, oxidase test. uraese test, fermentation test, reaction in KIA agar & simmon's citrate agar etc.

e) Detection of MRSA: All the isolated Staphylococcus aureus strains were subjected to oxacillin disc diffusion test. MRSA was detected by oxacillin disc diffusion method using 1mg disc. A zone of inhibition of less than 10mm indicates resistance to methicillin.

d) Antimicrobial susceptibility test: Antimicrobial susceptibility tests of all isolated Staph. aureus strains and other Gram positive and Gram negative aerobic organisms were done by Disc diffusion method against the following antimicrobial agents commonly used in the Oral & Maxillofacial surgery department using the Mueller Hin ton agar media (Modified Kirby-Bauer Technique).



Fig.-1: Chronic osteomyelitis of Mandible

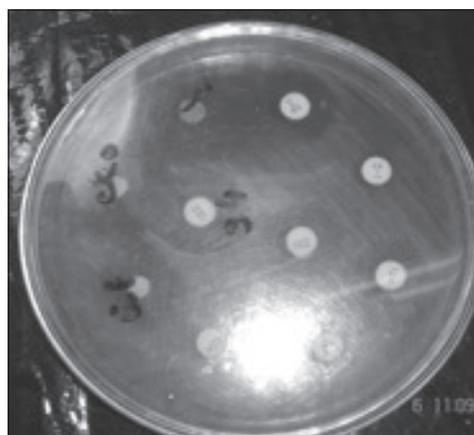


Fig.-2: Antibogram of MRSA in mueller-Hinton agar media.

Results & Observations:

Table-I
Distribution of Type of staphylococci

Types of staphylococci	Patient		Staff		Total	
	No	%	No	%	No	%
MRSA	20	64.5	11	15.9	31	31
MSSA	11	35.5	58	84.1	69	69
Total	31	100	69	100	100	100

Table-III
Distribution of the patients by history of taking antibiotic.

History of taking antibiotic	Frequency	Percent
Yes	56	87.5
No	8	12.5

Table-III
Comparison of duration of hospital stay and duration of antibiotic use between the patients with positive and negative MRSA

Variable	MRSA	N	Mean±SD	t	df	P value
Duration of hospital stay (days)	Positive	20	2845.0±1400.1	2.058	62	0.044(S)
	Negative	44	3306.8±1317.2			
Duration of antibiotic use	Positive	18	14.89±10.03	2.045	52	0.046(S)

Table-IV
Antibiotic sensitivity of MRSA among patients

Antibiotic	Sensitive		Resistant	
	Frequency	Percentage	Frequency	Percentage
Amoxicillin	3	15	17	85
Erythromycin	1	5	19	95
Gentamycin	12	60	8	40
Ciprofloxacin	7	35	13	65
Vancomycin	19	95	1	5
Cephadrine	1	5	19	95
Cloxacilin	5	25	15	75
Penicillin	3	15	17	85
Ceftriaxone	9	45	11	55

Table-V
Antibiotic sensitivity of MRSA among staff

Antibiotic	Sensitive		Resistant	
	Frequency	Percentage	Frequency	Percentage
Amoxicillin	1	9.1	10	90.9
Erythromycin	3	27.3	8	72.7
Gentamycin	3	27.2	8	72.7
Ciprofloxacin	7	63.6	4	36.4
Vancomycin	11	100	0	00
Cephadrine	5	45.5	6	54.5
Cloxacilin	5	45.5	6	54.5
Penicillin	1	9.1	10	90.9
Ceftriaxone	5	45.5	5	45.5

Discussion:

Out of 64 patients, 20 (31.3%) cases were affected by MRSA and out of 90 staffs, 11 (12.2%) cases were colonized by MRSA. Among patients, *S. aureus* was detected in 31 cases, of them, 20 (64.5%) were MRSA and the rest 11 were MSSA. Esuvaranathan et al. (1992)³ found 50% *S. aureus* isolated from the wound infection, were resistant to Methicillin. While Doebbeling (1995)⁴ reported 72% MRSA. So, in the current study, the prevalence of MRSA was rather among the highest group but not among the lowest.

Among medical staff, *S. aureus* were detected in 69 (76.7%) cases, of them 11(15.9%) were MRSA. The result is in

accordance with Avery et al. (2000)⁵ from Saudi Arabia where the isolation was 18.3%. A higher rate was reported by Saxena et al. (2002) from India (25%).⁶

Most MRSA were of higher age group and it is found to be associated with increased age ($P < .05$) where as no sex difference have been evident. Lu et al. (2005) also identified age as a risk factor.

In the present study, previous hospitalization was identified as a predictor ($P < .01$) for risk of MRSA infection. Several studies also illustrated the relationship of previous or prolonged hospitalization history with increased risk of having MRSA.⁷

Out of 64 subjects, 56 (87.5%) had taken antibiotics before. However patients with MRSA on an average took antibiotics for 4.72 days more and stayed 4.57 days more at hospital in comparison to their non MRSA counterpart ($P < .05$). Current study findings almost echoed the observation of Doebbeling BN (1995).⁴ His study suggested higher frequency of severe underlying disease, Prior antibiotic therapy, and prolonged hospitalization increases the risk of MRSA bacteremia, particularly in post operative patients.

Among the 20 patients with MRSA infection, Vancomycin was found to be 95% sensitive against MRSA. Next in the place was Gentamicin (60%) and Ceftriaxone 45%. Esuvaranathan et al. (1992) also found vancomycin most sensitive to MRSA 100%. Current study findings seem to have imitated the results of Jahan et al. (2004).⁸

Among the 11 staff with MRSA, Vancomycin was found to be the highly sensitive (100%) against MRSA, next in place were sensitive to ciprofloxacin 63.6% and Ceftriaxone 54.5%.

Vancomycin seems to be the only antimicrobial agent which showed highest sensitivity & may be used as the drug of choice for treating multidrug resistant MRSA infection.

Conclusion:

From the present study it may be concluded that, there is an alarmingly high incidence of MRSA in hospitalized patients. Nasal carriage rate of MRSA among hospital staffs is also high. MRSA is multiple drug resistance, susceptibility test should be performed with all commonly used anti-staphylococcal drugs and then appropriate drug

should be selected to prevent development of resistant to additional drugs. Regular monitoring of antibiotic sensitivity pattern of MRSA and formulation of definite antibiotic policy for a hospital will helpful in reducing incidence of MRSA infections.

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