

## Prevalence of Methicillin-Resistant *Staphylococcus aureus* (MRSA) in a Tertiary-Care Hospital in Eastern Nepal

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### ABSTRACT

Nosocomial infection is a major problem in the world today. Methicillin-resistant *Staphylococcus aureus* (MRSA) strains, usually resistant to several antibiotics, shows a particular ability to spread in hospitals and is now present in most of the countries.

The aim of the present study was to determine the prevalence of MRSA infections and their antimicrobial susceptibility pattern in our hospital located in eastern Nepal.

Identification of *Staphylococcus aureus* was confirmed by standard methods and the antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion method. Interpretation criteria were those of the national committee for clinical laboratory standards.

During a period of one year, out of a total of 750 *Staphylococcus aureus* strains isolated from various clinical samples, 196 (26.14%) were found to be Methicillin-resistant. Seventy percent isolates of MRSA were from inpatient departments and amongst them only 10% of the isolates were from intensive care units (ICU). More than 65% of MRSA were found to be resistant to Penicillin, Cephalosporins, Ciprofloxacin, Gentamicin Erythromycin and Tetracycline, while 47.96% of them were resistant to Amikacin. Many MRSA strains were multidrug-resistant. However, no strains were resistant to Vancomycin.

To reduce the prevalence of MRSA, the regular surveillance of hospital acquired infection, isolation nursing of patients who carry MRSA, monitoring of antimicrobial susceptibility pattern and formulation of a definite antibiotic policy may be helpful.

**Key words:** eastern Nepal, resistant, tertiary-care hospital

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## INTRODUCTION

Five to ten percent of hospitalized patients develop nosocomial infections.<sup>1</sup> The larger the referral hospital, the higher is the rate of these infections.<sup>2</sup> *Methicillin-resistant Staphylococcus aureus* (MRSA) frequently causes nosocomial infections, is often resistant to most of the antibiotics and is one of the greatest challenges for modern antimicrobial therapy, particularly since the emergence of *Staphylococcus aureus* (*S. aureus*) with intermediate susceptibility to glycopeptides.<sup>3</sup>

Recent studies suggest that the infection due to MRSA is not only hospital-acquired but community acquired as well.<sup>4</sup> MRSA now represent a global problem.<sup>5</sup> Some large outbreaks have been reported from different parts of the world, where it had caused severe infections including septicemia, endocarditis and meningitis.<sup>5</sup> A study by Dickinson in England and Wales has concluded an increase in the trend of death due to MRSA infection.<sup>6</sup> Infections caused by MRSA can be expensive in terms of antibiotic therapy, isolation facilities and materials and length of hospital stay. According to a World Health Organization literature, the global financial burden because of MRSA infection has been worked out to be \$20,000 to \$ 114,000 for outbreaks and from \$28,000 to \$1600,000 for endemic infections per year.<sup>5</sup>

The common sources of these infections are human patients and carriers.<sup>7</sup> The risk factors that contribute to MRSA are antibiotics abuse, prolonged hospitalization, intravascular instrumentation and hospitalization in an intensive care unit.<sup>8</sup> There is considerable variation in numbers of clinical infections among units, hospitals and countries.

## MATERIAL AND METHODS

A total of 750 *S. aureus* strains were isolated during a period of one year from, June 2003 to June 2004. The organisms were obtained from various clinical samples like pus, sputum, genital specimens (high vaginal swab, semen, urethral discharge), urine, blood, body fluids (cerebrospinal fluid, ascitic fluid, plural fluid, synovial fluid etc.), devices (urinary catheter, endotracheal tube, CVP catheter, tracheostomy tube, PD catheter, drain, suction catheter) and tissues. Standard isolation procedures were applied to all the samples. Identification of *S. aureus* was confirmed by standard coagulase; susceptibility testing for oxacillin (1 µgm disc from Himedia Laboratories Pvt. Ltd. India) was also performed by Kirby-Bauer's disk diffusion on Mueller- Hinton agar with 24 hours incubation at 35 °C. Interpretation criteria were those of the national committee for clinical laboratory standards (NCCLS).<sup>9</sup> A zone of inhibition of less than 10 mm or any discernible growth within the zone of inhibition was taken as indicative of methicillin-

resistance (screening out MRSA strains). Methicillin-resistance was confirmed by agar screen test using Mueller-Hinton agar plate supplemented with 4% NaCl and oxacillin (6µgm/ml). The antimicrobial susceptibility pattern of all the MRSA strains were determined against the following antibiotics:

Amikacin	-30 µgm
Ceftazidime	-30 µgm
Cephotaxime	-30 µgm
Ciprofloxacin	-5 µgm
Erythromycin	-15 µgm
Gentamicin	-10 µgm
Ofloxacin	-5 µgm
Penicillin	-10units
Tetracycline	-30µgm
Vancomycin	-30 µgm

*S. aureus* ATCC 25923 was used as a standard control strain.

## RESULTS

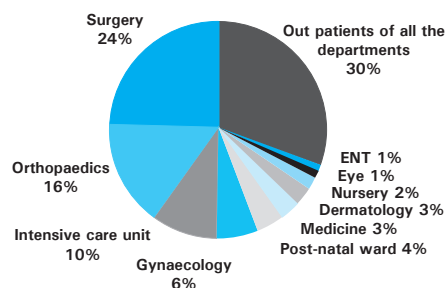
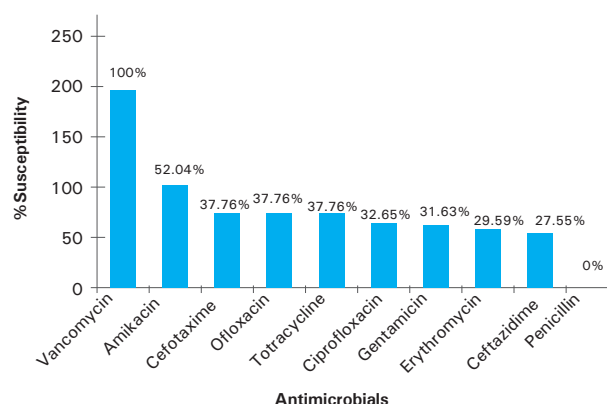
Out of the total of 750 strains of *S. aureus*, 196 were found to be MRSA (26.14%). The maximum isolation of MRSA was from pus and wound swabs. The number and percentage of isolation of MRSA from different clinical specimens (Table 1). Seventy percent of the MRSA isolates was from the inpatient departments. The majority of the samples were obtained from Surgery (24%) and Orthopedics units (16%). MRSA observed in intensive care units (ICU) represented 10% of the cases (Figure 1). More than 65% of MRSA were found to be resistant to the majority of the antibiotics tested (Figure 2). Many of the MRSA strains were resistant to all the antibiotics tested except Vancomycin.

## DISCUSSION

Scanty data regarding MRSA is available from Nepal, to the best of our knowledge. The prevalence rate of MRSA infection in our study was found to be 26.14%, which is in accordance with the reports by Udaya et al (20%) and Mehta et al (32.8%) from India.<sup>10-11</sup> On the contrary, some of the reports show an alarmingly high incidence of MRSA infection.<sup>12-13</sup> An important finding of the present study was that the MRSA cases from ICU accounted for only 10% of all cases. Our finding is in agreement with the findings of Dominique et al<sup>3</sup> from Switzerland. These findings illustrate the efficacy of relatively good infection control practice in our hospital.

**Table 1. Number and Percentage of Isolated MRSA from Different Clinical Samples**

Clinical samples	No. of <i>S. aureus</i> (n = 750)	No. of MRSA (n = 196)	Percentage
Pus and wound swab	480	128	26.67
Blood	150	18	12
Devices	36	18	50
Urine	24	8	33.33
Genital specimen	20	2	10
Body fluids	18	10	55.56
Tissue	12	6	50
Sputum/throat swab	10	6	60

**Figure 1. Frequency (in %) of MRSA cases from out patient department (OPD) and different wards of the hospital (n = 196)****Figure 1. Frequency (in %) of MRSA Cases from Different Departments and Wards of the Hospital (n = 196)****Figure 2. Susceptibility Pattern of MRSA Strains (n = 196)**

In the study, Penicillin-resistance was observed to be 100% against the organism. This corroborates with the finding of Anupurba et al.<sup>12</sup> The resistance for Ceftazidime and Cephataxime were 72.45% and 62.24% respectively ( $\beta$ -lactam resistance). Resistance to quinolones like Ciprofloxacin and Ofloxacin were 67.35% and 62.24% respectively. This is probably due to the indiscriminate and empirical use of these drugs. Further, quinolones are relatively cheaper and easily available as over-the-counter drugs in Nepal. Findings of this resistance in our study is relatively less than those of Uday et al (95.8%) and Mehta et al (68%).<sup>10-11</sup> Aminoglycosides also were found to be resistant. This is due to the fact that MRSA is often multidrug-resistant.

Vancomycin seems to be the only antimicrobial agent which showed 100% sensitivity and so may be used as the drug of choice for treating multidrug-resistant MRSA infections. Vancomycin is not a commonly-

prescribed drug, which is almost certainly due to the higher price of the antibiotic and its unavailability in many parts of the country.

## CONCLUSION

Therefore, regular surveillance of hospital-associated infections including monitoring of antimicrobial (especially Vancomycin and other newer glycopeptides) susceptibility pattern of MRSA and formulation of a definite antimicrobial policy may be helpful for reducing the incidence of these infections. Infected or colonized patients may be isolated in a single room or isolation unit to prevent the spread of MRSA. Knowledge about MRSA and carrier status needs to be raised among the health staff of the hospital and control measures need to be implemented consistently in order to reduce the burden of MRSA infection in the hospital environment. A further study of MRSA may be done for the epidemiological mapping of these infections.

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