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Prevalence of methicillin resistant *Staphylococcus aureus* (MRSA) as nasal carriers in the Health Care Workers of Visakhapatnam hospitals.

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ABSTRACT

The nasal swab samples of health care workers collected in three phases, and tested for MRSA showed presence of MRSA in 70% of the samples. The major cause of such a high prevalence of MRSA in the workers of health care facilities is the short fall of hygienic environment in the hospital premises.

Keywords: *Staphylococcus aureus*, hospitals, methicillin

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INTRODUCTION

Many microbial diseases cause serious problems, at times fatal in human beings. *Staphylococcus aureus* is one such facultative anaerobic, gram-positive coccus, which may cause many infectious diseases in human beings and animals collectively known as staphylococcal infections. It is frequently found in nasal cavities and skin. *S.aureus* can cause a range of illness from minor skin infections such as boils, abscesses to life threatening diseases such as *pneumonia*, meningitis, toxic shock syndrome and sepsis (Klimek, 1976).

The treatment of choice of *S.aureus* infection is penicillin, but in most countries penicillin resistance is extremely common. Above 80% of hospital acquired *S.aureus* isolates were resistant to penicillin's (methicillin, hafcillin, oxacillin etc) and cephalosporins. Methicillin resistant *Staphylococcus aureus* is a bacterium responsible for several difficult to treat infections in humans. It may also be called as multi drug resistant *Staphylococcus aureus* and oxacillin resistant *Staphylococcus aureus* (ORSA).

In this study we tested the hypothesis for identification and confirmation of MRSA in hcw's in the health care settings and quantify the prevalence of MRSA in different categories of hcw's in both in-patient and out-patient units of Visakhapatnam hospitals .This study confirms the prevalence of MRSA as nasal carriers in the health care workers of Visakhapatnam Hospitals.

MATERIALS AND METHODS

The present study was carried out in King George Hospitals, Visakhapatnam during August 2010- March 2011. Samples were collected in three phases, Aug-Sep, Nov-Dec, and Feb-Mar. In each phase, the samples for bacteriological studies were collected in duplicates. The nasal samples were collected from health care workers such as staff-nurses, ward boys, female nursing order (fnO's), and male nursing order (mnO's), sweepers and nursing students from various wards of both in-patient and out-patient units.

Nasal swab samples were collected aseptically using sterile swabs and immediately inoculated on to Baird Parker Agar Plate and incubated overnight at 37°C.Colonies were initially identified according to colony characteristics and enumerated for *Staphylococcus aureus*. The suspected colonies were aseptically transferred on to nutrient agar slants, grown and were identified and confirmed following ASM 2004. Antibiotic sensitivity and identification of MRSA was done following CLSI 2007 guidelines [7]. Reference strains ATCC 43300 and ATCC 25923 were used as positive and negative controls.

RESULTS AND DISCUSSION

The culture samples based on the morphological, staining, coagulase enzyme formation and other biochemical properties were identified as *Staphylococcus aureus* (Table-1).



Fig.1. Zone of clearance of MRSA at $\geq 16\mu\text{g/mL}$ level indicating resistance on the HI comb MIC testing strip

TABLE-1: Morphological, staining, and biochemical properties of MRSA

Character/Parameter	Result
Size	2-25mm
Shape	Black, spherical surrounded by white margin
Irregular clusters	+ ve
Motility	Non motile
Swarming	Absent
Gram's staining	Gram positive
Temperature	15-45 degrees centigrade
Growth in NaCl (10%)	+ ve
L-Arabinose	-ve
Raffinose	- ve
D-Cellubiose	-ve
Sucrose	+ve
Maltose	+ve
D-Mannitol, Trehalose, Mannose, Galactose	+ve
Dnase	+ve
Urease	+ve
Coagulase	+ve
Oxidase	+ve
Methicillin	Resistant(HI comb MIC Test) MIC ≥ 16

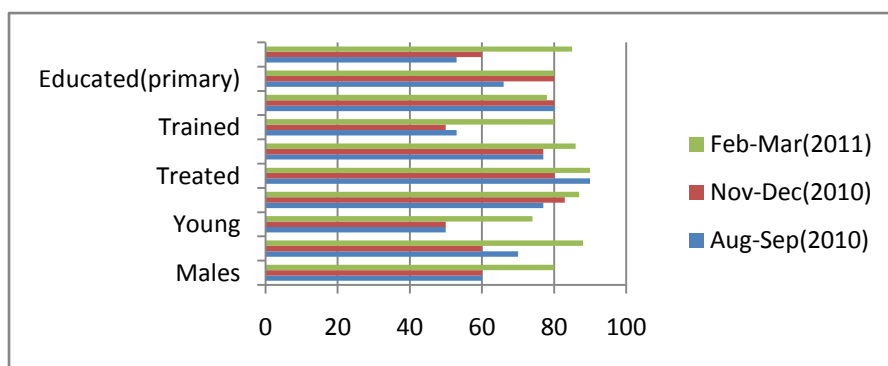
The prevalence of MRSA in health care workers in various wards is as shown in Table-2. Out-Patient settings show more MRSA prevalence than In-Patient settings. This may be due to overcrowding of out-Patient settings. Nasal swab samples (100 – 150 in each phase) were collected from different hcw's in three phases Aug-Sep, Nov-Dec, Feb-Mar from various wards of both in-patient and out-patient settings . Prevalence of MRSA in hcw's has been studied by many workers in recent past [1-6].

TABLE-2: Occurrence of MRSA in the samples observed during the study period

Sample nature	August-September(2010)			November-December(2010)			February-March(2011)		
	Sample size	MRSA no	% MRSA	Sample size	MRSA no	% MRSA	Sample size	MRSA No	% MRSA
Males	50	30	60	50	30	60	50	40	80
Females	100	70	70	50	30	60	70	60	88
Young	60	30	50	40	20	50	40	30	74
Old	90	70	77	60	50	83	80	70	87
Treated	20	18	90	10	8	80	8	7	90
Untreated	130	100	77	90	70	77	115	100	86
Trained	75	40	53	50	25	50	50	40	80
Untrained	75	60	80	60	50	80	70	55	78
Educated (Primary)	75	40	66	50	40	80	50	40	80
Educated (Secondary)	75	50	53	50	30	60	70	60	85

The nasal samples of hcw’s have showed more prevalence of *S.aureus* during Feb-Mar. This may be attributed to increase in temperatures. Also MRSA prevalence is high in female hcw’s and aged hcw’s. This may be due to weak immune systems. There is no demarcated variation of MRSA prevalence between treated and untreated hcw’s (treated hcw’s used mupirocin), due to resistant strains. It is well known that mupirocin is bactericidal only in higher concentrations while it is only bacteriostatic in lower concentrations. Thus treatment should be done with only higher concentrations to eliminate MRSA. Mupirocin contains pseudomonic acids mainly pseudomonic acid A (PA-A). Mupirocin inhibits mainly protein and RNA synthesis while it also mildly inhibits DNA and cell wall formation.

Fig. 2. Percentage prevalence of MRSA in Health care workers



Higher prevalence of MRSA in hcw’s having primary education indicates lack of proper knowledge in using preventive measures. Similarly nursing hcw’s trained in microbiology are less prone to MRSA rather than non-nursing hcw’s. Figure-2 shows percentage of prevalence of MRSA in the above mentioned hcw’s for various phases.

TABLE-3: Percentage prevalence of MRSA and chi square statistics

Sample nature	% MRSA (Aug-Sep)	% MRSA (Nov-Dec)	% MRSA (Feb-Mar)	Chi Square Values
Males	60	60	80	1.33*
Females	70	60	88	1.83*
Young	50	50	74	2.21*
Old	77	83	87	0.6583*
Treated	90	80	90	2.30*
Untreated	77	77	86	0.225*
Trained	53	50	80	0.5780*
Untrained	80	80	78	3.18*
Educated	66	80	80	2.98*
Uneducated	53	60	85	0.0124*

ns: non significant; *: significant at 5% level of significance

We have performed the chi square test conducted for each category of hcw for three phases (Table-3). The chi-square hypothesis (Ho) is accepted and there is no significant difference, since the calculated chi-square values are less than the tabulated chi-square values at 5% level of significance with r-1 degrees of freedom i.e., at 2 degrees of freedom and 5% level of significance tabulated chi-square value is 5.99 [7-9].

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