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CHANGING PATTERN OF NASAL CARRIAGE OF STAPHYLOCOCCUS AUREUS IN UNDERGRADUATE MEDICAL STUDENTS

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ABSTRACT: *Staphylococcus aureus* is the most common pathogen in nosocomial infections [(4-6,17,19)]. Nasal carriage of *Staphylococcus aureus* is now considered a well defined risk factor for subsequent infections in various groups of patients [(5,8,12,19).] Nasal carriage of the pathogen among hospital personnel is an important source of nosocomial infection [(1.3.18).] Very few dedicated studies have investigated the nasal carriage state among medical students [(3,18,21).] Incidence of *Staphylococcus aureus* in the nasal flora of medical students, with or without varying degrees of clinical exposures were determined in our study. Nasal cultures from these students demonstrated a significantly increasing rate of colonization of *Staphylococcus aureus* with increased clinical exposure and also a corresponding increase in Methicillin resistance.

Keywords: Medical students, Nasal carriage, MRSA

INTRODUCTION

Staphylococcus aureus is the leading nosocomial pathogen in hospitals throughout the world. [(4,5,6,17,19)] Many strains of *Staphylococcus aureus* have been showing antibiotic resistance. [(1,2,4,8,11,16,17)] Traditionally, control of *Staphylococcus aureus* carriage has been focused on , in the prevention of cross infection between patients. However, it has been repeatedly shown that, a large proportion of nosocomial *Staphylococcus aureus* infections originate from hospital staff itself.[(1,2,3,18,21)] Role of clinical medical students in nosocomial infections has not been given due importance. Very few dedicated studies have been undertaken with regard to the nasal carriage state of medical students, with varying clinical exposure. [(3,18,21).] In our study, nasal flora of medical students of a rural based medical college, with varying degrees of hospital exposure, were investigated for the colonization of *Staphylococcus aureus* and its antibiotic susceptibility was determined. We felt that medical students come into intimate contact with patients and hence may be an additional source of nosocomial infections in hospitals.

MATERIALS & METHODS

One hundred eighty six students of a rural based medical college were included in our study. Informed written consent was obtained from all the students who volunteered. The ethical committee of the college reviewed the study and gave its approval. All the volunteers were given a questionnaire containing questions regarding their age, sex, their class (pre-clinical or clinical), smoking habits, history of nasal allergies, infections(Sinusitis/URTI), recent use of antibiotics/medications, the number of working hours in the hospital, usage of facial masks while in OPD or wards.

The exclusion criteria were - any antibiotic usage in the past month, treatment for allergy and immunotherapy, any systemic disease and any active URTI.

All the students underwent routine oropharyngeal, nasal and aural examinations and nasal swabs (the specimen for the study), were collected from the nasal vestibules, under aseptic precautions.

SPECIMEN AND PROCEDURE

Nasal swabs were obtained from all participating students. The swabs were inoculated in a variety of culture media – Blood agar, McConkey agar and Mannitol salt agar and incubated aerobically. The isolates were identified by standard protocols. Antibiotic susceptibility testing of the isolates was determined by standardized disc diffusion method (KIRBY-BAUER) on Mueller-Hinton agar. The isolates were tested for susceptibility against Cefoxitin (30µg) and Oxacillin(1µg) disc (for Methicillin resistant strains) in accordance with CLSI guidelines (Clinical & Laboratory Standards Institute). Antibiotic susceptibility testing was also carried out for Penicillin, Vancomycin and Mupirocin.

RESULTS

Group-A had 86 first MBBS students (33 Males & 53 females) had no exposure to hospital environment; Group-B included 25 second year medical students (4 male & 21 female) with 12 hrs of clinical exposure/week; Group-C consisted of 49 third yr medical students(22 males&27 females) with 12 hrs of clinical exposure /week, but had a prior one yr of clinical exposure; Group-D had 26 fourth & final yr medical students (17 male & 9 females) with 24 hrs of clinical exposure /week with prior duration of exposure of 2 yrs(Table-1)

TABLE-1: Distribution of the students of the study into different groups & duration of hospital exposure:

GROUPS	CLASS	FEMALES	MALES	TOTAL	Duration of hospital exposure
A- I MBBS	1ST & 2ND semester	53	33	86	No exposure
B- II MBBS	3RD & 4TH semester	21	04	25	12 hrs/week
C-- III MBBS	5TH & 6TH semester	27	22	49	12 hrs/week
D—IV MBBS	7TH,8TH & 9Th semester	09	17	26	24hrs/week
TOTAL		110	76	186	

Isolation results

All the nasal samples yielded *Staphylococci*. Other organisms isolated along with *Staphylococci* were *Escherichia coli* (in 5 samples**),** *Klebsiella* spp (in 5 samples), *Micrococci* (in one sample) and *Moraxella* spp (in two samples).

Out of the 186 *Staphylococcal* isolates, 73 (39.25%) were *Staphylococcus aureus* and the remainder 113(60.75%) were Coagulase Negative *Staphylococci* (CONS). Among the 73 *Staphylococcus aureus* isolated, 46 (63 %) were Methicillin resistant *Staphylococcus aureus* (MRSA) and 27 (37%) were Methicillin sensitive *Staphylococcus aureus*(MSSA).(Tables 2 & 3).

Table-2: *Staphylococcus aureus* isolation rate in the individual groups

Groups	Number	Number of *Staph.aureus* isolation rate	Positive percentage
A	86	11	12.79%
B	25	13	52%
C	49	30	61.22%
D	26	19	73.08%
TOTAL	186	73	39.25%

Table-3: Shows the break up of CONS, *Staphylococcus aureus*, MRSA & MSSA:

GROUPS	n	*Staph aureus* n (%)	MRSA n (%)	MSSA n (%)	CONS n (%)
A	86	11 (12.79%)	06(54.54%)	05(45.45%)	75(87.21%)
B	25	13 (52%)	08(61.54%)	05(38.46%)	12 (48%)
C	49	30 (61.22%)	17(56.67%)	13(43.33%)	19(38.78%)
D	26	19 (73.08%)	15(78.95%)	04(21.05%)	07(26.92%)
TOTAL	186	73 (39.25%)	46(24.73%)	27(14.52%)	113(60.75%)

Antibiotic susceptibility of the 73 Staphylococcal isolates to Penicillin, Mupirocin and Vancomycin showed that, all the isolates were resistant to Penicillin but all were sensitive to Mupirocin and Vancomycin(Table-4).

Table-4: Antibiotic susceptibility rates in nasal *Staphylococcus aureus* isolates:

Antibiotics	Group-A (n-11)	Group-B (n-13)	Group-C (n-30)	Group-D (n-19)	number of sensitive isolates
Penicillin	- (0%)	- (0%)	- (0%)	- (0%)	0
Mupirocin	11(100%)	13(100%)	30(100%)	19(100%)	73
Methicillin	05(45.45%)	05(38.46%)	13(43.33%)	04(21.05%)	27
Vancomycin	11(100%)	13(100%)	30(100%)	19(100%)	73

Out of the total 73 Staphylococcal isolates, all were susceptible to Vancomycin

DISCUSSION

The incidence of *Staphylococcus aureus* in nasal flora showed a significant increase in the student groups A-D as their duration of exposure to the hospital environment increased, from 12.79% in Group-A, 52% in Group-B, 61.22% in Group-C and the highest incidence of 73.08% in Group-D, showing a statistically significant increase in groups B,C & D (P <0.0001). Though Groups-B & C had the same duration of exposure to the hospital environment, i.e.,12 hrs/week, Group-C students were exposed for a duration of 2 yrs, while Group-B students had an exposure to hospital environment for only one yr.

Our study is comparable to that of Stubbs, et al[18], who found the prevalence of nasal carriage of *Staphylococcus aureus* more in clinical medical students (42.6%) vis a vis preclinical students (35.2%)[18]

Kingdom et al [21] have reported an increase in incidence from 29% to 32% and Bischoff et al [7] have obtained similar results in *Staphylococcus aureus* nasal carriage rate of 29.1% in undergraduate students..

The elaborate study of Ender Guclu, et al [3] showed *staphylococcal* carriage rates of 13.4% in 1st & 2nd yr medical students who had no hospital exposure, 34.5% in 3rd & 4th yr medical students and 41.9% in 5th yr medical students & interns, showing a similar pattern regarding the colonization.

In our study, Methicillin sensitivity showed a gradual decline, from 45.4% in group A to 21.05% in group D, thereby indicating an increase in Methicillin resistance with increased hospital exposure. A similar result is also found in the study of Ender Guclu, et al [3] where the incidence of resistant strains increase with higher clinical exposure. Methicillin resistance rate was only 1.53% in the study of Bischoff et al [7] where the study population consisted only of preclinical medical students and undergraduate students. This is a relatively low rate compared with the findings of the clinical groups in the present study. Stubbs, et al[18] found the prevalence of nasal carriage increased from 35.2% to 42.6%. Kingdom, et al[21] reported an increase from 29% to 32%.

In the present study, Methicillin susceptibility showed a gradual decrease from 45.45% in Group-A to 21.05% in Group-D with a concomitant gradual increase in the number of MRSA isolates from 54.54% to 72.95% in the progression from Group-A to Group-D.

We observed that there was no Vancomycin resistance in the students harbouring nasal MRSA. [8,11]

SUMMARY AND CONCLUSION

To summarize and conclude, clinical medical students have higher rates of nasal *Staphylococcus aureus* carriage rates. They also show a corresponding increase in the Methicillin resistant strains of *Staphylococcus aureus***,** with increasing clinical exposure. As *Staphylococcus aureus* is the most common nosocomial pathogen, the medical students have the potential to transmit the infection to the patients during their hospital stay, and at the same time they are also at a higher risk of carrying the infections themselves. The presence of MRSA in the Group-A students may represent a community acquired MRSA.

None of the medical students (in the present study) wore facial masks or used disposable gloves during their clinical postings excepting in the operation theaters (due to compulsion).

Hence, we repeatedly stress the need for medical students, in fact, all medical personnel who come in direct contact with patients, to adhere to & practice strict hygienic measures, like wearing of facial masks (covering their nostrils!!) especially in ICUs and post operative wards, washing their hands properly with a disinfectant solution after examining each patient, as a matter of routine. These measures would go a long way in the prevention of nasal carriage of nosocomial bacteria and thus reducing hospital acquired infections.We also advocate the treatment of these MRSA carriers, to prevent them from being a source of nosocomial infections.

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