



AN EPIDEMIOLOGICAL STUDY OF BACTERIAL ISOLATES FROM THE NASAL AND HAND SWABS OF MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To study the bacterial isolates from the nasal and hand swabs of medical students.

Methods: This is a cross-sectional study conducted among the 4th and 6th year MBBS students. A total of 18 students (9 each from students from 4th and 6th year) were included in the study. The hand and nasal swabs were collected through standard methods.

Results: Overall, *Staphylococcus aureus* was the most prevalent organism in hand swab among the 4th (44.4%) and 6th (55.5%) year medical students. *Pseudomonas aeruginosa* was the second most common isolate in hand swab accounting for 33.3% each in 4th and 6th year students, however, difference was statistically insignificant ($p > 0.05$). MRSA (50%) in nasal swab contributed among half of the medical students being insignificantly ($p > 0.05$) higher in 4th year students (55.6%) compared to 6th year (44.4%). The percentage of *Pseudomonas aeruginosa* and *Staphylococcus aureus* in hand swab was higher among the students of Pediatrics ward than other wards, each accounted 66.7%. The percentage of Gram positive in hand swab of students was 42.4% and 57.6% in nasal swab. However, the percentage of Gram positive in hand swab of ward was 38.7% and 52.6% in nasal swab.

Conclusion: Medical students have higher rates of hand and nasal organism rates. The medical students have the potential to transmit the infection to the patients during their hospital stay.

KEY WORDS: Medical Students, Bacterial Isolates, Hand and Nasal Swabs.

INTRODUCTION

Microorganisms colonizing the human body are involved in important immunologic processes. They prevent the establishment of potentially harmful pathogens and assist in improving the immune system. On the other hand, the microbiota may promote the development of allergic diseases and is a major reservoir for endogenous infections. For bacteria in the nasal habitat, the latter has mainly been demonstrated for the role of nasal *Staphylococcus aureus* carriage in the development of nosocomial infections such as bacteraemia, sternal or orthopaedic infections.^[1]

Medical students is an important section of health care workers who are exposed to different patients and are thus at potential risk of being colonized by different pathogens.^[2] 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.^[3-5]

The present was designed to study the bacterial isolates from the nasal and hand swabs of medical students.

MATERIAL AND METHODS

Study Design

The cross sectional study design was used for the present study.

Study Area

The present study was conducted at college of Medicine, University of Hail, Hail Kingdom Saudi Arabia.

Collection of Sample

The Medical Students available in the different Ward (Burn unit, General Surgery, Internal Medicine and Pediatrics Ward) at the time of sample collection.

Nasal swab

Nasal swabs were collected from Medical students. The swab was inserted in anterior nasal chamber, 2 cm into the nares by rotating the swab against the nasal mucosa pre-moistened with saline.^[6] This process was repeated on the other side also.

Hand swabs

Hand swabs were collected from palm of hands of health care givers. This was done by rubbing a sterile swab, on palm of hands.^[6]

Culture of specimen

All the samples / specimens were inoculated on Sheep blood agar and MacConkey agar media and thereafter incubated at 37°C for 24 hours, for the bacterial identification.^[7]

Identification of Isolates

Bacterial isolates was identified with the help of Gram staining and biochemical tests. Mainly, facultative anaerobes and aerobic bacteria such as *Staphylococcus aureus* (including methicillin-resistant *Staphylococcus aureus*, i.e. MRSA), coagulase-negative *Staphylococci* (CoNS), *Acinetobacter* species and *Pseudomonas aeruginosa* and Enterobacteriaceae etc were taken into consideration as per guidelines of CLSI.^[8]

Ethical Clearance and Consent

Ethical clearance was taken from Institutional Ethical Committee of college of Medicine, University of Hail, Hail. The consent was taken from medical students before the collection of specimen.

Analysis

The results are presented in proportions. The difference in proportions was tested by Chi-square test. The p -value < 0.05 was considered significant. All the analysis was carried out by using SPSS 16.0 version (Chicago, Inc., USA).

RESULT

Overall, *Staphylococcus aureus* was the most prevalent organism in hand swab among the 4th (44.4%) and 6th (55.5%) year medical students. *Pseudomonas aeruginosa* was the second most common isolate in hand swab accounting for 33.3% each in 4th and 6th year students, however, difference was statistically insignificant ($p > 0.05$). MRSA (50%) in nasal swab contributed among half of the medical students being insignificantly ($p > 0.05$) higher in 4th year students (55.6%) compared to 6th year (44.4%) (Table-1).

Table-1: Comparison of organism in hand and nasal swabs according to year of education in MBBS

Organism*	4 th year (n=9)		6 th year (n=9)		Total (n=18)		p-value ¹
	No.	%	No.	%	No.	%	
Hand swab							
<i>Escherichia coli</i>	2	22.2	1	11.1	3	16.7	0.52
<i>Acinetobacter lwoffii</i>	3	33.3	2	22.2	5	27.8	0.59
<i>Pseudomonas aeruginosa</i>	3	33.3	3	33.3	6	33.3	1.00
<i>Klebsiella</i>	1	11.1	1	11.1	2	11.1	1.00
<i>Acinetobacter baumannii</i>	1	11.1	2	22.2	3	16.7	0.52
<i>Micrococcus spp</i>	1	11.1	1	11.1	2	11.1	1.00
Coagulase-negative Staphylococci (CoNS)	0	0.0	2	22.2	2	11.1	0.13
<i>Enterococcus</i>	1	11.1	0	0.0	1	5.6	0.30
<i>Staphylococcus aureus</i>	4	44.4	5	55.5	9	50.0	0.11
Nasal swab							
<i>Escherichia coli</i>	1	11.1	1	11.1	2	11.1	1.00
<i>Klebsiella spp</i>	4	44.4	6	55.5	10	55.6	0.11
Coagulase-negative Staphylococci (CoNS)	1	11.1	1	11.1	2	11.1	1.00
<i>Staphylococcus aureus</i>	3	33.3	5	55.6	8	44.5	0.14
<i>Citrobacter spp</i>	1	11.1	1	11.1	2	11.1	1.00
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	5	55.6	4	44.4	9	50.0	0.63

¹Chi-square test, *Multiple response

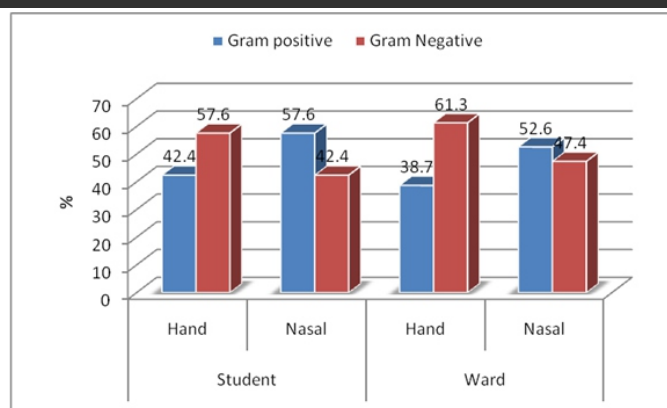
Table-2 shows the distribution of organism in hand and swabs according to different wards. The percentage of *Pseudomonas aeruginosa* and *Staphylococcus aureus* in hand swab was higher among the students of Pediatrics ward than other wards, each accounted 66.7%. *Acinetobacter lwoffii* (33.3%) in hand swab was similar among the students of Pediatric ward and Internal Medicine but lower than General Surgery (40%). *Klebsiella* spp and MRSA in nasal swab was higher among the students of Pediatric ward than other wards accounting for 66.7%.

Table-2: Distribution of organism in hand and swabs according to wards

Organism	Burn unit (n=4)		General Surgery (n=5)		Internal Medicine (n=6)		Pediatrics (n=3)	
	No.	%	No.	%	No.	%	No.	%
Hand swab								
<i>Escherichia coli</i>	0	0.0	1	20.0	2	33.3	0	0.0
<i>Acinetobacter lwoffii</i>	0	0.0	2	40.0	2	33.3	1	33.3
<i>Pseudomonas aeruginosa</i>	2	50.0	1	20.0	1	16.7	2	66.7
<i>Klebsiella</i>	1	25.0	0	0.0	1	16.7	0	0.0
<i>Acinetobacter baumannii</i>	2	50.0	0	0.0	1	16.7	0	0.0
<i>Micrococcus spp</i>	0	0.0	1	20.0	1	16.7	0	0.0
Coagulase-negative Staphylococci (CoNS)	1	25.0	1	20.0	0	0.0	0	0.0
<i>Enterococcus</i>	0	0.0	0	0.0	1	16.7	0	0.0
<i>Staphylococcus aureus</i>	3	75.0	3	60.0	1	16.7	2	66.7
Nasal swab								
<i>Escherichia coli</i>	0	0.0	1	20.0	1	16.7	0	0.0
<i>Klebsiella spp</i>	1	25.0	4	80.0	3	50.0	2	66.7
Coagulase-negative Staphylococci (CoNS)	0	0.0	1	20.0	0	0.0	1	33.3
<i>Staphylococcus aureus</i>	2	50.0	3	60.0	2	33.3	1	33.3
<i>Citrobacter spp</i>	1	25.0	0	0.0	1	16.7	0	0.0
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	2	50.0	2	40.0	3	50.0	2	66.7

*Multiple response

The percentage of Gram positive in hand swab of students was 42.4% and 57.6% in nasal swab. However, the percentage of Gram positive in hand swab of ward was 38.7% and 52.6% in nasal swab (**Fig.1**).

**Fig.1: Distribution of Gram positive and Gram negative organism****DISCUSSION**

Hand contamination rate among 4th & 6th year students was almost similar except for *Escherichia coli*, *Acinetobacter lwoffii*, coagulase negative and *Staphylococcus aureus* being more than 10%. This indicates the higher rate of hand contamination among medical students which is really a cause of concern. Khodavaisy et al reported 73.1 % rate of hand contamination of health care workers (HCWs).^[9] Almost all studies concerning hand hygiene have indicated the frequent contamination of HCWs hands.^[10-12] The organisms known to cause nosocomial infections such as *Staphylococcus aureus*, *E.coli*, *Klebsiella* & *Pseudomonas aeruginosa* were also isolated from hands of both 4th and 6th year medical students. Our findings agree with the other data indicating an increased number of microbe specially with nosocomial pathogens.^[10-12] These further highlights the importance of our study in such a manner that hand hygiene practices should be impressed upon medical students so that hand hygiene practices should be incalculated in future doctors.

Our study is comparable to that of Stubbs et al and Ravi et al who found the prevalence of nasal carriage of *Staphylococcus aureus* in clinical medical students being 42.6% and 39.2% respectively.^[13,4] Bischoff et al had also obtained similar results in *Staphylococcus aureus* nasal carriage rate of 29.1% in undergraduate students.^[14] It has been reported that certain strains of *Staphylococcus aureus* have a special ability to colonise patients and staff of hospitals and that certain MRSA strains are among these.^[15] Medical personnel have been traced as source of infection in many outbreaks of MRSA in hospitals.^[16] We found the incidence of MRSA in nasal swab being 50%. However, in Brazil, Prates et al reported that the prevalence of MRSA nasal carriage in university students was 2.4%.^[17] In a study, 29 (20%) medical students with clinical posting, were screened positive for *Staphylococcus aureus* and remaining 112 (77%) were screened positive for coagulase negative *Staphylococcus* cases from nasal swab.^[8]

In this study, the percentage of *Pseudomonas aeruginosa* and *Staphylococcus aureus* in hand swab was higher among the students of Pediatrics ward than other wards. *Klebsiella* spp and MRSA in nasal swab was higher among the students of Pediatric ward than other wards accounting 66.7%. The pattern of hand & nasal swabs in this study was almost similar. As per our best knowledge, none of the study had reported such data so that comparison cannot be done.

CONCLUSION

Clinical medical students have higher rates of hand and nasal organism rates. The medical students have the potential to transmit the infection to the patients during their hospital stay, and are at a higher risk of carrying the infections themselves.

Conflict of interest: None**Funding:** College of Medicine, University of Hail, Hail, Kingdom Saudi Arabia**REFERENCES**

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