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Original Article

Discerning Nasal Carriage Among Medical Students: Impact on the Quality of Medical Life and Patient Care by Aspiring Therapists

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ABSTRACT

Background: Nasal carriage of *Staphylococcus aureus* plays an important role in transmission of infections within the hospital. Undergraduate medical students because of their prolonged contact with the patients as well as hospital environment are at increased risk of colonization and may act as potential vectors as well as reservoirs transmitting the pathogens, thereby impacting patient safety and their own health , academics and overall quality of medical life.
Aim and objectives: The study was undertaken to determine the prevalence of nasal carriage among undergraduate medical students, evaluate the antimicrobial susceptibility pattern of the isolates, identify suitable therapeutic options for colonized students, promote infection prevention and control practices, and recommend measures for the containment of healthcare-associated infections.
Materials and methods: A cross sectional study was conducted on 180 undergraduate medical students at a tertiary care center. Nasal swabs were collected and gram staining and culture was performed.Isolates were subjected to antibiotic susceptibility testing by Kirby-Bauer disc diffusion method.
Results: The prevalence of nasal carriage among under graduate medical students was 27% and 31% with duration of clinical posting 6-12 months and 12-18 months respectively.Coagulase negative staphylococci was the predominant isolate,followed by S.*aureus*.High sensitivity was observed to Cotrimoxazole and Amoxicillin clavulanic acid,while notable resistance was observed to Erythromycin, cefoxitin and Clindamycin . Methicillin resistance was detected among all S. Aureus(12) isolates and among several CONS (23)isolates.
Conclusion: The present study highlights that there is considerable prevalence of nasal carriage among undergraduate medical students with higher rate among those with prolonged exposure. So there is a need for periodic screening for carrier status and regular training regarding infection prevention control measures of the undergraduate medical students attending clinical postings along with health care workers.

Keywords*: Nasal carriage, Medical students, MRSA,MRCONS, Antimicrobial resistance.*

INTRODUCTION

Commensal bacteria in the human nasal cavity are vital members of the normal flora and contribute to the maintenance of normal physiological and immune functions [1,2]. The most common bacteria residing in the nasal cavity include *Staphylococcus*, *Streptococcus*,*Corynebacterium*, and *Moraxella* and *Haemophilus*[3,4]. These microorganisms exist in a dynamic equilibrium that is continuously influenced by host factors, environmental exposures, and interspecies microbial interactions. Among these, Staphylococcus aureus is one of the most clinically significant nasal colonizers.

[5].*Staphylococcus aureus* is a Gram-positive facultative anaerobe that functions both as a commensal and a versatile opportunistic pathogen. Following colonization, it can translocate to various body sites and cause a wide range of clinical manifestations[6,7] .Being resistant to multiple antibiotics, it inflicts illness with considerable morbidity and mortality, many of them are due to Methicillin Resistant Staphylococcus aureus leading to invasive infections and serious complications imposing an increased burden on healthcare services.

Medical students occupy a unique place in the health care delivery system. They are simultaneous learners as well as active participants in the patient care. A typical medical student spends significant amount of time in contact with the patients in the outpatient departments, wards and operation theatres which increases their chances of exposure to the hospital flora. This prolonged exposure not only increases the risk of colonization with drug resistant pathogenic organisms, but may also lead to recurrent infections among medical students thereby affecting their health, academics .They act as potential reservoirs as well as vectors in the transmission of pathogenic organisms to vulnerable patients [8,9].This becomes an important concern regarding Infection prevention and control practices and patient safety.

The present study aimed to assess nasal carriage and colonization status among medical students, determine the prevalence of nasal pathogens, evaluate their antimicrobial susceptibility patterns, identify appropriate antimicrobial options, and emphasize infection prevention and control practices and preventive strategies for reducing healthcare-associated infections.

MATERIALS AND METHODS

The present study was a cross sectional study conducted on undergraduate medical students attending clinical postings at a tertiary care center, Andhra Pradesh. Undergraduate medical students with at least 6 months of exposure in hospital settings and who are willing to participate were included in this study. Students who are currently receiving or have received antibiotics within the past 2 weeks and students with upper respiratory tract infection, having chronic nasal conditions were excluded from the study.The study was conducted from July 2025 to December 2025 (ie.,for a duration of 6 months). Institutional Ethics Committee approval was obtained prior to commencement of the study.

Two nasal swabs were collected from anterior nares of the participants after taking informed consent. From one swab gram staining was performed and the other swab was inoculated on chocolate agar, blood agar, MacConkey agar. The inoculated plates were incubated at 37° C for 18-24 hrs. After incubation, plates were observed for growth.If any growth was present the isolates were processed and identified using standard microbiological procedures[10].Further staphylococci strains were subjected to tube coagulase test to identify Coagulase positive staphylococci and Coagulase negative staphylococci species. Antibiotic susceptibility testing was performed by Kirby Bauer disc diffusion method on Mueller Hinton agar . All procedures were performed according to Clinical and Laboratory Standards Institute guidelines. [11].

RESULTS

A total of 180 students participated in this study. Among the study participants 99 were exposed to the hospital environment for duration of 6-12 months and 81 were exposed to the hospital environment for a duration of 12-18 months. Percentage of nasal carriage was 27% (n=27) among the participants exposed for the duration of 6-12 months and 31% (n=25)among the participants who were exposed for 12-18 months.Among the participants exposed for duration of 6-12 months 18 Coagulase negative staphylococci and 9 Staphylococcus aureus were isolated, and among the participants exposed for duration of 12-18 months 22 Coagulase negative staphylococci and 3 Staphylococcus aureus were isolated. Among the 12 Staphylococcus aureus isolates high sensitivity was observed to Cotrimoxazole (10) and ,AMC (9), Linezolid (8),vancomycin (8),moderate susceptibility was observed to levofloxacin(7).Resistance was evident against cefoxitin(12),Clindamycin (10),Erythromycin (9),and Levofloxacin (5),notably reduced susceptibility was noted against vancomycin(4). Among the 40 isolates of Coagulase negative staphylococci majority showed high sensitivity to Cotrimoxazole (31),AMC showed equal sensitivity and resistance , decreased susceptibility was observed to Linezolid (22), high resistance was observed to Levofloxacin (36)and Erythromycin (36) , Clindamycin (39).Cefoxitin resistance showed that all the 12 S.aureus isolates were MRSA and 23 were MRCONS. The highest number of MRSA isolates was observed from participants from pediatrics, followed by gynecology and ENT, Surgery. MRCONS were predominantly isolated from participants attending Gynecology and surgery.

Table 1:Distribution Of Nasal Carriage Among The Undergraduate Medical Students Based On The Duration Of Exposure.

DURATION OF EXPOSURE TO HOSPITAL ENVIRONMENT	NUMBER OF PARTICIPANTS	CULTURE POSITIVE	S.*aureus*	*CONS*	CULTURE NEGATIVE	PERCENTAGE OF NASAL CARRIAGE
6-12 MONTHS	99	27	9	18	72	27%
12-18 MONTHS	81	25	3	22	56	31%

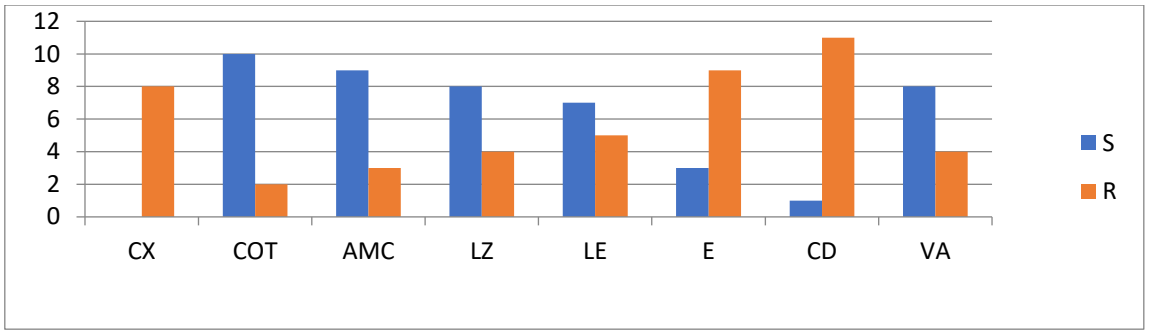

Figure 1. Antibiotic susceptibility pattern of Staphylococcus aureus isolates

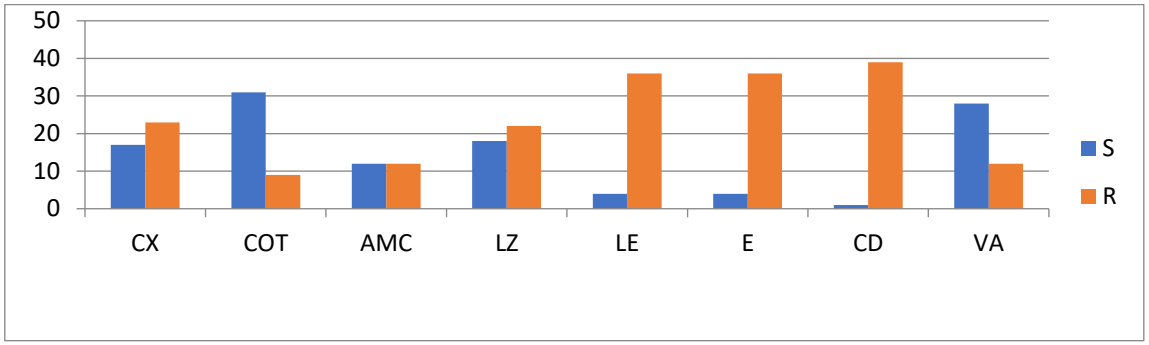

Figure 2. Antibiotic susceptibility pattern of Coagulase-negative staphylococci isolates

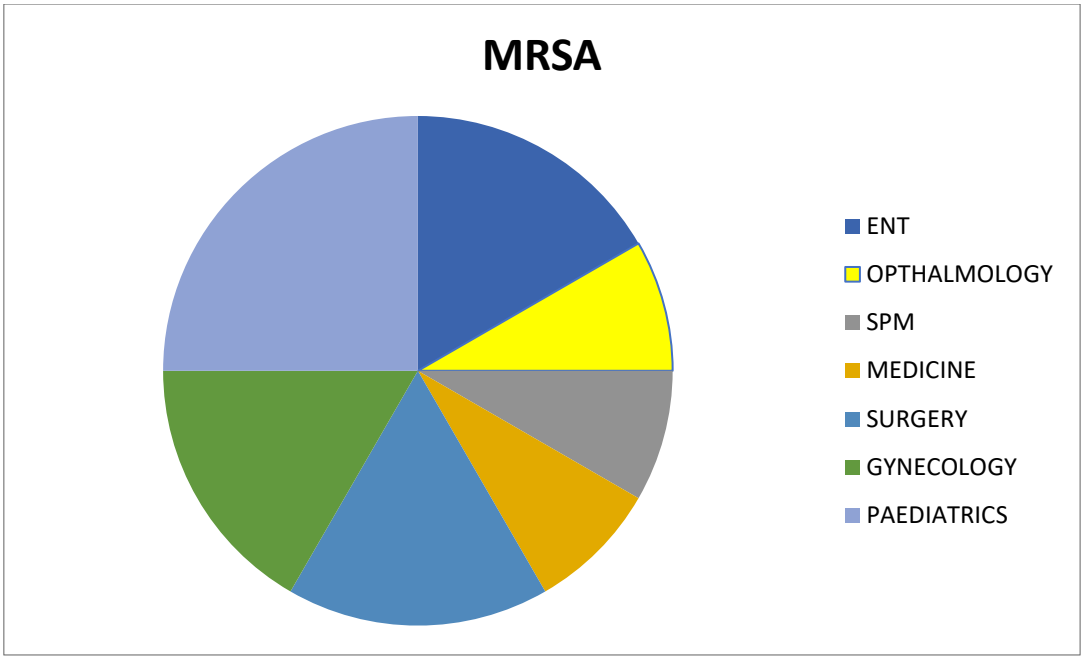

Figure 3. Department-wise distribution of MRSA isolates

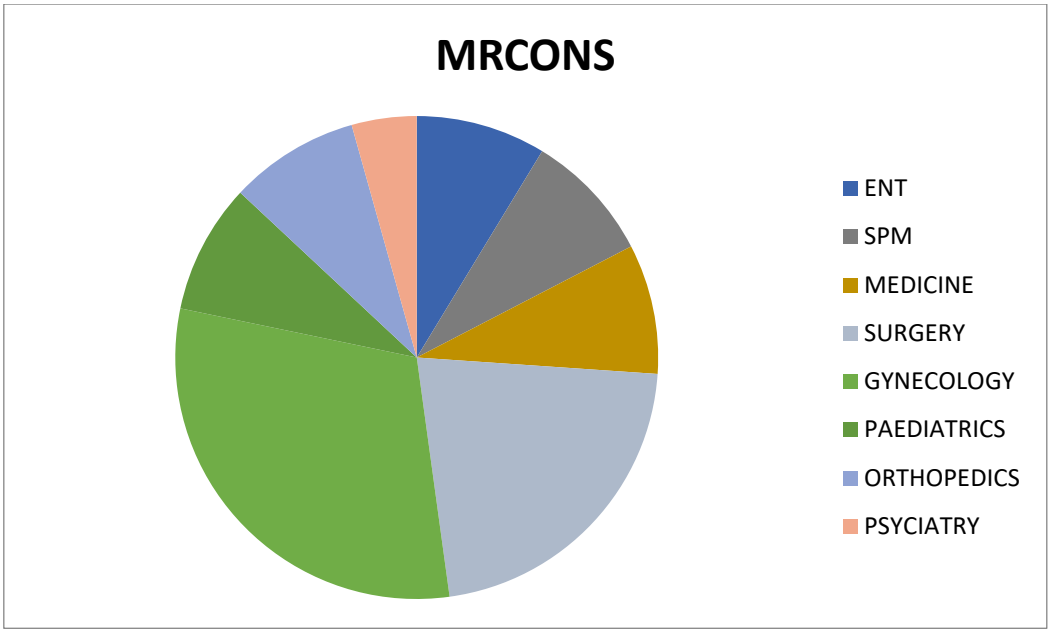

Figure 4. Department-wise distribution of MRCONS isolates

DISCUSSION

Nasal carriage not only poses a significant risk for the transmission of pathogens within healthcare settings but may also adversely impact the quality of medical life among students. Colonized individuals are at an increased risk of developing endogenous infections and may experience psychological stress related to their carrier status, particularly due to concerns about transmitting infections to patients. Furthermore, recurrent or subclinical infections may lead to reduced clinical efficiency, disruption of academic activities, prolonged absence to classes, thereby affecting both their professional development and overall well-being.

In the present study, the prevalence of nasal carriage among undergraduate medical students ranged from 27% to 31% with the slightly higher rate among the students with longer duration of exposure (12-18 months).Similar observations were reported by Kuehnert et al., Sharma et al., and Manyala et al who suggested that longer duration of clinical exposure with the hospital environment predisposes the medical students with the colonization risk especially potentially pathogenic and multidrug resistant organisms because of continuous contact with patients, hospital surfaces and equipment[5,8,9].This highlights the role of duration of exposure to hospital environment in determining the colonization risk.

Among all the isolates Coagulase negative staphylococci predominated over S.aureus. While coagulase-negative staphylococci are usually considered commensals, their increasing role as nosocomial pathogens cannot be overlooked [12]. Their pathogenic potential is particularly significant in immunocompromised patients and those with indwelling medical devices.

Antimicrobial susceptibility pattern of the S.aureus isolates revealed high sensitivity to Cotrimoxazole and Amoxycillinclavulanic acid, Vancomycin and Linezolid, with notable resistance observed against Clindamycin, Erythromycin.cefoxitin.Reduced susceptibility of S.aureus to Vancomycin detected among 4 isolates and CONS to Linezolid is a matter of concern[9]. This necessitates cautious use of antibiotics and strict antimicrobial stewardship in times of emerging resistance to last resort drugs like vancomycin and Linezolid limiting the therapeutic options.

In the present study there is high proportion of Methicillin resistance among the isolated S.aureus and Coagulase negative staphylococci. This high proportion of MRSA is consistent with finding of RadhaKrishna M et al., and Rathisk et al.,who reported significant MRSA coloization among medical students[13,14]. This finding also indicates the circulation of resistant strains within the hospital environment and emphasizes on the need for strict implementation of infection prevention and control practices not only among health care workers but also among the students who will be in continuous contact with patients.

In the present study MRSA isolation is higher among students posted in pediatrics, gynecology and surgical braches like general surgery and ENT, this may be because of increased patient interaction, frequent exposure to invasive procedures and contact with vulnerable population thereby increasing the risk of colonization.

Decolonization of carriers along with infection prevention control measures plays an important role in the management of carriers as well as in breaking the transmission chain. The nasal carriers were advised for decolonization with 2% mupirocin nasal ointment, twice daily for five days. Mupirocin acts by inhibiting the bacterial enzyme Isoleucyl tRNA synthetase, thereby preventing the incorporation of isoleucine into bacterial proteins and ultimately inhibiting protein synthesis [15].Medical students and health care workers who are in constant contact with the patients and hospital environment may act as vectors as well as reservoirs, so they should be educated regarding the infection prevention control measures such as hand hygiene, significance of asepsis while carrying out minor procedures etc. Limitations of the study include its single-centre design, relatively small sample size restricted to undergraduate medical students, lack of long-term follow-up of colonized individuals, and the absence of molecular characterization of isolates, which may limit the generalizability and detailed epidemiological interpretation of the findings. Strengths of the study include assessment of students with varying durations of clinical exposure, comprehensive antimicrobial susceptibility testing, identification of methicillin-resistant isolates, and its emphasis on infection prevention and control practices among future healthcare professionals.

CONCLUSION

The present study highlights that there is considerable prevalence of nasal carriage among undergraduate medical students with higher rate among those with prolonged exposure. The presence of MRSA and MRCONS among asymptomatic carriers in the hospital environment is an alarming concern for antimicrobial resistance. Medical students due to their dual role can act as reservoirs and vectors posing threat to patient safety, this finding highlights need for periodic screening of their carrier status and regular training regarding infection prevention control measures of the undergraduate medical students attending clinical postings along with health care workers.

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