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Prevalence of nasal carriage of coagulase negative staphylococcus among medical students and its antibiotic susceptibility pattern

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Abstract
Introduction: The human anterior nares are known to be the principle habitat of both commensals and opportunistic pathogens such as *Staphylococcus aureus* and *Coagulase negative Staphylococcus*. The spread of multidrug resistant coagulase negative staphylococcus is a major concern.
Aims & Objectives: The present study was conducted to know the prevalence of asymptomatic nasal carriage of CONS among medical students and to determine their antibiotic susceptibility patterns
Materials & Methods: A total of 154 medical students in their preclinical and clinical years were included in this study and were categorised into four groups according to the degree of hospital exposure. Nasal swab from each subject was collected using moistened sterile cotton swab and *Coagulase negative staphylococci* were identified by standard biochemical methods. Antibiotic susceptibility testing is done on these isolates by Kirby Bauer disk diffusion method and methicillin resistance was tested by using Cefoxitin (30 µg) disc.
Results: The prevalence of CONS in our study was found to be 89.61 %. The prevalence of Methicillin resistant *Coagulase Negative Staphylococcus* (MRCONS) and Methicillin sensitive *Coagulase Negative Staphylococcus* (MSCONS) were found to be 10.87 % and 89.13% respectively. All isolates were susceptible to Linezolid, Vancomycin, Gentamicin, Teicoplanin and Clindamycin.
Conclusion: Health professional should be educated and trained about the maintenance of hygiene and infection control and the effective use and misuse of antibiotics. Regular screening of carrier is essential for prevention of nosocomial infection.

Keywords: CONS, MRCONS

Introduction

Coagulase Negative Staphylococcus, a skin commensal are recognised as the most frequent causative agent of hospital associated infection and device associated infection. *Coagulase Negative Staphylococcus* (CONS) are most common pathogens in the community and nosocomial blood stream infections and indwelling catheters [1]. Eventhough multiple body sites can be colonised in human beings, anterior nares and skin are the most frequent carriage site for Staphylococcus species. Nasal colonisation with these agents is an important risk factor for the pathogenesis of infection [2].
They also act as reservoirs of drug resistance gene for methicillin (mec A gene) for *S. aureus.* Staphylococcus Cassette chromosome mec (SCC mec) is wide spread in CONS which has low affinity for most synthetic penicillin and for Beta lactam antibiotics. Methicillin resistant *Coagulase Negative Staphylococcus* (MRCONS) and MSSA share the same ecological niche in humans, hence transfer of SCC mec can occur from MRCONS to MSSA [3]. Methicillin resistance is frequently observed within the CONS (MRCONS), particularly in surgical site infection (SSI) where biofilm formation on implants and on tissue further reduces treatment success [4]. *S. epidermidis are* increasingly been recognised as a major etiological agent of methicillin resistance dissemination among community strains of staphylococci. This species represents 69 to 84% of the MRCONS isolates obtained in previous community-based studies [5].
Medical students are an important section of health care workers who are exposed to different patients and can spread the infection to other patients, other individuals in community and are also at risk of themselves suffering from disease [6]. The hospital environment, the patient's endogenous microflora, and health care workers (HCWs) may play a role in the spread of these resistant strains. For the selection of appropriate treatment options for nasal carriers of MRCONS, the knowledge of frequency of nasal carriage and their antimicrobial profile is essential. Screening for carriers of staphylococcal species is fundamental to infection control practices in nosocomial settings..

Aims & Objectives

1. To study the prevalence of asymptomatic nasal carriage of CONS among medical students.
2. To determine the antibiotic susceptibility patterns of CONS.
3. To stress the need of stringent infection control practices in preventing nosocomial infection from medical personnel.
4. To create awareness among medical students regarding the rational use of antibiotics.

Materials & Methods

Collection of sample and identification of bacteria

A total of 154 medical students in their preclinical and clinical years were included in this study. This study was conducted over a period of two months from July 2016 to Sept 2016 at the Department of Microbiology.

Study Population

Study population consists of all the medical students who consented to participate in the study.

The Medical students were divided into four groups (Group I to Group IV- According to the degree of Hospital exposure).

- Group 1- comprises I MBBS students who had no Hospital exposure.
- Group II- comprises II MBBS (Paraclinical) students who had less than one year of Hospital exposure.
- Group III- comprises III MBBS (Clinical) students who had one to two years of Hospital exposure.
- Group IV- comprises IV MBBS (Clinical) students who had two to three years of Hospital exposure.

Nasal swab from each subject was collected using sterile cotton swab moistened with sterile saline (0.9%). The swab is circled in both nostrils consecutively and placed back in the sterile container. The swabs are inoculated onto sheep blood agar plates, Mac Conkey agar and mannitol salt agar. The plates were incubated at 37º C for 24-48 hours. Coagulase negative staphylococci were identified by colony morphology, Gram staining, Catalase, Coagulase, and Mannitol fermentation tests [7].

Antibiotic susceptibility testing

Antibiotic susceptibility testing is done on Muller Hinton agar by disk diffusion method, as per the Clinical and Laboratory Standards Institute guidelines (CLSI) [8]. The following antibiotics were used Ampicillin (10µg), Gentamicin (10 µg), Ciprofloxacin (10µg)), Cotrimoxazole (25µg), Erythromycin (15µg), Clindamycin (2µg), Linezolid (30µg), Vancomycin (30µg) and Teicoplanin (30µg).

Detection of methicillin resistance

The CONS isolated were tested of methicillin resistance by Kirby Bauer disc diffusion method by using Cefoxitin (30 µg) disc, as per CLSI guidelines.The plates were incubated at 33-35^0 C for 24 hours. Zone sizes of ≤ 24 mm and ≥ 25mm were taken as resistant and susceptible zones respectively.

Observations and Results

In the present study, 154 medical students were divided into four groups according to the degree of hospital exposure. This consists of group I (30), group II (65), group III (40) and group IV (19) students and were in the age group of 17-24 years.

A total of 138 CONS were isolated from the nares of 154 medical students. Out of 138 isolates, 15 were resistant to Cefoxitin by disc diffusion method (Fig 1 & 2). The prevalence of CONS in our study was found to be 89.61 % (138/154) (Table 1).

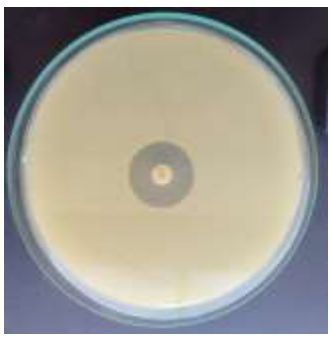

Fig 1: Cefoxitin sensitive

Fig 2: Cefoxitin Resistant

Table 1: Nasal carriage rate of MRCONS among various groups of medical students.

Groups	No. of CONS	No. of MRCONS	No. of MSCONS
Group I (30)	27 (19.57 %)	3 (11.11 %)	24 (88.89 %)
Group II (65)	64 (46.38 %)	6 (9.38 %)	58 (90.63 %)
Group III (40)	32 (23.19 %)	5 (15.63 %)	27 (84.38 %)
Group IV(19)	15 (10.87 %)	1 (6.67 %)	14 (93.33 %)
Total (154)	138 (89.61 %)	15 (10.87 %)	123 (89.13 %)

The prevalence of Methicillin resistant *Coagulase Negative Staphylococcus* (MRCONS) in our study was 10.87 % (15 / 138), whereas the Methicillin sensitive *Coagulase Negative Staphylococcus* (MSCONS) were found to be 89.13% (123/138).

About 10.87 % (15 / 138) were resistant to Co-trimoxazole and 13.04 % (18/138) were resistant to penicillin. A total of 16 isolates were resistant to Erythromycin and 2 isolates were resistant to Ciprofloxacin. All isolates were susceptible to Linezolid, Vancomycin, Gentamicin, Teicoplanin and Clindamycin by disc diffusion method (Table 2).

Table 2: Antibiotic sensitivity pattern of CONS isolated from anterior nares

Antibiotics	MRCONS (15)	%	MSCONS (123)	%	Total (138)
Ampicillin	15	100	123	100	138
Erythromycin	2	13.33	120	97.56	122
Cotrimoxazole	2	13.33	121	98.37	123
Ciprofloxacin	13	86.67	123	100	136
Gentamicin	15	100	123	100	138
Clindamycin	15	100	123	100	138
Vancomycin	15	100	123	100	138
Teicoplanin	15	100	123	100	138
Linezolid	15	100	123	100	138
Penicillin	1	66.67	119	96.75	120

Discussion

Health care workers (HCWs) can be a potential source of hospital acquired infection to the patients they take care of. Medical students are at risk of getting infected by drug resistant strains during their training due to exposure with infected patients and may be a source of transmission for other patients. Various studies have reported MRCONS nasal carriage rates from 3-60% among HCW'S [9, 10].

In the present study 89.61 % CONS were isolated from the anterior nares of medical students. The prevalence of MRCONS in our study was 10.87%.

In a study conducted among medical students by Namitha *et al*. 77% were screened positive for *Coagulase negative staphylococcus* (CONS) and methicillin resistance (MRCONS) was found in 8% of CONS studied [4].

In a similar study among medical students by Akinjogunla *et al*. [11] isolation rate of CONS was found to be 30%. In a study among health care workers 29.8 % physicians had nasal colonisation of CONS [12].

In our study 15 isolates were resistant to Cefoxitin, 10.87% (15/138) were resistant to Cotrimoxazole and 13.04% (18/138) were resistant to penicillin. Health care workers

(HCWs) may serve as reservoirs of drug resistant bacteria. One of the important sources of staphylococcus for nosocomial infections is nasal carriage among hospital personnel.

The prevalence of nasal carriage of CONS and MRCONS vary due to the difference in geographical distribution of strains of bacteria or due to differences in infection control policies practiced in different hospitals, subjects of the study or variations in the year.

Conclusion

Routine screenings of nasal colonization of anterior nares among the medical students should be carried out to create awareness on the implications of misuse and abuse of drugs. Identification of *Staphylococcus* by proper microbiological methods and detection of methicillin resistance contribute greatly to the effective treatment of patients and prevention of hospital acquired infection.. Strategies on spreads of multi-drug resistant strains should be adopted and epidemiological studies on nasal carriage of these organisms in the community are consequently recommended.

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