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Original Research Article

Distribution of MR-CoNS in the clinical staffs of tertiary care hospital

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ABSTRACT

Methicillin-resistant coagulase-negative staphylococci (MR-CoNS) associated infection is a growing concern in healthcare settings now a day. MR-CoNS are the main infectious agents of the hospital acquired infection. Clinical staffs to patients transmission of resistant strains have caused a rapid increase in the prevalence of antimicrobial resistance in recent years. Growing rate of antimicrobial resistant against available antibiotics of MR-CoNS is a developing problem in low income or lower middle income counties.
Aim: This study was conducted to determine the occurrence MR-CoNS isolated from different clinical staffs of tertiary care hospital.
Materials and Methods: This prospective study conducted in clinical staffs, nasal swab were collected from all the participants. Screening of CoNS were done on the basis of cultural, morphological and biochemical tests, identification and AST analysis done by VITEK-2 automated system. Methicillin resistance pattern was checked by VITEK-2 and Kirby-Bauer disc diffusion method according to CLSI guideline.
Results: A total of 129 nasal swab samples were collected from clinical staffs, of which n=81 isolates (85.6%) were CoNS. Among n=81 CoNS, (48.12%) *S. epidermidis*, (41.97%) *S. haemolyticus*, (7.4%) *S. lugdunensis* and *S. saprophyticus* (2.4%) were reported. Out of n=81 CoNS isolates, n=26 were conformed as MR-CoNS. Maximum methicillin resistance were reported in *S. epidermidis* 53.48% (14/26), *S. haemolyticus* 42.30% (11/26), *S. lugdunensis* 3.84% (1/26) and *S. saprophyticus* 0% (0/26).
Conclusion: The occurrence rate of MR-CoNS are higher (20.6%) in the healthcare workers and most of the methicillin resistant-CoNS isolates shows high level of resistance against widely used antibiotics but all the isolates susceptible against vancomycin.

1. Introduction

Coagulase negative staphylococci are the commensal microorganism mostly colonize on human skin and are among the most commonly isolated organism in the clinical specimens. CoNS have simply culture contaminants, furthermore have become true pathogens in immune-suppressed individuals.[1] In fact, CoNS cause serious infection in cardiovascular, joint and blood stream, 36% CoNS reported in blood stream infection. Usually CoNS infection acquired during exposure to hospitals and other healthcare facilities. Approximately 20-40% isolates belongs to CoNS in the clinical samples in Indian.[2] Despite the technological advancement and the introduction of various new classes of drugs, these infections are difficult to diagnose and treat.[3]

The term methicillin-resistant CoNS are used for the coagulage negative staphylococci, leads to the methicillin-resistance but now refers to a multi-drug resistant group and are susceptible only to glycopeptide antibiotics such as vancomycin.[4] Outbreaks of hospital-acquired MR-CoNS are typically the result of nosocomial transmission of MR-CoNS from patient to patient and colonized healthcare workers act as the reservoir for the spread of MR-CoNS to

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uncolonized susceptible patients.[5,6] That by present study conducted for screen out MR-CoNS in the healthcare staffs that have directly associated with patients care.

2. Materials and Methods

The present study conducted in a tertiary care hospital of Central India. Healthcare staffs (such as doctors, nurses, and laboratory staff) above the eighteen-year old were included in the study. Authors prior describe the purpose of the study to all the participants before collection of samples.

2.1. Isolation and Identification of clinical specimens

Nasal swab was collected from all the participants and send to microbiology laboratory for further processing.[7] All the specimens processed within two hours of receiving in laboratory, swabs were cultured on sheep blood agar culture plates (Himedia Pvt. Ltd., India). The specimens show positive culture growth further charactarization was carried out by conventional methods including colony characteristics, Gram-staining, catalase test, slide and tube coagulase test, growth on mannitol salt agar and identification was done using automated system VITEK-2.[8]

2.2. Antimicrobial susceptibility testing

The antibiotic susceptibility pattern of all the confirmed CoNS were determined by automated system VITEK-2. Kirby-Bauer disc diffusion method also performed for further conformation against the following antibiotics as per CLSI guidelines: Penicillin (10 μg), erythromycin (15 μg), clindamycin (2μg), co-trimoxazole (25 μg), tetracycline (30 μg), levofloxacin (5μg), gentamycin (10 μg), vancomycin (30 μg), linezolid (15μg), oxacillin (1 μg), ciprofloxacin (5 μg), cefalexin (30 μg), rifampicin (5 μg), chloramphenicol (30 μg), ampicillin (10 μg), amoxy/clavulanic acid (20/10 μg), teicoplanin (30 μg), amikacin (30 μg), tobramycin (10 μg), amp/sulbactam (10/10 μg), and cefotaxime (30 μg).[1,8]

2.3. Detection of MR-CoNS

2.3.1. Oxacillin (1 μg) disc diffusion method

The test was performed by Kirby-Bauer disc diffusion method by using 1 μg of oxacillin disc on Muller-Hinton agar plate incubated at 35-37°C for 24 h at. The interpretation criteria were taken according to (NCCLS) guidelines. If a zone of inhibition was <10 mm or any discernible growth within a zone of inhibition was used as an indicator for methicillin-resistant and ≥13 mm zone of diameter was indicative for methicillin susceptible.

2.3.2. Cefoxitin (30 μg) disc diffusion test

The isolated samples were subjected to cefoxitin disc diffusion test by using 30 μg discs. A suspension, equivalent to 0.5 McFarland standard was prepared from each strain. Then, a swab was taken and dipped into the suspension and lawn culture was done on MHA plate after that plate was incubated at 37°C for 18-24 h and zone of inhibition was measured. An inhibition zone diameter of ≤21 mm was considered as cefoxitin resistant reported as methicillin-resistant and ≥22 mm was reported as cefoxitin sensitive indicating methicillin-sensitive.

2.4. Statistical analysis

The data were recorded and analyzed using Microsoft Excel (2007 Version). Results are presented in frequency (number) and percentage (%).

3. Results & Discussion

A small study conducted in a tertiary care hospital to evaluate the spectrum of MR-CoNS in hospital staffs. Total of n=154 participants were registered in the study initially which are divided into three major group as; clinical staffs i.e. doctors, nurses and laboratory technicians. But n=25 clinical staffs were self-excluded from the study due to personal reasons. So that the final study conducted in n=129 clinical staffs (Table 1).

Nasal swab samples were collected from the clinical staffs and send to the laboratory for isolation and identification of MR-CoNS. All the received nasal swabs were processed within two hours after sample collection, all the swabs samples were culture on blood agar culture plate (Himedia, India) and incubate at 37^{o}C for 24-48 hrs. Cultural characteristics such as colony morphology, appearance and color were observed. Identification and antimicrobial susceptibility testing were performed by automated system Vitek-2 (bioMerieux, France). Out of n=129 swab samples, n=96 (76.19%) samples shows positive growth on blood agar culture plates. Creamy white colonies on culture plates were further used for identification and AST analysis.

Out of n=96 (100%) positive culture n= 15 (14.4%) samples were MRSA positive while n= 81 (85.6%) samples were identified as CoNS. Among n=81 CoNS, (48.12%) *S. epidermidis*, (41.97%) *S. haemolyticus*, (7.4%) *S. lugdunensis* and *S. saprophyticus* (2.4%) were reported (Figure 1) (Figure 1).

Cefoxitin screening positive and oxacillin resistant pattern were analyzed by VITEK-2 system and Kirby-Bauer disc diffusion method. Among n=81 CoNS isolates, n=26 were conformed as MR-CoNS. Maximum methicillin resistance were reported in *S. epidermidis* 53.48% (14/26), *S. haemolyticus* 42.30% (11/26), *S. lugdunensis* 3.84% (1/26) and *S. saprophyticus* 0% (0/26) (Table 2). Out of 26 MR-CoNS isolates, 19 (73.07%) were from nursing staffs and 7 (26.92%) were from doctors. There was not significant MR-CoNS reported in laboratory staffs.

Table 1: Distribution of participants

S. No.	Total Numbers of Participants (N=129)			
1.	Groups	**Doctors**	**Nursing Staffs**	**Laboratory Staffs**
2.	No. of Participants	n=27	n=67	n=35
3.	Male	16	19	22
4.	Female	11	48	13
5.	Mean Age (Y ± SD)	47 ± 10.73	32 ± 9.92	29 ± 10.21

N= Number of participants, Y ± SD= Year ± Standard deviation

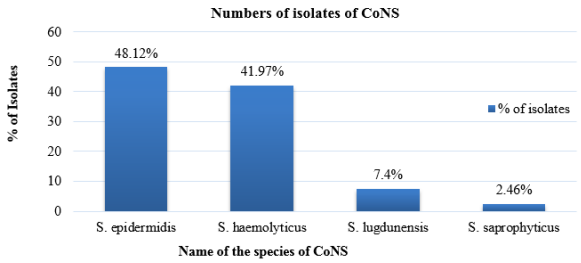

Fig. 1: Isolated species of Coagulage negative staphylococci

Table 2: Distributions of MR-CoNS

S. No.	Name of Species	No. of MR-CoNS	% of MR-CoNS
1	*S. epidermidis*	14	53.48
2	*S. haemolyticus*	11	42.3
3	*S. lugdunensis*	1	3.84
4	*S. saprophyticus*	0	0

The present study observed that most of the MR-CoNS showed multidrug resistance that makes difficult to treat the infection. Hence, it is necessary to evaluate the drug resistant pattern against MR-CoNS for controlling the nosocomial infections in an effective manner.

4. Conclusion

This prospective study reported four species of CoNS i.e. *S. epidermidis* (48.12%), *S. haemolyticus* (41.97%), *S. lugdunensis* (7.4%) and *S. saprophyticus* (2.4%) in the healthcare worker of tertiary care hospital, among that *S. epidermidis* 53.48% (14/26) and *S. haemolyticus* 42.30% (11/26) shows highest resistance against methicillin. In this study occurrence rate of MR-CoNS are higher (20.6%) in the healthcare workers and most of the methicillin resistant CoNS isolates shows high level of resistance against widely used antibiotics but all the isolates susceptible against vancomycin.

5. Conflicts of Interest

All contributing authors declare no conflicts of interest.

6. Source of Funding

None.

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