

Speciation of coagulase negative staphylococci (CoNS) isolated from various clinical specimens in a tertiary care hospital of southern Rajasthan

Rohit Kumar¹, Ramanath Karicheri², Sheetal Jain^{3*}

¹Assistant Professor, Department of Microbiology, Index Medical College and Hospital, Indore, Madhya Pradesh

²Professor, Department of Microbiology, Index Medical College and Hospital, Indore, Madhya Pradesh

³Assistant Professor, Department of Microbiology, American International Institute of Medical Sciences, Udaipur, Rajasthan, India

*Corresponding Author:

Sheetal Jain, Assistant Professor, Department of Microbiology, American International Institute of Medical Sciences, Udaipur, Rajasthan, India

E-MAIL: jainsheetal1991@gmail.com

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ABSTRACT

Background: Coagulase negative staphylococci (CoNS) are a group of staph bacteria, which generally exist as normal flora of human skin and the oral flora found on mucous membranes. CoNS in immunocompromised patients can cause variety of infections like bacteraemia, central nervous system shunt infection, intravascular catheter-related infections, endocarditis, surgical site infections, urinary tract infections, foreign body infection, endophthalmitis, peritonitis and wound, bone and joint infections as well as infections in neonates. These infections are difficult to treat because of the risk factors and the drug resistant nature of the organisms. **Objective:** To find out species wise distribution of Coagulase negative Staphylococci (CoNS) in various relevant clinical samples in our institute. **Materials and Method:** A total of 500 CoNS strains were isolated from relevant clinical specimens. CoNS strains were isolated from variety of clinical specimens. Strains were identified as CoNS on the basis of colony morphology, gram stain, catalase test and coagulase test. Conventional methods were used for species identification after confirming isolates as CoNS. **Results:** The most common source of CoNS isolation was blood (34%), followed by respiratory secretions (24.4%), urine (16.8%), pus (13.4%), swabs (5.4%), bodily fluid (1.4%), and others (4.6%). *S. epidermidis* was most frequently isolated (30.6%), followed by *S. hemolyticus* (25.4%), *S. hominis* (12.6%), *S. capitis* (12%), *S. lugdunensis* (11.4%) and *S. cohnii* (08%). **Conclusion :** As CoNS have become major cause of nosocomial infections, there is a need for rapid identification and speciation of CoNS with their antibiotic susceptibility for better management of these cases and to prevent emergence of drug resistance.

KEYWORDS: Coagulase Negative Staphylococci (CoNS), Nosocomial Infections, *S. epidermidis*, Immunocompromised

INTRODUCTION

In the past, Coagulase-negative Staphylococci (CoNS) were generally considered to be contaminants having little clinical significance. Over the last decades, however, these organisms have become recognized as important agents of human disease.^[1,2] CoNS are a group of staph bacteria, which generally exist as normal flora of human skin and the oral flora found on mucous membranes. However, many of these bacteria can act as potential pathogens under reduced immunity in humans.^[3] There are around 45 types of known CoNS, and some of important strains are *Staphylococcus epidermidis*, *S. haemolyticus*, and *S. saprophyticus*.^[2] The most common species isolated from human specimens that result in disease are *S. epidermidis*, *S. haemolyticus*, *S. hominis*, and *S. saprophyticus*. Some species have been considered as significant opportunistic pathogens but are rarely isolated which include *S. warneri*, *S. lugdunensis*, *S. capitis*, *S. simulans*, *S. cohnii*, *S. saccharolyticus*, and *S. xylosus*.^[3-5] *S. epidermidis* is the most common organism among the CoNS species, accounting for 50 to 80% of isolates causing surgical site infections, prosthetic device associated infections, peritoneal dialysis related infections, cerebrospinal fluid shunt and ophthalmic infections. *S. saprophyticus* is considered as the second most common cause of urinary tract infections and accounts for 11-32% cases of UTI in female out patients.^[6] CoNS in immunocompromised patients can cause variety of infections like bacteraemia, central nervous system shunt infection, intravascular catheter-related infections, endocarditis, surgical site infections, urinary tract infections, foreign body infection, endophthalmitis, peritonitis and wound, bone and joint infections as well as infections in neonates.^[3] Differentiation between the clinically significant pathogenic infection and contaminating CoNS isolates is difficult and is a major challenge for clinicians. There are limited studies from our area on the speciation of CoNS. These infections are difficult to treat because of the risk factors and drug resistant nature of the organisms. Hence, this study was conducted to find

out species wise distribution of Coagulase negative Staphylococci (CoNS) in various clinical sample in our institute.

MATERIALS AND METHODS:

This study was carried out in the department of Microbiology, AIIMS, Udaipur. The study was conducted over a period of 3 years. Study was carried out after taking permission from the institutional ethics committee. A total of 500 of CoNS strains were isolated from relevant clinical specimens. CoNS strains were isolated from variety of clinical specimens, including pus, wound or vaginal swabs, blood, bodily fluids (cerebrospinal fluid, pleural fluid, ascitic fluid), urine, sputum and endotracheal secretions. Initially, the strains were identified as CoNS on the basis of colony morphology, gram stain, catalase test and coagulase test. Bacitracin sensitivity test was done to exclude Micrococci and Stomatococcus species. Species identification was done based on various biochemical tests. The conventional tests which are simple, easy to perform and non-expensive were chosen from the scheme of Kloos and Schleifer and Koneman. Tests like ornithine decarboxylase test, nitrate reduction test, Voges-Proskauer test, urease test and fermentation of sucrose, lactose, maltose, mannose, mannitol, xylose and trehalose were performed. Susceptibility to novobiocin and polymyxin B was done as per the regular procedure for species identification. Information like age, gender and history of any clinical ailment was gathered through the AIIMS Udaipur, Microbiology Department's requisition form. Microsoft word and excel were used to generate tables.

RESULTS :

The most common source of CoNS isolation was blood (34%), followed by respiratory secretions (24.4%), urine (16.8%), pus (13.4%), swabs (5.4%), bodily fluid (1.4%), and others (4.6%) Table 1. Among 500 CoNS isolates *S. epidermidis* was most frequently isolated (30.6%), followed by *S. hemolyticus* (25.4%), *S. hominis* (12.6%), *S. capitis* (12%), *S. lugdunensis* (11.4%) and *S. cohnii* (08%) Table 2. Table 3 shows the species wise distribution of CoNS in various clinical specimens. Age and gender wise distribution of CoNS is shown in Table 4. Out of 500 cases of CoNS most were from 41-60 years age group (30.2%), followed by less than 20 years (23.4%), 21-40 years (23%), 20 years (22.4%), 61-80 years (16%), and finally 80 years (7.4%). Age and gender wise distribution of isolated species of CoNS is shown in Table 5. Among males the most common strain identified was *S. hemolyticus* (37) followed by *S. epidermidis* (31) from 41-60 year age group. Among females the most common strain identified was *S. hemolyticus* (27) from 41-60 year age group followed by *S. epidermidis* (23) from 21-40 years age group.

DISCUSSION:

In the present study 500 CoNS were isolated from various clinical samples. In our study, the most common source

| Clinical specimen | No. of isolates n=500 | Percentage |
|-------------------------------------------------------------------|-----------------------|------------|
| Blood | 170 | 34% |
| Respiratory secretions (Sputum, ETsecretion, Bronchial aspirates) | 122 | 24.4% |
| Urine | 84 | 16.8% |
| Pus | 67 | 13.4% |
| Swabs (wound,vaginal,throat) | 27 | 5.4% |
| Body fluids | 07 | 1.4% |
| Others | 23 | 4.6% |

Table 1: Distribution pattern of CoNS isolates in various clinical specimens

| Isolates | No of isolates n=500 | Percentage (%) |
|-----------------------|----------------------|----------------|
| <i>S. epidermidis</i> | 153 | 30.6 |
| <i>S. hemolyticus</i> | 127 | 25.4 |
| <i>S. hominis</i> | 63 | 12.6 |
| <i>S. capitis</i> | 60 | 12 |
| <i>S. lugdunensis</i> | 57 | 11.4 |
| <i>S. cohnii</i> | 40 | 8 |

Table 2: Distribution pattern of CoNS isolates in various clinical specimens

of CoNS isolation was blood (34%), followed by respiratory secretions (24.4%), urine (16.8%), pus (13.4%), swabs (5.4%), bodily fluid (1.4%), and others (4.6%). In previous studies the isolation rate of CoNS from blood varies from 4.71% (Phatak et al) to 46.33% (Sharma et al).^[7-9] However, in some previous studies (Jayakumar et al [6], Roopa et al [10], Golia et al [11] and Mir et al [12]) the most common source of CoNS isolation was pus. Our results were similar to studies by Mane et al [9] and Usha et al [13] in which most common source of CoNS isolation was blood. In present study *S. epidermidis* was most frequently isolated (30.6%), followed by *S. hemolyticus* (25.4%) which was similar to various previous studies.^[6, 10, 11, 13] In previous studies the isolation rate of *S. epidermidis* from various clinical specimens varies from 32% (Usha et al [13]) to 57.4% (Jayakumar et al [6]). In our study the most common source of *S. epidermidis* isolation was respiratory tract samples followed by samples from pus, urine and blood. However in studies by Roopa et al [10], Golia et al [11] and Jayakumar et al [6] the most common source of *S. epidermidis* isolation was pus. In our study the most common source of *S. hemolyticus* isolation was blood which was similar to study by Usha et al [13]. However in studies

| Isolates | Blood | Respiratory secretions | Urine | Pus | Swab | Body fluid | Others |
|----------------------|-------|------------------------|-------|-----|------|------------|--------|
| S.epidermidis(n=153) | 32 | 41 | 33 | 38 | 8 | 0 | 11 |
| S.hemolyticus(n=127) | 57 | 23 | 13 | 8 | 9 | 7 | 0 |
| S.honminis(n=63) | 51 | 12 | 12 | 0 | 0 | 0 | 0 |
| S.capitis (n=60) | 12 | 17 | 3 | 5 | 10 | 0 | 5 |
| S.lugdunensis(n=57) | 5 | 8 | 14 | 16 | 0 | 0 | 7 |
| S.cohnii(n=40) | 13 | 21 | 9 | 0 | 0 | 0 | 0 |

Table 3: Species wise distribution of CoNS

| Age group (in years) | ≤ 20 | 21-40 | 41-60 | 61-80 | ≥80 | Total |
|----------------------|-------|-------|-------|-------|------|-------|
| Male | 64 | 57 | 96 | 42 | 31 | 290 |
| Female | 53 | 58 | 55 | 38 | 06 | 210 |
| Percent | 23.4% | 23% | 30.2% | 16% | 7.4% | 100% |

Table 4: Species wise distribution of CoNS in various clinical isolates

| Isolates | Age group ≤ 20 (in years) | | Age group 21-40 (in years) | | Age group 41-60 (in years) | | Age group 61-80(in years) | | Age group ≥80(in years) | |
|--------------------|---------------------------|----|----------------------------|----|----------------------------|----|---------------------------|----|-------------------------|---|
| | M | F | M | F | M | F | M | F | M | F |
| S.epidermidis(153) | 13 | 17 | 14 | 23 | 31 | 16 | 18 | 11 | 4 | 6 |
| S.hemolyticus(127) | 18 | 12 | 6 | 8 | 37 | 27 | 6 | 7 | 6 | 0 |
| S.hominis(63) | 7 | 4 | 8 | 0 | 9 | 8 | 8 | 7 | 12 | 0 |
| S.capitis(60) | 8 | 7 | 11 | 18 | 12 | 0 | 4 | 0 | 0 | 0 |
| S.lugdunensis(57) | 7 | 13 | 11 | 9 | 4 | 0 | 0 | 13 | 0 | 0 |
| S.cohnii(40) | 11 | 0 | 7 | 0 | 3 | 4 | 6 | 0 | 9 | 0 |

Table 5: Age and gender wise distribution of CoNS

by Roopa et al [10] and Golia et al [11], the main source of isolation of S.hemolyticus was pus. In our study out of 500 CoNS isolates, 58 % were from males, compared to 42% in females which was similar to study by Mane et al [9]. In our study the most of CoNS isolates from 41 to 60 year age group followed by 21 to 40 year age group. However, in studies by Mane et al [9] and Roopa et al [10], the most of CoNS isolates were from 21 to 40 year age group.

CONCLUSION:

The most common CoNS isolate found in our study was S. epidermidis followed by S. Hemolyticus. Blood was the

most common source of CoNS isolation in our study followed by respiratory secretions. As CoNS have become major cause of nosocomial infections, there is a need for rapid identification and speciation of CoNS with their antibiotic susceptibility for better management of these cases and to prevent emergence of drug resistance.

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