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Original Research Article

Prevalence and Antibiotic Susceptibility of Coagulase Negative Staphylococci in Tertiary Care Centre

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Abstract

Introduction: Coagulase negative Staphylococci are a part of normal human flora .They are an important cause of nosocomial infections worldwide. Previously they were considered as commensals but now they are considered as major cause of nosocomial bloodstream infections, urinary tract infections and various indwelling device‐related and prosthetic implants infections [3]. ***Aim:*** To determine the prevalence and susceptibility of Coagulase negative staphylococci and their antibiotic susceptibility testing from various clinical samples in a tertiary care centre. ***Materials & Methods:*** A cross sectional study was conducted in the department of microbiology, Saveetha medical college .76 strains of CONS were isolated from blood, urine and exudate from both OP and IP. Specimens were collected from various departments like ICU, NICU, General Medicine, SICU, MICU, OBG, ORTHO. Antibiotic susceptibility of all the isolated CONS was done according to CLSI guidelines. ***Result:*** In this study, most CONS species isolated were from blood (65%) followed by exudate (25%) and urine. Prevalence of CONS is more in females than in males among the people of 20-39 yrs of age. CONS were isolated more from GM and OBG wards. *Staph epidermidis* is the most prevalent CONS species followed by *S.haemolyticus*.26% were methicillin resistance CONS species. Regarding the antibiotic susceptibility, they showed high susceptibility to vancomycin, nitrofurantoin, linezolid, norfloxacin and resistance were seen in Penicillin, Cephalosporin group of drugs.

Keywords: Coagulase negative Staphylococci, Staph.epidermidis, MR – CONS, device associated infections.

INTRODUCTION

Coagulase negative staphylococci (CONS) are a part of normal flora of human skin and oral cavity found on mucous membranes. These gram positive bacteria are an important cause of nosocomial infections [1]. Acquisition of genes often results in the conversion of commensal Staphylococci into invasive pathogens that causes infections especially in old, very young children and immune-compromised patients [4].

They have the ability to survive for several weeks to months on synthetic medical devices and equipments. They are an important etiological agent of wide variety of infections like bacteraemia, urinary tract infections, central nervous system shunt infections, catheter-related infections, surgical site infections, endocarditis, peritonitis, endophthalmitis and others [1]. They are transmitted via use of contaminated equipments and devices such as prosthetic heart valves, catheters, orthopaedic implants and others.

They are a heterogeneous group of organisms. There are about 38 species of CONS. Important among them include *S.epidermidis, S.haemolyticus, S.saprophyticus, S.lugdunensis, and other species are S.hominis, S.capitis, S.warneri, S.xylosus.*

After admission to the hospital and especially after exposure to multiple course of antibiotics or surgical prophylaxis, patients become colonised with multi-drug resistant strains. Hence antibiotic susceptibility of all isolated CONS was determined against 18 antibiotics.

The aim of this study is to determine the prevalence and antibiotic susceptibility of CONS isolated from various clinical samples in a tertiary care centre.

MATERIALS & METHODS

STUDY DESIGN AND SETTING

A cross sectional study was conducted in the Department of microbiology, Saveetha medical college and hospital, Chennai, for 6 months from July to 2018 to December 2019. A total number of 76 clinically significant strains of CONS were isolated from various samples such as blood, urine, wound swab, and pus. Specimens were collected from both IP and OP patients and from the following departments like ENT, ER, GM, MICU, NICU, SICU, OBG, ORTHO.

Strain Identification and Antibiotic Susceptibility

Clinical specimens were collected and inoculated on appropriate biological media such as Blood agar, Chocolate agar and MacConkey agar. These specimens were then incubated at 37 degree C for 18-24 hrs. Identification of isolated CONS were made based on gram staining, colony morphology, catalase test, fermentation of Mannitol, Urease production and slide and tube coagulase tests. The antibiotic susceptibility testing was done according to the CLSI guidelines and the results were confirmed by Kirby-Bauer disc diffusion technique. Different antibiotics were used to evaluate the susceptibility pattern of isolated CONS according to recommendations of CLSI 2009 guidelines for Gram Positive Bacteria. The isolated CONS specimens were ruled out whether it is methicillin resistant or methicillin sensitive.

RESULT

In our study, out of 4666 total samples, 76 grew CONS. Among this, 37 were isolated from blood and in patients located in the ICU followed by exudate (26) and urine (13).

Regarding the gender, 44 isolates (58%) were from females and 32(42%) from males. As far as the age is concerned, 30 isolates were from 20 to 40 age group followed by 24 isolates from 40 to 60 and 17 isolates from 60 to 70 age group.

Regarding OP and IP patients, Coagulase negative staphylococci is more prevalent among IP patients with 49 patients (64%) than OP patients with 27 patients (36%)

Figure-1 represents the department wise distribution. CONS is prevalent in GM and OBG with 25% (14 patients), followed by URO with 12%, ICU (6 patients) and ER with 11% (6patients), Surgery 9% (5 patients), ENT 7% (4 patients), ORTHO 2% (1 patient)

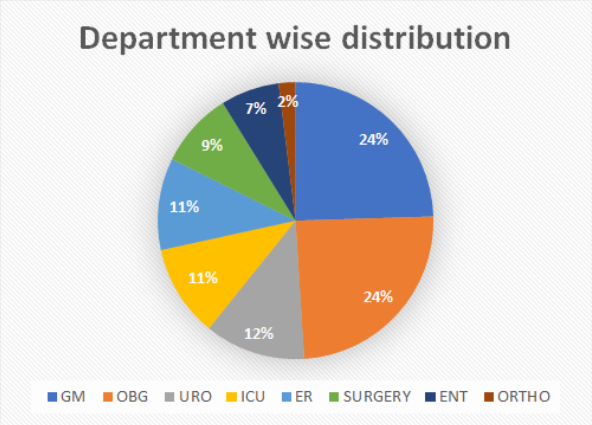

Fig-1: Department wise distribution of CONS

Fig-2 depicts the speciation of CONS isolated. Out of 76 isolates of CONS, *S.epidermidis* is most prevalent (27 no) followed by *S.saprophyticus* (21) *S.haemolyticus (12)*, *S.hominis (5)*, *S.lugdenensis (9)* and finally *S.xylosus (2)*.

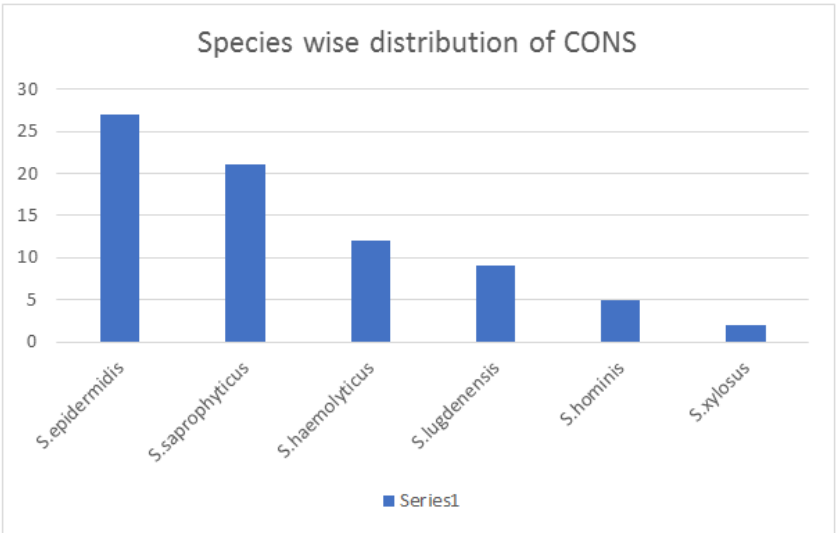

Fig-2: Species wise distribution of coagulase negative staphylococci

Table-1: Shows the antibiotic susceptibility testing of CONS

ANTIBIOTIC	SUSCEPTIBLE %	RESISTANT %
Cefazolin	32	68
Cefriazon	8	92
Ciprofloxacin	39	61
Erythromycin	25	75
Gentamicin	75	25
Levofloxacin	88	13
Linezolid	98	2
Nitrofurantoin	99	1
Norfloxacin	98	2
Oxacilin	36	64
Penicillin	8	91
Tetracycline	20	80
Vancomycin	99	1

74% of CONS was methicillin sensitive and 26% was MR-CONS.

DISCUSSION

Recently, studies have implicated this group as one of the more important causative agents of nosocomial human infections, especially in immune-compromised patients, premature newborns and in patients with indwelling medical devices such as catheters [7, 15]. CONS possess the ability to survive on synthetic medical devices and equipment and also on various surfaces in hospitals for weeks to months [6]. In our study, out of 76 CONS isolates, majority were isolated from blood and in patients located in the ICU which is consistent with other similar studies done by Ibrahim Ali Al Tayyar *et al.,* [1], Nzeako B AS *et al.,* [7], Javadpour S KE *et al.,* [15]. The remaining species of CONS were isolated from exudate followed by urine. Coagulase negative staphylococci is prevalent in GM and OBG with 25% (14 patients), followed by URO with 12%, ICU (6 patients) and ER with 11% (6patients), Surgery 9% (5 patients), ENT 7% (4 patients), ORTHO 2% (1 patient)

12% of CONS were isolated from ICU. IP patients were more prone to infections 64% (49 patients) caused by CONS than OP patients 36% (27 patients) due to more use of catheters and other indwelling devices. In our study, CONS were more prevalent in ICU which is correlating well with a study by Ibrahim Ali al Tayyar *et al.,* from Seth's university, Lydia [1]. This could be due to increase in use of central venous catheters (CVC) and other indwelling vascular devices in hospitals, especially in ICU patients, create a potential for increased rates of infection. The high percentage of isolates obtained from ICUs and the high number of infected catheter tips cultures may be due to the possibility of colonisation of catheters or medical devices with CONS as a result of contamination of skin of patients and staff [7, 10]. Studies done by Jain A *et al.,* shows that possible reason for the OPD specimens having a high percentage of CONS species isolates may be related to poor sample collection techniques and/or multi-sample sources and clinics which is in contrast with our study. Due to these circumstances, CONS species must be considered as an important causative agent of nosocomial bacteraemia and catheter related infection [5]. In this study *S.epidermidis* is the commonest of all CONS species. This is followed by *S.saprophyticus & S.haemolyticus* and *S.hominis, S.lugdenensis* and finally *S.xylosus*. Our results are consistent with studies performed by Prapti Bora *et al.,* [3], Akinkunmi E OA *et al.,* [11], de Oliveira *et al.,* [12], Sheikh A MM *et al.,* [13]. CONS have been isolated from various medical devices used in these units, from NICU environment and paediatric wards [9].CONS are more prevalent in female population with 61% than in males with 39%.The prevalence of CONS is more common among people of age groups between 20-39yrs followed by people of age group between 40-59yrs, followed by 60-79yrs ,followed by 0-19 yrs. Out of isolated CONS species 74% of them were methicillin sensitive and 26% of the species were methicillin resistant. In study done by Serawit Deyno *et al.,* [4] methicillin resistance was 37%. Different antibiotics were used to evaluate the susceptibility pattern of isolated CONS according to recommendations of CLSI 2009 guidelines for Gram Positive Bacteria [10]. They were highly susceptible to four antibiotics namely vancomycin, nitrofurantoin, linezolid and norfloxacin. CONS species showed remarkable resistance to penicillin and cefriaxon. While bacteria continue to acquire resistance to antibiotics, selection of the appropriate agents is of great importance. Our results are consistent with the results observed by other institutions and studies done by Akinkunmi *et al.,* [11], de Oliveira A *et al.,* [12]. The possible reasons of a high resistance rate in general and to oxacillin specifically; especially in the species that were isolated from catheter tips and blood cultures is long hospitalization periods, extensive use of antibiotics and the ability of these organisms to create multi-layered bio-films on artificial surfaces[8]. In urine samples, *S.saprophyticus* species was the predominant isolate which was similar with the study done by Agbede O KO *et al.,* [9], Sheikh A MM *et al.,* [13].

Patients clinical case, age and type of causative agent identified may be the reason behind high resistance rate of CONS species that were isolated from the ICU and the paediatric wards [11, 12, 14].

CONCLUSION

The most common CONS isolated from specimens collected from the microbiology lab, Saveetha medical college were found to be *S.epidermidis* and *S.haemolyticus*. The collected organisms showed high susceptibility to vancomycin, nitrofurantoin, linezolid and showed higher resistance to penicillin and quinalones. Proper sample collection will exclude the commensals. Antibiotic policy and antibiotic stewardship will help in choosing the right antibiotic for the right person and for the right period of time.

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