

## Characterization of Coagulase negative Staphylococci isolated from urine, pus, sputum and blood samples.

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**ABSTRACT:** In the past, Coagulase negative staphylococci were generally considered to be contaminants having little significance over the past four decades. However these organisms have been recognized as important agents causing human diseases. In present study an attempt has been made to isolate and characterize the coagulase negative staphylococci from urine, pus, sputum and blood samples.

**Materials and Methods:** All coagulase negative staphylococci were further tested for phosphatase production, sensitivity to Novobiocin and Polymyxin B, mannitol fermentation for differentiation of *Staphylococcus epidermidis*, *S. saprophyticus* and *S. haemolyticus*. They are tested for sensitivity to other antibiotics also.

**Results:** Out of the total number (N=450) of samples, 28 urine samples (18 for *S. saprophyticus*, 10 for *S. epidermidis*), 26 sputum samples (20 for *S. epidermidis*, 4 for *S. haemolyticus*, 2 for *S. saprophyticus*) and 1 blood sample (*S. epidermidis*) were positive for Coagulase negative Staphylococci. All the strains of *S. saprophyticus*, *S. epidermidis*, *S. haemolyticus* were 100% sensitive to Vancomycin from urine. Except the strains isolated from urine which are resistant to Penicillin, majority of the other strains are sensitive to penicillin

**Conclusion:** The present study reveals the need to characterize Coagulase negative Staphylococci and to know their antibiotic sensitivity pattern to report them as pathogens in causing human disease.

**Keywords**—Coagulase negative Staphylococci, *Staphylococcus saprophyticus*, *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, Coagulase test.

### I. INTRODUCTION

#### Coagulase Negative Staphylococci

In the past, Coagulase-negative Staphylococci were generally considered to be contaminants having little clinical significance. Over the past four decades, however, these organisms have become recognized as important agents of human disease.

#### *Staphylococcus epidermidis*

When clinical findings are correlated with the isolation of Coagulase negative Staphylococci, *S. epidermidis* is the most frequently recovered organism, accounting for 50% to over 80% of isolates. Almost all infections caused by *S. epidermidis* are nosocomially acquired, except for native valve endocarditis and infections of semipermanent venous access devices. In addition to both native-valve and prosthetic-valve endocarditis, *S. epidermidis* has been isolated and documented as a pathogen in urinary tract infections, infections of various prosthetic devices, cerebrospinal fluid (CSF) shunt infections, peritoneal dialysis-related infections and ophthalmic infections. Over the past several years, resistance of coagulase negative staphylococci to many classes of antimicrobial agents has emerged, including resistance to penicillinase resistant penicillins (i.e. oxacillin, methicillin). Increasing use of vancomycin has led to the emergence of coagulase negative staphylococci with decreased susceptibility to vancomycin. This has been primarily in *S. haemolyticus*, but has also occurred to a lesser extent among *S. epidermidis* clinical isolates. Though the resistance to antibiotics is not contributing to virulence, it is a practical problem as they lead to infection.

#### *Staphylococcus saprophyticus* subspecies *Saprophyticus*

The Coagulase-negative species *S. saprophyticus* deserves special mention, since this species is a well-documented pathogen causing primarily acute urinary tract infections in young healthy, sexually active women.

### **Other Coagulase negative staphylococci**

Other Staphylococcal species are found in both humans and animals as a part of the normal flora and also causes several types of infections. Some species are found in the environment and are isolated in foods while processing in food industry.

Coagulase negative species other than *S.epidermidis* and *S.saprophyticus* are frequently found as contaminants in clinical specimens, may play an important role in human infections and disease. Several other species have now been reported as causes of human infections, principally in wounds, urinary tract infections, bacteremia, osteomyelitis, catheter related sepsis, ventriculoperitoneal shunt infections and both native-valve and prosthetic-valve endocarditis. These agents are increasingly being recognized as important opportunistic pathogens in immunocompromised patients, including premature neonates, neutropenic cancer patients, elderly persons with serious underlying diseases and hospitalized patients following invasive procedures and with indwelling plastic devices. Infections with many of these other species are acquired in the hospital setting. The more commonly implicated species include *S.haemolyticus*, *S.lugdunensis*, *S.schleiri*, *S.warneri*, *S.hominis*, *S.simulans* and *S.saccharolyticus*.

### **Staphylococcus haemolyticus**

*S.haemolyticus* is part of the human normal flora. This organism has been documented as a cause of primary and nosocomial bacteremia, wound and soft tissue infections ,urinary tract infections and nosocomial paediatric and neonatal infections.

### **Infections associated with Staphylococcus epidermidis and other Coagulase negative staphylococci**

#### **Urinary tract infections**

Among the Coagulase negative Staphylococci, *S.saprophyticus* is a true urinary tract pathogen, causing both upper and lower respiratory tract infections, primarily in young women. Several studies have found this organism to be the second most common cause of urinary tract infections after *Escherichia coli*, representing 11-32% of urinary tract infections in female outpatients. Other Coagulase negative staphylococci are rare causes of urinary tract infections, and about 80-90% of these infections are caused by *S.epidermidis*. Urinary tract infections due to *S.epidermidis* and other Coagulase negative staphylococci are usually catheter-associated and occur in elderly patients with prior urinary tract instrumentation or surgery, renal transplantation, urolithiasis or other urologic abnormalities.

#### **Osteomyelitis**

Osteomyelitis due to Coagulase negative staphylococci may occur as a complication of both cardiothoracic surgery and implantation of prosthetic materials, such as knee and hip prostheses.

#### **Native valve endocarditis**

Coagulase negative staphylococci are rare causes of native valve and pacemaker related endocarditis, accounting for about 5% of all cases.

#### **Prosthetic valve endocarditis**

In contrast to native valve endocarditis, Coagulase negative staphylococci are the most common etiologic agents of prosthetic valve endocarditis, with *S.epidermidis* being the most frequently isolated species, almost to the exclusion of all others. In this infection, organisms infect the ring of sutures holding the valve in place, causing the formation of microabscesses that are relatively protected from antibiotics.

#### **Ocular infections**

*S.epidermidis* is the most frequently implicated pathogen causing postsurgical endophthalmitis. Surgical procedures associated with these infections include lens implantation and cataract surgeries(Weber DT et al 1986).

#### **Intravenous catheter infections**

*S.epidermidis* is the most common isolate infecting intravenous catheters. Implicated catheter types have included central and peripheral intravenous lines, central hyperalimentation catheters, subclavian hemodialysis catheters, Hickman and Broviac central lines and Swan-Ganz catheters. Infected catheters may be the source of bacteremias, which may seed distant sites to create additional infections complications.

#### **Paediatric infections**

Most paediatric infections are nosocomial staphylococcal bacteremias occurring in neonatal intensive care units. These infections are associated with prematurity, the presence of indwelling peripheral or central

lines, ventilator assistance and administration of total parental nutrition. Although most staphylococcal agents in such infections are *S. epidermidis*, other species (eg, *S. haemolyticus*) have also been involved.

### **Cutaneous infections**

Coagulase negative Staphylococci may be recovered from a variety of cutaneous lesions (cysts, carbuncles, furuncles), both alone and along with other pyogenic bacteria, including *S. aureus* and beta-hemolytic streptococci. The most commonly implicated species have included *S. epidermidis*, *S. haemolyticus*, *S. lugdunensis* and *S. hominis*. Unusual cutaneous infections involving *S. epidermidis* include malignant external otitis.

## **II. MATERIALS AND METHODS**

All the samples (urine, pus, sputum and blood) which were sent to the Microbiology laboratory, MIMS General Hospital and were processed by the following:

1. Gram's staining was done for sputum and pus samples.
2. Culture was done on Blood agar, MacConkey agar and Nutrient agar for urine, sputum, pus samples and blood sample was inoculated first in Bile broth and Hartley's broth and was subcultured on blood agar and MacConkey agar.
3. Antibiotic sensitivity testing was done by modified Kirby-Bauer's disc diffusion method on Muller Hinton agar.

*Staphylococcus saprophyticus* strains (n=21) were identified by:

- a. Negative coagulase test
- b. Negative Mannitol fermentation test
- c. Negative phenolphthalein phosphatase test
- d. Positive urease test
- e. Novobiocin resistance on blood agar
- f. Oxacillin sensitivity on Mueller Hinton agar with 4% NaCl.

*Staphylococcus epidermidis* strains (n=39) were identified by:

- a. Negative coagulase test
- b. Negative Mannitol fermentation test
- c. Positive phenolphthalein phosphatase test
- d. Positive urease test
- e. Novobiocin sensitivity on blood agar
- f. Oxacillin sensitivity on Muller Hinton agar with 4% NaCl.

*Staphylococcus haemolyticus* strains (n=5) were identified by:

- a. Negative coagulase test
- b. Negative Mannitol fermentation test
- c. Negative phenolphthalein phosphatase test
- d. Negative urease test
- e. Novobiocin sensitivity on blood agar
- f. Oxacillin sensitivity on Mueller Hinton agar with 4% NaCl.

-All the novobiocin sensitive strains of *S. epidermidis* and *S. haemolyticus* were further differentiated by Polymyxin-B sensitivity on Mueller-Hinton agar.

## **III. ANTIBIOTIC SENSITIVITY TESTING:-**

Antibiotic sensitivity was done by the modified Kirby-Bauer disc diffusion technique as recommended by World Health Organization technical report. Culture broth was inoculated on Mueller Hinton agar. But for oxacillin sensitivity, Mueller Hinton agar with 4% NaCl was used.

Mueller Hinton agar was inoculated using a swab that has been submerged in the bacterial suspension isolated. The surface of the plate was swabbed in three directions to ensure an even and complete distribution of the inoculum over the entire plate. Within 15min of inoculation the antibiotic discs were applied and the plates were inverted for incubation to avoid accumulation of moisture on the agar surface that can interfere with interpretation of the test results. The plates were incubated at 37°C for 24hrs in an incubator.

The following discs were used for antibiotic sensitivity testing of Coagulase negative Staphylococci isolated from culture positive urine samples:-

1. Penicillin G-----10units/disc
2. Ciprofloxacin-----5mcg
3. Gentamycin-----10mcg
4. Vancomycin-----30mcg

5. Tetracycline-----30mcg

6. Oxacillin-----1mcg

The following discs were used for antibiotic sensitivity testing of Coagulase negative Staphylococci isolated from culture positive sputum, blood and pus samples:-

1. Penicillin G-----10units/disc

2. Polymyxin B-----300units/disc

3. Ciprofloxacin-----5mcg

4. Gentamycin-----10mcg

5. Erythromycin-----15mcg

6. Vancomycin-----30mcg

7. Netilmicin-----30mcg

8. Oxacillin-----1mcg

#### IV. RESULTS

**Table -1 Total number of samples:**

<b>1</b>	<b>Urine</b>	<b>200</b>
<b>2</b>	<b>Sputum</b>	<b>150</b>
<b>3</b>	<b>Pus</b>	<b>50</b>
<b>4</b>	<b>Blood</b>	<b>50</b>
	<b>Total</b>	<b>450</b>

**Table-2 Culture positivity for Coagulase negative Staphylococci in total number of samples:**

S.No	Number of samples	Culture positive samples.	Percentage(%)
<b>1.</b>	<b>Urine(n=200)</b>	<b>28</b>	<b>14</b>
<b>2.</b>	<b>Sputum(n=150)</b>	<b>26</b>	<b>17.3</b>
<b>3.</b>	<b>Pus(n=50)</b>	<b>10</b>	<b>20</b>
<b>4.</b>	<b>Blood(n=50)</b>	<b>01</b>	<b>2</b>
	<b>Total=450</b>	<b>65</b>	<b>53</b>

This table shows that out of: 200 urine samples 28(14%), 150 sputum samples 26(17.3%), 50 pus samples 10(20%) and out of 50 blood samples 01(2%) were culture positive for Coagulase negative staphylococci.

**Table-3 Coagulase Negative Staphylococci isolated from culture positive urine samples(N=28)**

S.no.	Coagulase negative Staphylococci isolated	Number of culture positive samples	Percentage(%)
<b>1.</b>	<b>S.saprophyticus</b>	<b>18</b>	<b>64.28</b>
<b>2.</b>	<b>S.epidermidis</b>	<b>10</b>	<b>35.71</b>
	<b>Total</b>	<b>28</b>	<b>99.99</b>

This table shows that from 28 urine samples, S.saprophyticus strains 18(64.28%) and S.epidermidis strains 10(35.71%) were culture positive for coagulase-negative staphylococci isolates.

**Table-4 Coagulase Negative Staphylococci isolated from culture positive sputum samples(N=26)**

S.no	Coagulase negative Staphylococci isolated	Number of culture positive samples	Percentage(%)
<b>1.</b>	<b>S.saprophyticus</b>	<b>02</b>	<b>7.69</b>
<b>2.</b>	<b>S.epidermidis</b>	<b>20</b>	<b>76.92</b>
<b>3.</b>	<b>S.haemolyticus</b>	<b>04</b>	<b>15.38</b>
	<b>Total number of isolates</b>	<b>26</b>	<b>99.99</b>

This table shows that from 26 culture positive sputum samples coagulase negative staphylococci isolates were S.saprophyticus 02(7.69%), S.epidermidis 20(76.92%) and S.haemolyticus 04(15.38%) .

**Table-5 Coagulase Negative Staphylococci isolated from culture positive pus samples(N=10)**

S.no.	Coagulase negative staphylococci isolated	Number of culture positive samples	Percentage(%)
1.	S.epidermidis	08	80
2.	S.saprophyticus	01	10
3.	S.haemolyticus	01	10
	<b>Total</b>	<b>10</b>	<b>100</b>

This table shows that out of 10 culture positive pus samples, 08(80%) strains of S.epidermidis, 01(10%) strain of S.saprophyticus and 01(10%) strain of S.haemolyticus were isolated in the present study.

**Table-6 Coagulase Negative Staphylococci isolated from culture positive blood sample(N=1)**

S.no	Coagulase negative Staphylococci isolated	Number of culture positive samples	Percentage(%)
1.	S.epidermidis	1	100
	<b>Total number of isolates</b>	<b>1</b>	<b>100</b>

This table shows that one S.epidermidis strain was isolated from one culture positive blood sample in the present study.

**Table-7 Antibiotic Sensitivity Pattern Of Coagulase Negative Staphylococci isolated from culture positive urine samples(N=28)**

Name of the Antibiotic	S.saprophyticus(n=18)				S.epidermidis (n=10)			
	Sensitive		Resistance		Sensitive		Resistance	
	No.	%	No.	%	No.	%	No.	%
Penicillin	0	0	18	100	02	20	08	80
Oxacillin	10	55	08	45	04	40	06	60
Ciprofloxacin	09	50	09	50	06	60	04	40
Gentamycin	14	77.8	04	22.2	07	70	03	30
Vancomycin	18	100	0	0	10	100	0	0
Tetracycline	11	61	07	38.9	05	50	05	50

This table shows that from culture positive urine samples S.saprophyticus strains isolated were 100% resistant to Penicillin G and sensitive to Vancomycin (100%), Oxacillin (55%), Ciprofloxacin (50%), Gentamycin (77.8%) and Tetracycline (61%). S.epidermidis strains isolated were 80% resistant to Penicillin G and 60% resistant to Oxacillin and sensitive to Vancomycin (100%), Ciprofloxacin (60%), Gentamycin (70%) and Tetracycline(50%)

**Table-8 Antibiotic sensitivity pattern of Coagulase Negative Staphylococci isolated from culture positive sputum samples (n=26)**

Name of the Antibiotic	S.saprophyticus(n=2)				S.epidermidis (n=20)				S.haemolyticus(n=4)			
	Sensitive		Resistant		Sensitive		Resistant		Sensitive		Resistant	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Penicillin G	0	0	2	100	4	20	16	80	1	25	03	75
Polymixin-B	-----	-----	-----	-----	-----	-----	20	100	4	100	-----	-----
Ciprofloxacin	-----	-----	2	100	15	75	05	25	03	75	01	25
Gentamycin	2	100	-----	-----	15	75	05	25	02	50	02	50
Erythromycin	1	50	1	50	13	65	07	35	1	25	03	75
Vancomycin	2	100	-----	-----	19	95	01	05	04	100	-----	-----
Netilmicin	2	100	-----	-----	18	90	02	10	04	100	-----	-----
Oxacillin	2	100	-----	-----	08	40	12	60	03	75	01	25

This table shows that S.saprophyticus strains isolated were 100% resistant to Penicillin G and Ciprofloxacin and 100% sensitive to Gentamycin, Vancomycin, Netilmicin, Oxacillin and 50% sensitive to Erythromycin. S.epidermidis strains isolated were 100% resistant to Polymyxin B, Penicillin G (80%) and Oxacillin (60%) and sensitive to Ciprofloxacin (75%), Gentamycin (75%), Erythromycin(65%), Vancomycin (95%) and Netilmicin (90%). S.haemolyticus strains isolated were 75% resistant to Penicillin G and

Erythromycin and 100% sensitive to Polymyxin-B, Vancomycin and Netilmicin and 75% sensitive to Oxacillin and Ciprofloxacin.

**Table-9 Antibiotic sensitivity pattern of Coagulase Negative Staphylococci isolated from culture positive pus samples(n=10)**

Name of the Antibiotic	S.saprophyticus(n=1)				S.epidermidis(n=8)				S.haemolyticus(n=1)			
	Sensitive		Resistant		Sensitive		Resistant		Sensitive		Resistant	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Penicillin G	-----		01	100	01	12.5	07	87.5	-----		01	100
Polymyxin B	NA	NA	NA	NA	-----		08	100	01	100	-----	
Ciprofloxacin	01	100	-----		06	75	02	25	01	100	-----	
Gentamycin	01	100	-----		07	87.5	01	12.5	01	100	-----	
Erythromycin	-----		01	100	06	75	02	25	01	100	-----	
Vancomycin	01	100	-----		07	87.5	01	12.5	01	100	-----	
Netilmicin	01	100	-----		08	100	-----		01	100	-----	
Oxacillin	01	100	-----		03	37.5	05	62.5	01	100	-----	

This table shows that S.saprophyticus strain(n=1) isolated was 100% resistant to Penicillin G and Erythromycin, 100% sensitive to Ciprofloxacin, Gentamycin, Vancomycin, Netilmicin and Oxacillin. S.epidermidis strains(n=8) isolated were resistant to Polymyxin-B(100%), Penicillin G(87.5%) ,Oxacillin (62.5%) and sensitive to Ciprofloxacin (75%),Gentamycin (87.5%) ,Vancomycin (87.5%),Netilmicin (100%), Erythromycin (75%). S.haemolyticus strain(n=1) isolated was 100% resistant to Penicillin G and 100% sensitive to Polymyxin- B, Ciprofloxacin, Gentamycin, Erythromycin, Vancomycin, Netilmicin, Oxacillin.

## V. DISCUSSION

In the present study, 450 samples (urine,pus,sputum and blood) were collected from patients attending Maharajah's Institute of Medical Sciences General Hospital, Nellimarla,Vizianagaram. They were collected from various outpatient departments and wards and processed. A total number of 65 samples were culture positive for coagulase negative staphylococci(28 samples out of 200 urine samples, 26 samples out of 150 sputum samples 10 out of 50 pus samples and one strain was isolated from 50 blood samples).The distribution of individual species of coagulase negative staphylococci varied in different samples depending on the type of specimen. From urine, S.saprophyticus was the dominating species 18 (64.28%) out of 28 coagulase-negative staphylococci isolated and S.epidermidis which was the other species isolated in the present study constituting 10 (35.71%) strains out of 28 isolates. S.epidermidis was the dominating species i.e. 20 (76.92%) out of 26 isolates followed by S.haemolyticus 4 (15.38%) strains and S.saprophyticus 2 (7.69%) strains from sputum samples. S.epidermidis was the common species out of 10 isolates from pus in the present study i.e 8 out of 10 isolates whereas S.saprophyticus and S.haemolyticus one strain for each species were isolated from pus samples . The culture positivity for blood samples was only one out of 50 blood samples processed and the species was S.epidermidis.

Out of all the coagulase negative staphylococci isolated, S.epidermidis was the common species except from urine where S.saprophyticus was common in present study. Five S.haemolyticus strains were isolated from sputum and pus in the present study .Other species reported in several studies like S.hominis, S.lugdunensis, S.warneri S.simulans, S.schleiferi and S.saccharolyticus were not isolated in the present study.

Iwantsheff A et al (1985) also reported S.epidermidis as the common species in their study. The second common species reported by them was S.hominis and S.haemolyticus was the third common species as reported by them. S.saprophyticus was reported to be more common in urine samples among sexually active young women by them also. In the present study, only S.saprophyticus and S.epidermidis were isolated from urine whereas S.epidermidis and S.hominis were reported to be more common species by S.shrikhande et al (1996) from Nagpur.

Von Eiff C et al (2001), from Germany also reported S.epidermidis as the most common species from immunocompromised patients with nosocomial bacteremia and S.saprophyticus in urinary tract infections particularly young, sexually active men and women.

Isabel L Barberis et al(2001),from Argentina reported S.haemolyticus as the common species in urinary tract infections with high sensitivity pattern to Vancomycin and tetracycline and low sensitivity to Beta-lactam drugs. In the present study, out of 28 positive coagulase negative staphylococci from urine, 18(64.28%) were S.saprophyticus and 10(35.71%) were S.epidermidis. S.saprophyticus has been reported as common species from urine which is similar to other studies also by Iwantsheff A et al(1985)from Germany, Uesugi A et al(1996) from Tokyo,Orett F A et al(1998)from WestIndies, Kumari N et al(2001) from Patna,India and Von Eiff C et al, Germany (2001) from sexually active young women whereas Nicolle L E et al(1983) reported high

incidence of *S.epidermidis* (70%) in urinary tract infections. Ozturkeri H et al(1994) from Istanbul reported high incidence of *S.epidermidis*(47.8%) in urinary tract infections followed by *S.saprophyticus*(42.3%). *S.epidermidis*(45.90%) was also reported as common species by Kumar N et al(2001) followed by *S.saprophyticus* (34%). Kleeman(1993) reported *S.epidermidis* as most common species and *S.haemolyticus* as most common species in urinary tract infections. The difference in species isolated may be due to the difference in study population from whom the specimens were collected.

Out of 26 coagulase negative staphylococci isolates from sputum samples, 20 strains were *S.epidermidis* in the present study. *S.epidermidis* is the most common species isolated including 20(76.92%) out of 26 coagulase negative staphylococci strains from sputum.08(80%) out of 10 coagulase negative staphylococci strains from pus samples was *S.epidermidis* and the only 1 isolate was also *S.epidermidis* from the blood samples in the present study.

The incidence of *S.epidermidis* as the most common species out of coagulase negative staphylococci is similar to studies by many workers from various places. Iwantscheff A et al(1985) from Germany, S.shrikhande et al(1996) from Nagpur, Von Eiff C et al (2001) from Germany, Isabel L Barberis et al(2001) from Argentina, U Mohan et al (2002) from Amritsar,India, R Goyal et al(2006) from New delhi, India and Surekha.Y. Asangi et al(2011) Bellary, India.

Antibiotic sensitivity was performed by selecting antibiotics depending on the samples from which the strains were isolated.

*S.saprophyticus* strains which were isolated from urine,sputum and pus samples were 100% resistant to Penicillin G in the present study. *S.epidermidis* strains which were isolated from urine, sputum and pus samples were 80% resistant to Penicillin G except from blood sample which is sensitive in the present study. *S.haemolyticus* strains which were isolated from sputum and pus samples were 75% and 100% resistant to penicillin G respectively in the present study. *S.saprophyticus* and *S.epidermidis* strains isolated from urine samples were 50% sensitive to oxacillin in the present study.

*S.epidermidis* strains from all samples were 60-75% sensitive to ciprofloxacin. But there is a variation by *S.saprophyticus* strains for sensitivity to ciprofloxacin differing with source of specimens. From sputum samples, all the *S.saprophyticus* strains were resistant to ciprofloxacin. This may be due to the chronicity of the respiratory infections with long usage of antibiotics.From urine and pus samples,*S.saprophyticus* strains isolated were 50% and 100% sensitive to ciprofloxacin respectively.

*S.saprophyticus* strains from all samples were highly sensitive to gentamycin,vancomycin and netilmicin. Strains of *S.epidermidis* from urine have shown 100% sensitivity to vancomycin, but strains from pus and sputum have shown 12.5% and 5% resistance respectively. Tetracycline was kept only for urine samples.50% sensitivity were exhibited by both *S.saprophyticus* and *S.epidermidis* which were isolated from urine samples.

Single strain of *S.haemolyticus* isolated from pus sample was resistant to Penicillin-G but sensitive to Polymyxin-B, oxacillin, ciprofloxacin, gentamycin, erythromycin, vancomycin and netilmicin. *S.haemolyticus* strains isolated from sputum samples were 75% resistant to Penicillin G and Erythromycin, 100% sensitive to polymyxin B, vancomycin and netilmicin. 75% sensitive to ciprofloxacin and 50% gentamycin. Single strain of *S.epidermidis* isolated from culture positive blood sample from one day old female newborn was sensitive to Penicillin G, oxacillin, gentamycin ,vancomycin ,erythromycin, netilmicin and resistant to polymyxin-B.

The pattern of sensitivity is coinciding with the reports of U.Mohan et al (2002), R.Goyal et al (2006) in the present study. All the strains were sensitive to Vancomycin. Useugi A et al (1996) reported high sensitivity by coagulase negative staphylococci isolated from urine to many drugs like oxacillin, vancomycin, gentamycin and many other drugs in their study which pattern is similar to the present study. About 60% sensitivity to tetracycline by coagulase negative staphylococci was observed in present study and this is similar to the sensitivity pattern reported by Goel M M et al.

## VI. CONCLUSION

1. There is a definite need for characterization and isolation of different species of Coagulase negative Staphylococci from the different clinical specimens as they are important in various infections nowadays.
2. *S.epidermidis* is the common species isolated among coagulase negative staphylococci isolated from various samples except urine.
3. Among the coagulase negative staphylococci, *S.saprophyticus* is a true urinary tract pathogen, causing both upper and lower urinary tract infections, primarily in sexually active young women.
4. The present study reveals a need to report *S.saprophyticus* strains isolated from urine samples as pathogens when collected from sexually active young women suffering from symptomatic urinary tract infection.

5. Antibiotic sensitivity testing should be done for the coagulase negative staphylococci isolates as there is development of definite resistance to Beta-lactam drugs not only to Penicillin-G but to other drugs also. As it is observed not only in present study but also by other past studies .
6. Sensitivity to ciprofloxacin varied depending on the source of the specimens and sensitivity pattern varied from 50-75%. From pus samples, 100% sensitivity to ciprofloxacin was observed by *S.saprophyticus* strains. All coagulase negative staphylococci strains isolated were found to be highly sensitive to gentamycin, vancomycin, netilmicin. *S.epidermidis* was found to be 60% resistant to Oxacillin.

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**8. Figures**



**Figure 1: Oxacillin resistance on Mueller hinton agar with 4% NaCl.**



**Figure 2: Polymyxin-B resistance on Mueller hinton agar.**



**Figure 3: Antibiotic sensitivity pattern of S.epidermidis.**



**Figure 4: Antibiotic sensitivity pattern of S.saprophyticus.**



**Figure 5: Tube Coagulase test.**