International Journal of Biomedical and Advance Research
ISSN: 2229-3809 (Online); 2455-0558 (Print)
Journal DOI: https://doi.org/10.7439/ijbar
CODEN: IJBABN **Original Research Article**

Prevalence and Antibiotic Susceptibility Pattern of Coagulase negative *Staphylococcus* Isolated from patients of Urinary tract infection at a Tertiary Care Hospital

Dharmendra Singh[1] and Anita E. Chand[2*]

[1]*Ph.D. Scholar, Department of Medical Microbiology, Government Medical College, Kota, Rajasthan, India*
[2]*Senior Professor, Department of Medical Microbiology, Government Medical College, Kota, Rajasthan, India*

Abstract

Introduction: Urinary tract infection (UTI) is the second most common infectious presentation in community medical practice. *Escherichia coli* is the most frequent infecting organism in acute infection. *Coagulase Negative Staphylococci (CoNS)* are a common cause of urinary tract infection in some reports.
Aims & Objective: To isolate *Coagulase negative Staphylococcus (CoNS)* causing urinary tract infections & its Antimicrobial Sensitivity.
Material and Methods: Mid-stream urine (MSU) specimens were collected from both inpatients (IPD) and outpatients (OPD) suspected to be having urinary tract infection. All the isolates were identified as Coagulase negative Staphylococcus by Gram staining, Catalase test, Coagulase test & then followed by antimicrobial sensitivity (as per CLSI guidelines).
Results & Conclusion: A total 255 urine samples of UTI suspected patients were screened 101 (39.60%) patients were showed to be urine culture positive of which80 (79.20%) were females and 21 (20.79%) Male. The isolation percentages of Gram positive uropathogens were found as 38 (37.62%) in which Coagulase negative Staphylococcus 16 (42.10%). Most *Coagulase negative Staphylococcus* occurring in UTIs are found to show maximum Antimicrobial sensitivity against Vancomycin and minimum sensitivity against Co-trimoxazole.
Keywords: Urinary tract infection, Coagulase negative Staphylococcus (CoNs), Antibiotic sensitivity.

***Correspondence Info:**
Dr. Anita E. Chand
Senior Professor,
Department of Medical Microbiology,
Government Medical College, Kota,
Rajasthan, India

***Article History:**
Received: 15/05/2021
Revised: 27/06/2021
Accepted: 29/06/2021
DOI: https://doi.org/10.7439/ijbar.v12i6.5608

QR Code

How to cite: Singh D. and Chand A. E. Prevalence and Antibiotic Susceptibility Pattern of Coagulase negative Staphylococcus Isolated from patients of Urinary tract infection at a Tertiary Care Hospital. *International Journal of Biomedical and Advance Research* 2021; 12(06): e5608. Doi: 10.7439/ijbar.v12i6.5608 Available from: https://ssjournals.com/index.php/ijbar/article/view/5608

1. Introduction

Urinary tract infections (UTI) are the most common bacterial infections affecting humans throughout their lifetime. They are the frequent cause of morbidity in outpatients as well as most frequently involved in the cause of nosocomial infection in many hospitals. [1]

Coagulase negative Staphylococci had previously considered as the commensal bacteria of the skin and are now recognised as major agents of nosocomial infections especially in compromised hosts, important exceptions of are Native valve Endocarditis and Staphylococcus saprophyticus infections of the urinary tract.[2] The increased incidence of these infections is the result of medical progress and is due to the use of invasive and indwelling medical device.[3] During the past decade, *CoNS* isolates exhibited a remarkable ability to rapidly develop antibiotic resistance and Area-specific monitoring studies in order to detection of antimicrobial resistance patterns, effective treatment and decrease mortality rates is necessary.[4]

Incidence of Urinary tract infection is higher in women than men, 40%-50% of whom will suffer at least one clinical episode during their lifetime. [5] More than 95% of urinary tract infections are caused by a single bacterial species. *Escherichia coli* is the most frequent infecting organism in acute infection [6]. *Klebsiella pneumonia*, *Staphylococcus aureus*, *Proteus vulgaris, Pseudomonas aeruginosa*, and *Enterococci* species are more often isolated from inpatients, whereas there is a greater preponderance of *Escherichia coli* in an outpatient population [7].

*Coagulase Negative Staphylococcus (CoNS)*are a common cause of urinary tract infection in some reports. *Staphylococci saprophyticus* tends to cause infection in young women of a sexually active age [8].

1.1 Aims & Objectives

To isolate *Coagulase negative Staphylococcus (CoNS)* causing urinary tract infections & determine antimicrobial susceptibility pattern of the isolates.

1.2 Inclusion Criteria:-

1. Patients having complained of painful micturition, frequent urination and urinary urgency will be selected in study group.

1.3 Exclusion Criteria:-

1. Catheter specimen.
2. Urine specimen from infants.

2. Material & Method

Total 255 patients with clinical symptoms of different age group patient either Male or Female suspected to UTI were sampled attending Hospital of Teerthnaker Mahaveer Medical College & Research Centre, Moradabad.

Isolation of uropathogens was performed by a surface streak procedure on both blood and CLED agar using calibrated loops for semiquantitative method and incubated aerobically at 37^0C for 24 hours, and those cultures were negative at the end of 24 hrs incubations were further incubated for 48 hours. Various biochemical reactions and test for enzyme production were carried out.

3. Observations

All the isolates from lactose fermenting colonies on CLED agar. Majority of *Coagulase Negative Staphylococcus (CoNS)* isolated belong to *Staphylococcus epidermidis*. Others were mainly *Staphylococcus saprophyticus* and *Staphylococcus haemolyticus.* The identification of *Staphylococcus saprophyticus* was done by Phosphatase production, Novobiocin resistance, Mannitol fermentation and Urease production.

Table 1: Major Species distribution of Coagulase *Negative Staphylococcus (CoNS)*-

Total isolates	*Staphylococcus epidermidis*	*Staphylococcus saprophyticus*	*Staphylococcus haemolyticus*
16	8(50.0%)	5(31.25%)	3(18.75%)

3.1 Antimicrobial Sensitivity test

Antimicrobial susceptibility testing of the isolates was carried out using Kirby-Bauer disc diffusion method on Mueller-Hinton agar as recommended by Clinical and Laboratory Standards Institute (CLSI).Using following antibiotics Amoxy/Clavulanic acid (30mcg), Amoxicillin (10mcg), Vancomycin (30mcg), Cephalexin (30mcg), Co-trimoxazole (25mcg),Nitrofurantoin (300mcg) Norfloxacin (10mcg), Teicoplanin (300mcg) Linezolid (30mcg) Clindamycin (2mcg) and Tobramycin (10mcg).[9]

Interpretation of diameter of growth inhibition zone was done by using the standard interpretative chart provided by disc manufacture. At 37^0C after 24 hours of incubation organisms were scored as sensitive or resistant to corresponding antibiotics on the basis of zone of inhibition following the criteria of Clinical and Laboratory Standards Institute (CLSI).

3. Result

A total 255 midstream urine samples (both IPD & OPD) were processed from patients having clinically suspected UTI attending Teerthanker Mahaveer Hospital and Research Centre Moaradabad. Out of which 101(39.60%) patients were showed to be urine culture positive. Among them 80(79.220%) were females and 21(20.779%) were male.

The isolation percentages of Gram positive uropathogens were found as 38 (37.62%) in which Coagulase negative Staphylococcus 16 (42.10%) where 11(68.75%) and 5 (31.25%) male were found.

Table 2: Sex wise distribution of CoNS

Sex	CoNS
Male	05
Female	11
Total	16

Figure 1: Sex wise distribution of CoNS

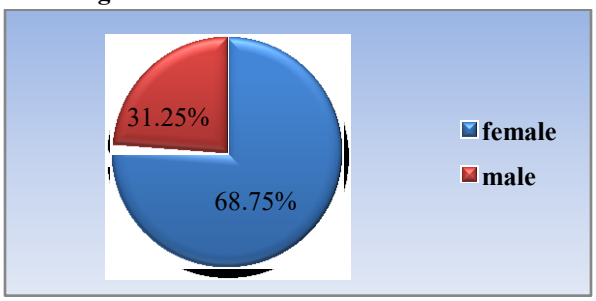

Table 2 & Figure 1: Shows Coagulase negative Staphylococcus (CoNS) which was 16 (42.10%) out of which 5 (31.25%) male and 11 (68.75%) were female.

Table 3: Age wise distribution of CoNS

Age Group	CoNS
11-20	01
21-30	07
31-40	01
41-50	02
51-60	02
> 60	03
Total	**16**

Figure 2: Age wise distribution of CoNS

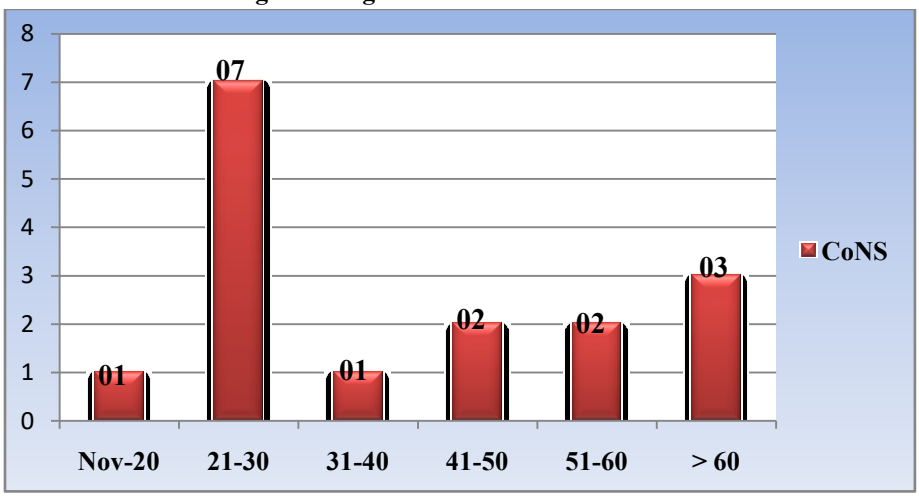

Table 3 & Figure 2: Shows Isolation of Coagulase negative Staphylococcus (CoNS) was maximum among age group of 21- 30 that is 07 (43.75%) followed by age more than 60 is 03 (18.75%), 41-50 year and 51-60 year (2 each 12.5%) and only one case was reported in age 11-20 year and 31-40 year (1 each 06.25%).

Table 4: Antibiotic sensitivity pattern on *(CoNS)* (16)

	Staphylococcus epidermidis (8)		**Staphylococcus saprophyticus (5)**		**Staphylococcus haemolyticus (3)**	
Antibiotic	**Sensitive**	**Resistant**	**Sensitive**	**Resistant**	**Sensitive**	**Resistant**
Amoxy/Clavulanic acid	3 (37.50%)	5 (62.50%)	2 (40.00%)	3 (60.00%)	1 (33.33%)	2 (66.66%)
Amoxicillin	4 (50.00%)	4 (50.00%)	4 (80.00%)	1 (20.00%)	2 (66.66%)	1 (33.33%)
Vancomycin	7 (87.50%)	1 (12.50%)	4 (80.00%)	1 (20.00%)	2 (66.66%)	1 (33.33%)
Cephalixin	4 (43.75%)	4 (56.25%)	3 (60.00%)	2 (40.00%)	3 (100.0%)	0 (0.00%)
Co-trimoxazole	5 (62.50%)	3 (37.50%)	3 (60.00%)	2 (40.00%)	1 (33.33%)	2 (66.66%)
Nitrofurantoin	4 (50.00%)	4 (50.00%)	2 (40.00%)	3 (60.0%)	2 (66.66%)	1 (33.33%)
Norfloxacin	5 (62.50%)	3 (37.50%)	3 (60.00%)	2 (40.00%)	2 (66.66%)	1 (33.33%)
Teicoplanin	6 (75.00%)	2 (25.00%)	2 (40.00%)	3 (60.00%)	1 (33.33%)	2 (66.66%)
Linezolid	4 (50.00%)	4 (50.00%)	3 (60.00%)	2 (40.00%)	2 (66.66%)	1 (33.33%)
Tobramycin	3 (37.50%)	5 (62.50%)	2 (40.00%)	3 (60.00%)	1 (33.33%)	2 (66.66%)

3.1 Antibiotics sensitivity pattern to Coagulase negative Staphylococcus (CoNS):

Antibiotic susceptibility pattern to Coagulase negative Staphylococcus (CoNS) has been shown in following Table 4 Coagulase negative Staphylococcus (CoNS) show highest sensitivity for *Teicoplanin* (75.00%) and *Vancomycin* (87.50%) and Followed by *Co-trimoxazole*(62.50%), *Linezolid*, *Cephalixin, Nitrofurantoin,* and *Amoxicillin* (these are 50.00%) and lest for *Amoxy/Clavulanic acid*(37.50%).

4. Discussion & Conclusion

The prevalence of urinary tract infection remains high both in developing and developed countries despite improvement in living standards and advancements in diagnostic and therapeutic facilities. This is in contrast to many other infections which have seen a marked decline in prevalence with time. This could be due to the fact that treatment of urinary tract infection presents great hurdles due to changing spectrum of causative pathogens developing newer and increasing antibiotic resistance.[10]

Urinary tract infections are common conditions worldwide and the pattern of antimicrobial resistance varies in different regions. We describe the relationships between sex, isolated bacterial agents and antibiotic resistance of CoNS causing UTIs.

In present study the isolation rate of gram positive cocci (37.62%) from urine which was less than gram negative bacteria (62.18%), these are similar to recent study Zahra Tayebi et al.[11]

In our study, the incidence of CoNS causing UTI was high among the females (68.75%) than males (31.25 %). Factors such as short urethra and its closeness to the anus as well as sexual activity have been reported to influence the higher prevalence of UTI in females.[12]

In this study the high prevalence of CoNS causing UTI was between the age of 21 to 30 year. This may be due to increase sexual activity at this age range which predisposes the female to the possibility of contracting UTI. This result is in agreement with other reports which showed that UTI were more common in females than males during adolescence and adulthood.[13]

*Coagulase negative staphylococci(CoNS)*previously considered as commensals can cause serious human infections especially in neonates, immunocompromised patients with indwelling catheters and foreign body implants. Its clinical significance is increasing day by day not only in urinary tract infections but also in meningitis, endocarditis and other body infections with the medical progress and very soon *Coagulase negative staphylococci (CoNS)* may emerge as one of the leading hospital pathogens in special categories of patients. The antibiotic resistant pattern is a great threat to the clinicians and needs special attention and intensive study.

In the end we can conclude that the choice of drugs to be used for the treatment of UTI is moderately limited because of wide amount of resistance that the usual UTI organisms show against drugs which have been given previously. Drugs like Vancomycin and Teicoplanin were believed to be effective against uropathogens are now rarely prescribed as initial therapy in areas where level of resistance to these antibiotics is high. But it is clear that Nitrofurantoin, fluoroquinolones and Minocycline are good choices for treating outpatients.

References

[1]. M. Sussman. In: Topley and Wilson's Microbiology and Microbial infections. Hausler Jr, Sussman M eds. 9th edn. Arnold: 1998, 601-621.

[2]. Herard A, Brasme L Jaussaud R, Current role of Staphylococci in Urology. *Prog Urol* 2016; 8: 579-85.

[3]. Pupp ME, Archer GL. Coagulase negative staphylococci. Pathogens associated with medical progress. *Clin Infect Dis*.2016; 19: 231-43.

[4]. Ronald A. The etiology of urinary tract infection: Traditional and emerging pathogens. *Dis Mon*. 2003;49(2):71-82

[5]. Foxman B, Brown P. Epidemiology of urinary tract infections transmission and risk factors and incidence, *Infect Dis Clin North Am.* 2003; 17: 227.

[6]. Dharmendra Singh et al., Prevalence and Antibiogram of Gram Positive Organism Isolated from Patients of Urinary Tract Infection *Sch. J. App. Med. Sci.,* 2018; 6(3): 1365-1370

[7]. Ronald A. The etiology of urinary tract infection: Traditional and emerging pathogens. *Am J Med.* 2002; 113: Suppl 1A: 14S-9S.

[8]. Bronsema DA, Adams JR, Pallares R, et al. Secular trends in rates and etiology of nosocomial urinary tract infections at a university hospital. *J Urol*. 1993; 150: 414- 6.

[9]. Schneider PF, Riley TV. Staphylococcus saprophyticus urinary tract infections: Epidemiological data from Western Australia. *Eur J Epidemiol.* 1996; 12: 51-4.

[10]. Clinical and Laboratory Standards Institute (CLSI). Performance standards for antimicrobial susceptibility testing-fourth informational supplement (Update). CLSI document. Wayne: CLSI; 2014: M100–S24.

[11]. Musarrat Jehan, Mahadev Harani, Rizwana Yasmin et al. The Frequency and Antibiotic Susceptibility Patterns of Uropathogens in a Low-Income Locality of Karachi, *Int. J. Pathol* 2015; 13(2): 14-19.

[12]. Tayebi Z, Seyedjavadi SS, Goudarzi M, Rahimi MK, Boromandi S, Bostanabad SZ, Mirzaii A, Mahdiyoun M. Frequency and antibiotic resistance pattern in gram positive uropathogenes isolated from hospitalized patients with urinary tract infection in Tehran. *Iran. J Genes Microb Immun.* 2014;2014:1-9

[13]. Adedeji BAM, Abdulkadir OA. Etiology and antimicrobial resistance pattern of bacterial agents of urinary tract infections in students of tertiary institution in Yola metropolis. *Advanced Biomedical Research*, 2009; 3(3- 4): 67-70.