RESEARCH PAPER

Bacteriological profile and antibiogram of urinary tract infections in a Tertiary care Hospital

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Abstract

Urinary tract infections are amongst the most common cause of bacterial infections in humans. As there is an emergence of resistance in the uropathogens to multiple drugs, a present study was conducted to study the uropathogens and their antibiotic sensitivity pattern. The present study was conducted to isolate and identify the bacterial pathogens causing urinary tract infections and their antibiotic sensitivity pattern. The study was conducted in the Department of Microbiology and urine samples sent for culture and sensitivity over a period of 6 months from January 2020 to June 2020 were included in the study. Samples were collected, transported and processed in the laboratory as per the standard protocol. Antibiotic sensitivity test was done by Kirby Bauer disc diffusion method. Out of 285 samples, 158 (55.43%) yielded growth and 127 (44.56%) yielded no growth. Among the culture positive cases, Females 105 (66.5%) were more affected than males 53 (33.5%). The most predominant organism isolated was Escherichia coli 68(43.03%) followed by *Klebsiella pneumoniae* 29 (18.35%), Coagulase Negative Staphylococci 20(12.65%), Pseudomonas aeroginosa 18 (11.39%). Among the Gram positive cocci, CoNS 20 (12.65%) was the predominant organism followed by *Enterococcus* species 13 (8.3%) and *Staphylococcus aureus* 4 (2.3%). *Escherichia coli* were sensitive to Nitrofurantoin (100%), and Ceftriaxone (96%). *Klebsiella pneumoniae* was sensitive to Norfloxacin (90%), Ciprofloxacin (90%).*Pseudomonas aeroginosa* was sensitive to Cotrimoxazole (96%), Norfloxacin (90%). CoNS were sensitive to Norfloxacin (100%), Levofloxacin (100%), Vancomycin (100%). The present study concludes that among the urinary tract infections cases. Females were more affected than males. The predominant organism isolated was Escherichia coli and sensitive to Nitrofurantoin, Ceftriaxone. Among the Gram positive cocci CoNS was frequently isolated and sensitive to Levofloxacin, Vancomycin and Norfloxacin.

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Introduction

Urinary Tract Infection (UTI) is one of the most common infectious diseases in clinical settings. Apart from being the most common cause of nosocomial infection among hospitalized patients, it is also the second most common cause of hospital visit (VP. Sarasu, 2017). It has been observed that females are more susceptible to UTI as compared to males due to shorter and wider urethra. More than 90% of acute UTI in community acquired infection is caused by *Escherichia coli* and 10–20% by CONS especially *Staphylococcus saphrophyticus* which is the second most common cause in young sexually active women and 5% or less by other Enterobacteriaceae and *Enterococci.*

In almost all cases, there is a need to start treatment before the final microbiological results are available which may lead to antibiotic resistance due to frequent misuse of antibiotics. To aid better decision making the physician must have current knowledge of the organisms and should advice a bacteriological examination of urine sample along with their antibiogram to know the trend of antibiogram of uropathogens in the regions. Prompt diagnosis and timely antimicrobial treatment help to minimize renal scarring and progressive kidney damage.

It is universally accepted that UTI can only be ascertained on the basis of microscopy and microbial culture. The dipstick/dip-slide method used in many centres serves only as a screening method but culture is needed for the final diagnosis. Since many UTIs are treated empirically without any antibiotic susceptibility testing leads to increased drug resistance in bacteria against commonly used antibiotics.

The urinary antibiogram patterns help clinicians a lot in deciding the empirical therapy of UTIs so that the incidence of antimicrobial resistance may decrease. Knowledge of current local trend in our hospital is important to update recommandations for appropriate treatment and to prevent development of multi-drug resistant organisms. Hence, we undertook this study on the isolation of urinary pathogens and their antibiogram at our institute.

Materials and methods

The study was conducted in the Department of Microbiology in a tertiary care hospital.

Study period

January 2020 to June 2020.

Study population

A total of 285 mid-stream urine samples were collected from suspected UTI patients of all age-groups who presented to the Outpatient and Inpatient departments of Karuna Medical College Hospital, Palakkad, India with complaints of dysuria, increased frequency and urgency of voiding, suprapubic discomfort or loin pain and fever.

Sample processing

Screening of the urine sample was done by gram staining. Urine culture was done by a semi-quantitative technique. With the help of a calibrated bacteriological loop, urine (0.001ml) was cultured on blood agar and Mac Conkey's agar. Culture results were interpreted as significant and insignificant, according to the standard Kass criteria. A growth of ≥1 lakh colony forming units/ml indicated an active urinary infection and considered as significant bacteriuria (Dnyaneshwari P. Ghadage, 2016). Patients with significant bacteriuria were considered as having UTI. Cultures with more than three types of colonies were discarded as contaminants (Dnyaneshwari P. Ghadage, 2016).

Identification of uropathogens

Bacterial pathogens were identified by gram reactions, motility and biochemical characteristics as per standard Microbiological techniques. The antibiotic susceptibility pattern of the isolates was determined by the Kirby-Bauer disk diffusion method according to CLSI guidelines.

Gram negative bacilli (GNB) were tested against Amikacin (30μg), Ciprofloxacin, Ceftriaxone, Co-trimoxazole (1.25/23.75μg), Gentamicin (10μg), Norfloxacin (10μg), Nitrofurantoin (300μg), Ceftazidime and *Pipercillin tazobactam*. For gram positive organisms Amikacin (30μg), Ceftriaxone, Linezolid, Cotrimoxazole, Doxycycline (30μg), Gentamicin (10μg), Norfloxacin (10μg) and Nitrofurantoin (300μg), Vancomycin (30μg), were used.

Results

Out of 285 samples collected from urinary tract infection cases, 158 (55.4%) showed growth and remaining 127 (44.56%) showed no growth (Table 1). Among the samples collected from urinary tract infection cases 180 (63.2%) were females and 105 (36.8%) were males. Among the culture positive cases Females 105(66.5%) were most commonly affected than males 53(33.5%) (Table 2). In this study Gram negative organisms were most commonly isolated than Gram positive organisms.

The most commonly isolated organism was Escherichia coli 68(43.03%) followed by *Klebsiella pneumoniae* 29(18.35%), Coagulase Negative Staphylococci 20(12.65%). *Pseudomonas aeroginosa* 18(11.39%), *Enterococcus* sp. 13(8.3%), *Staphylococcus aureus* 4(2.5%) followed by Proteus vulgaris 3(1.89%) and *Acinetobacter* sp. 3(1.89%). Among the Gram positive organisms Coagulase Negative Staphylococci was frequently isolated followed by *Enterococcus* sp. (Table 3).

Table 1. Distribution of culture positive cases.

SL	Growth	No. of samples	% of samples
1.	Culture positive	158	55.4%
2.	Culture negative	127	44.56%
3.	Total	285	100%

Table 2. Gender wise distribution of culture positive cases.

Gender	No. of collected samples	Organisms isolated
Male	105(36.8%)	53(33.5%)
Female	180(63.2%)	105(66.5%)
Total	285(100%)	158(100%)

Table 3. Frequency of different pathogens isolated from UTI cases.

Organism	Frequency	Percentage
Escherichia coli	68	43.03%
Klebsiella pneumoniae	29	18.35%
CoNS	20	12.65%
Pseudomonas aeroginosa	18	11.39%
Enterococcus species	13	8.3%
Staphylococcus aureus	04	2.5%
Proteus vulgaris	03	1.89%
Acinetobacter species	03	1.89%

Among the Gram negative isolates, Escherichia coli were highly sensitive to Nitrofurantoin (100%), Ceftriaxone (96%), Ciprofloxacin (95%) and Norfloxacin (95%). *Klebsiella pneumoniae* was sensitive to Norfloxacin (90%), Ciprofloxacin (90%) and Cotrimoxazole (86%).

Pseudomonas aeroginosa was mostly sensitive to Cotrimoxazole (96%), Norfloxacin (90%) and Imipenem (88%).Proteus vulgaris was highly sensitive to Nitrofurantoin (100%), Imipenem (95%) and Ceftriaxone (88%) (Table 4).

Among the Gram positive isolates, CoNS was mostly sensitive to Norfloxacin (100%), Levofloxacin (100%) and Vancomycin (100%). *Staphylococcus aureus* was mostly sensitive to Levofloxacin (100%), Vancomycin (100%) and Linezolid ((96%). Enterococcus species was sensitive to Levofloxacin (100%) and Vancomycin (88%) (Table 5).

Table 4. Antibiotic sensitivity pattern of Gram negative organisms.

Organism	Ak	G	Cip	Ctr	Cot	Nit	Nx	Caz	Pit
Escherichia coli(n=68)	88%	70%	95%	96%	88%	100%	95%	80%	86%
Klebsiella pneumoniae (n=29)	72%	75%	90%	82%	86%	80%	90%	82%	70%
Pseudomonas Aeroginosa (n=18)	80%	75%	80%	75%	96%	65%	90%	75%	80%
Proteus vulgaris (n=03)	75%	75%	68%	88%	80%	100%	60%	88%	88%
Acinetobacter sp(n=03)	80%	80%	75%	75%	29%	65%	29%	75%	100%

Ak-Amikacin, G-Gentamycin, Cip- Ciprofloxacin, Ctr- Ceftriaxone, Cot- Cotrimoxazole

Nit- Nitrofurantoin, Nx- Norfloxacin, Caz- Ceftazidime, Pit- Piperacillin-Tazobactam

Table 5. Antibiotic sensitivity pattern of Gram positive organisms.

Organisms	Ak	Ctr	Lz	Cot	Nx	Amx	Le	Va	Nit
CoNS (n=20)	53%	92%	96%	60%	100%	85%	100%	100%	65%
Staphylococcus aureus (n=04)	78%	92%	96%	68%	90%	50%	100%	100%	65%
Entero coccus species (n=13)	76%	62%	82%	50%	80%	50%	100%	88%	72%

Ak- Amikacin, Ctr- Ceftriaxone, Lz- Linezlid, Cot- Cotrimoxazole
Nit- Nitrofurantoin, Nx- Norfloxacin, Amx- Amoxycillin,
Le- Levofloxacin, Va- Vancomycin

Discussion

In a hospital setting the cause and antimicrobial susceptibility pattern of uropathogens has been changing over years. UTI accounts for huge burden on health care systems due to high prevalence of infection in both community and nosocomial settings. UTI is caused by variety of pathogens including *E. coli, Klebsiella* spp, *Proteus* spp, *Staphylococcus aureus,* Coagulase negative staphylococci including *Staphylococcus saprophyticus* and *Staphylococcus epidermidis.* Continuous surveillance of antibiotic susceptibility patterns of uropathogens at local level is crucial in dealing with emerging problems of antibiotic resistance and provides assistance in managing effective initial therapy.

In present study urine culture positivity was 158(55.4%) which is very similar to a study by Durgesh *et al.* In our study, among the culture positive cases Females 105(66.5%) were most commonly affected than males 53(33.5%).This is similar to a study done by Ramalakshmi Koripella *et al.* (2020) where females (64.5%) showed more predominance than males (35.5%). and also in a study done by Swathi kuna *et al.* (2019).

In this study Gram negative organisms were more commonly isolated than Gram positive organisms. This data coincides with a study done by Shah Dharati *et al.* (2021). Escherichia coli 68(43.03%) was most commonly isolated among Gram negative organisms followed by *Klebsiella pneumoniae* 29(18.35%). This is similar to a study done by Shah Dharati *et al.* (2021) where *Escherichia coli* was (38.48%) followed by *Klebsiella pneumoniae* (14.85%) and Durgesh *et al.* (5) and Suvankar *et al.* (2020). Among the Gram positive organisms CoNS 20(12.65%) was most commonly isolated followed by *Enterococcus* sp.13 (8.3%).This was similar to a study by V P Sarasu *et al.* (2017).

In this study, Escherichia coli was most sensitive to Nitrofurantoin (100%), Ceftriaxone (96%), Ciprofloxacin (95%) and Norfloxacin (95%).This is similar to a study by Veena *et al.* (20218) and Latika *et al.* (2015) where Escherichia coli was highly sensitive to Nitrofurantoin (100%) *Klebsiella pneumoniae* was more sensitive to Norfloxacin (90%) and Ciprofloxacin (90%). This correlates with a study by Veena *et al.* (2018). Among the Gram positive organisms CoNS was highly sensitive to Levofloxacin (100%) and Vancomycin (100%) and Norfloxacin (100%) and this coincides with a study by Veena *et al.* (2018). *Staphylococcus aureus* was most sensitive to Levofloxacin (100%), Vancomycin (100%) and Linezolid ((96%) and found similar to a study by Vijay prakash *et al.* (2017).

Conclusion

Bacterial identification and susceptibility tests are important for selecting appropriate anti-microbial agent affecting bacterial diseases. The study of antimicrobial susceptibility pattern of UTI in a particular area can guide the clinicians in the rational choice of antibiotic treatment so that misuse of antibiotics can be prevented.

From this study, we can conclude that Females were more affected than males. The isolation rates of Gram negative organisms were more and sensitive to Nitrofurantoin and Fluoroquinolones. The gram positive organisms were more sensitive to Levofloxacin, Vancomycin and Linezolid. These data highlight the changing trends in the antimicrobial susceptibilities and it may be used by the healthcare agencies to formulate local antibiotic policies.

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