Research Article

Epidemiological and Bacteriological Profile of Urinary Tract Infection and the Antibiotic Sensitivity Pattern of Causative Organisms in National Medical College and Teaching Hospital - A Retrospective Cross-Sectional Study

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ABSTRACT

Background: Urinary tract infections (UTIs) are one of the most common infectious conditions seeking treatment. There are varieties of microorganisms associated. The bacteriological investigations are incomplete without antibiotic sensitivity test of the isolate. Our aim is to determine age and sex distribution of UTI, bacteriological profile, and antibiotic sensitivity pattern of the organisms.

Materials and Methods: A retrospective cross-sectional observational study of records of patients with clinically suspected UTI from Kartik 2076 to Magh 2076 was conducted at National Medical College and Teaching Hospital (NMCTH). It included both inpatient and OPD visit patients who submitted their clean-catch midstream urine sample for culture and antibiotic sensitivity at Microbiology lab of NMCTH.

Result: Out of 385 patients, 103 (26.75%) showed bacterial growth. Escherichia coli (47.58 %) was the most common organism followed by Staphylococcus sps. (18.45%) and Klebsiella sps.(17.47%) respectively. There was female dominance (62.13%) but male were predominantly affected in children and older population. The most common age group for UTI was 21-30 years (mean age 25 years) and females were more affected than males. The most common pathogen was Escherichia coli, followed by Staphylococcal sps. and Klebsiella. All the organisms showed best sensitivity to tigecycline (100%).

Conclusion: This study highlights the common pathogens causing UTI and their antibiotic sensitivity patterns which could help clinicians in starting rational empirical antibiotic therapy for such patients while awaiting urine culture reports.

Keywords: Epidemiology; Escherichia coli; Nepal; Nitrofurantoin; Urinary Tract Infection.

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INTRODUCTION

Urinary Tract Infection (UTI) is a term applied to variety of clinical conditions, ranging from asymptomatic presence of bacteria in urine to severe infection of kidney with resultant sepsis.[1] From microbiological perspective, UTI exists when pathological microorganisms are detected in urine, urethra, bladder, kidney or prostrate.[2] UTI is one of the commonest infection occurring in all age groups worldwide.[3] It is more common in females as compared to males, especially females of reproductive age group.[4] Many microorganisms can infect the urinary tract, but by far the most common agents are gram- negative bacilli.[2] *E. coli causes* ~80% of acute infections; followed by *Proteus sps.* and *Klebsiella sps.* gram positive cocci play a lesser role in UTI.[2] However, *Staphylococcus saprophyticus* account for 10-15 % of acute symptomatic UTI in young female patients.[2] The microorganisms causing UTI and their susceptibility to antimicrobials vary from place to place and time to time.[5] Due to use of empirical antibiotics in infectious diseases, low patient compliance to antibiotics and lack of standardization of antibiotic susceptibility test, resistance to commonly used microorganisms is increasing year by year.[6] So this study was conducted to ascertain the microorganisms causing UTI according to age and sex and their antibiotic susceptibility status to guide empirical antibiotic use prior to culture reports.

MATERIALS AND METHODS

A retrospective cross-sectional observational study of records of patients with clinically suspected UTI from Kartik 2076 to Magh2076 was done in Department of Microbiology, National Medical College and Teaching Hospital. The study included 385 consecutive patients (inpatient and OPD visits) who had their urine cultured for bacterial growth and antibiotic sensitivity patterns at Microbiology Lab, NMCTH. Non probability purposive sampling was the method of sampling. Ideal sample size regarding the prevalence of UTI (5.7/1000 according to 2073-74 Annual Report), total population of Parsa (601017 according to 2011 census) and allowable error of 0.01 was calculated and found to be 230. Permission for conduction of research was taken from Microbiology Department, NMCTH. The data thus obtained were analyzed using Microsoft Excel.

RESULTS:

According to annual report 2074/75 B.S. the annual incidence of Urinary tract infections in Parsa district was 5.8/1000 midyear population. Out of 385 urine samples, 103 (26.75%) samples showed bacterial growth and were subjected to antibiotic sensitivity tests.
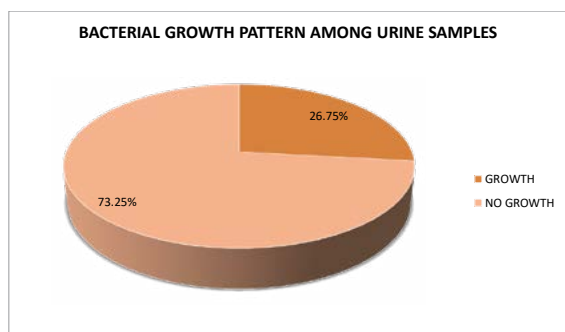
Fig 1: Bacterial growth pattern among urine samples

SEX DISTRIBUTION:

Out of 103 culture positive patients, 64 were females (62.13%) and 39 were males (37.87%) i.e. F:M=1.64:1.
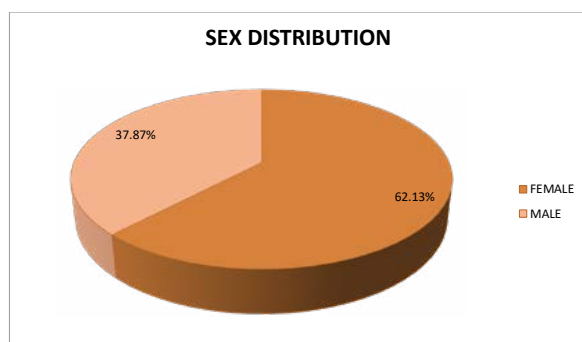

Fig 2: Sex distribution among culture positive cases

AGE DISTRIBUTION:

Out of 103 culture positive samples, two cases were from <1 year old age group, 5 cases were 1-10 years old, 16 cases were 11-20 years old, 25 cases were 21-30 years old, 13 cases were 31-40 years old, 9 cases from 41-50 years old, 8 cases from 51-60 years old, 19 cases from 61-70 years old while 6 cases were from >70 years age group.
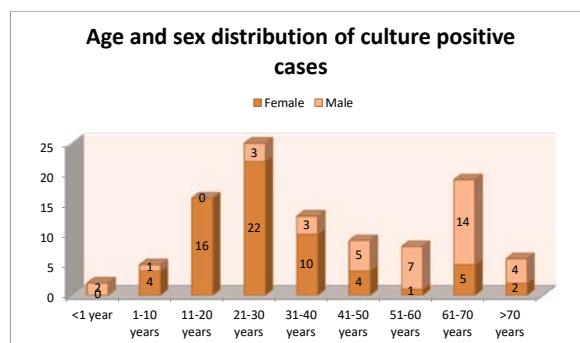

Fig 3: Age and sex distribution of culture positive cases
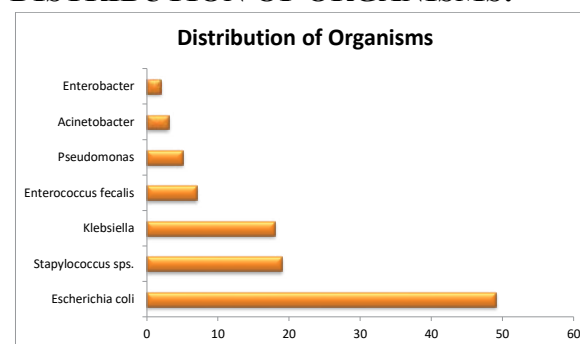
DISTRIBUTION OF ORGANISMS:

Fig 4: Distribution of Organisms among Culture Positive Urine Sample

ORGANISM DISTRIBUTION ACCORDING TO AGE

Table 1: Age wise distribution of organisms causing UTI

AGE (YEARS)/ ORGANISM	Staphylococcus sps.	Escherichia coli	Klebsiella	Enterococcus fecalis	Pseudo-monas	Entero-bacter	Acinetobacter
<1	0	1	0	1	0	0	0
1-10	1	4	0	0	0	0	0
11-20	6	3	4	2	0	0	1
21-30	7	10	6	1	0	1	0
31-40	2	7	3	1	0	0	0
41-50	2	5	0	0	0	1	1

51-60	0	7	0	0	0	0	1
61-70	1	9	4	1	4	0	0
70 & Above	0	3	1	1	1	0	0
TOTAL	19	49	18	7	5	2	3

ANTIBIOTIC SENSITIVITY PATTERN AMONG DIFFERENT ORGANISMS

The antibiotic sensitivity pattern among some common organisms (sensitivity tested for respective antibiotics) cultured in our setup is described as below:

1. Escherichia coli
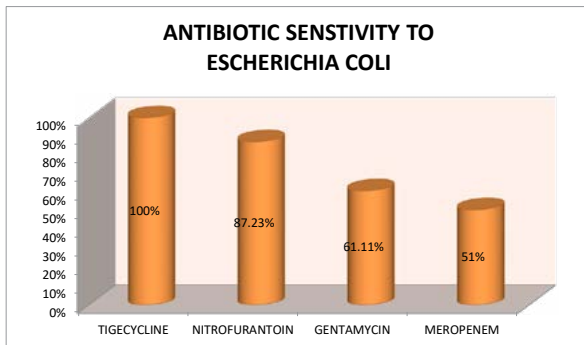*Samples in which the organism was cultured: 49*

Fig 5: Antibiotic sensitivity of Escherichia coli

2. Staphylococcus sps.
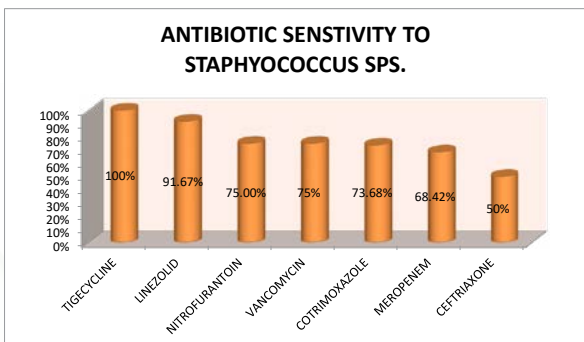*Samples in which the organism was cultured: 19*

Fig 6: Antibiotic sensitivity of Staphylococcus sps.

3. Klebsiella
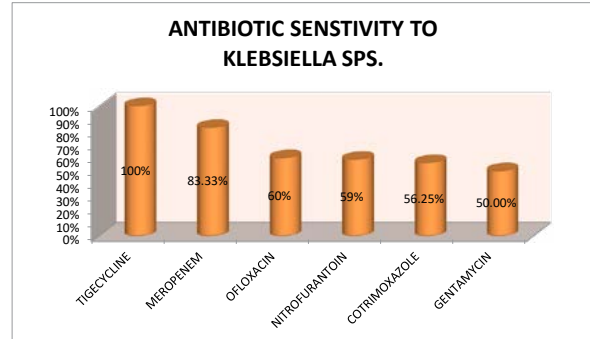*Samples in which the organism was cultured: 18*

Fig 7: Antibiotic Sensitivity of Klebsiella sps.

4. Pseudomonas
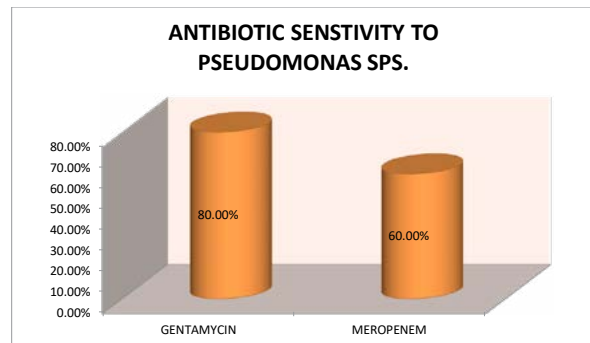*Samples in which the organism was cultured: 5*

Fig 8: Antibiotic sensitivity of Pseudomonas sps.

5. Enterococcus fecalis:
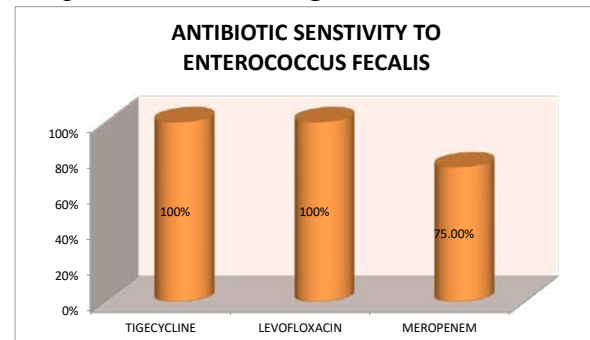*Samples in which the organism was cultured:4*

Fig 9: Antibiotic sensitivity of Enterococcus sps.

DISCUSSION

UTI has been one of the most common conditions seeking for hospital visit and treatment in clinical practice. It has been studied extensively by many people.

The culture positive cases were 103 out of 385 cases enrolled in the study which amount to 26.75%. Edirisinghe et al.[7] and Banerjee et al.[5] in their studies showed culture positive in 31% and 24.5% cases respectively. In another study, culture positive as low as 8.7% has been reported by Mansour et al.[8] In a similar study conducted by N. Subedi et al.[6] culture positivity was 17.4% .

Out of culture positive cases, female age group predominated the males (62.13% to 37.87%). Several other studies showed similar findings like N. Subedi et al.[6] and Banerjee et al.[5] This could possible because of colonization with enteric bacteria due to short urethra, proximity of urethra to anus and its termination beneath labia.[2]

Most number of urine cultures were seen in age group 21-30 (highly sexually active phase) i.e. 25 cases (24.27%) and most of the cases were females (88%). This could possible because of sexual intercourse may cause minor urethral trauma and transfer bacteria from perineum into the bladder.[9] Males were predominantly affected in first year of life 100%. This may be because congenital urinary tract abnormalities are more common in males compared females.[10] Males were also predominantly affected in age group over 50 years (75.76%) when UTI may complicate the bladder outflow obstruction.[9]

Escherichia coli was the most predominant organism causing 47.58% of all UTIs which is in accordance to study by N. Subedi et al.[6] and Mansour et al.[8] It was followed by *Staphylococcus* (18.45%) and *Klebsiella* (17.47%). *Staphylococcus sps.* predominated the age group (21-30 years) accounting to 36.84 % of all its culture cases that could possibly be explained by its associated in reproductively active years.[2] *Pseudomonas sps.* were more prominent after the age of 60 years accounting to everyone of its culture positive cases.

E. coli was found to be more resistant to tested antibiotics than other commonly associated organisms. It was most sensitive to tigecycline 100% and nitrofurantoin 87.23%. Klebsiella showed better prognosis compared to *E. coli* being 100% sensitivity to tigecycline, 83.33% sensitivity to meropenem while only 58.82% to commonly used nitrofurantoin. Ofloxacin was a better alternative at 60% sensitivity. Staphylococcus sps showed 100% sensitivity to tigecycline, 91.67% sensitivity to linezolid, 75% sensitivity to nitrofurantoin and vancomycin while 73.68% sensitivity to cotrimoxazole. Enterococcus fecalis and Pseudomonas were among the more resistant ones despite showing 100% sensitivity to tigecycline.

This was in contrast to study by N. Subedi et al.[6] Where piperacillin-tazobactamand ceftriaxone showed best sensitivity to the cultured organisms in the study.

CONCLUSION

The result showed that Escherichia coli was the most common organism causing UTI. The most common age group for infection was 21-30 years and the condition predominated in females. Since tigecycline, which showed best sensitivity results, is believed to attain low concentration in urine, other drugs with similarly good sensitivity can be used in

the first line therapy. Nitrofurantoin showed highest sensitivity as first line drug for E. coli. A larger and broader study would be necessary for more accurate results. Though it is one of the most common infectious condition, its local epidemiological and antibiotic sensitivity studies are lacking.

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