Section – Microbiology

Original Article

Prevalence of Urinary Tract Infection in Patients attending Teerthanker Mahaveer Medical College & Research Centre and Hospital Moradabad

Saman Mashkoor[1*], Shewtank Goel[2], Umar Farooq[3], Neha Dayal[4], Divyaansh Sridhar[4], Bhavna Bhadauria[4]

[1]Student MSc. Medical Microbiology; [2]Associate Professor; [3]Professor & HOD; [4]Student, Department of Microbiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

ABSTRACT

Background: It has been estimated that symptomatic urinary tract infections (UTI) occurs in around 7 million patients visiting to emergency units and 100,000 hospitalizations annually. It continues to be the most common cause of infection in hospitalized patients accounting approximately 40% of hospital acquired infections, and is the second most common cause of bacteraemia in hospitalized patients. **Objective: a)** To study the prevalence of UTI and its etiology in patients coming to the hospital. **b)** To study the susceptibility pattern of the isolate. **Methods:** The study was performed on 630 midstream urine positive samples taken from all age group patients, either male or female. Samples were collected prior administration of antibiotics in a sterile container. In case of cathetized patients, it is collected directly from catheter. Samples were inoculated on CLED agar. By colony count the stage of bacteraemia was assessed. To know the causative organism , colony morphology as well biochemical test were done. **Results:** The prevalence of Urinary Tract Infections (UTI) was evaluated in 630 patients attending Teerthanker Mahaveer Medical College & Research Centre, Moradabad for the duration of one year from February 2016 to January 2017. Results showed 215 (34.12%) patients were positive. Out of 215 positive cases 41(19.06%) were gram positive organisms and rest 174 (80.94%) were gram negative organisms. The most common pathogenic organisms were Escherichia coli accounting for 98(45.19%) urinary isolates. Among gram positive organism Enterococcus 26(12.09%) were the most common. In-vitro antibiotic susceptibility tests revealed that the gram negatives bacteria were sensitive to quinolones and Carbapenems, while the gram positive isolates were sensitive to glycopeptides antibiotics. **Conclusions:** The findings suggested the need for regular screening for the presence of symptomatic or asymptomatic bacteriuria for different populations and constant monitoring of susceptibility to commonly used anti-microbial agents.

Key words: Urinary tract infections, Antibiotic susceptibility

INTRODUCTION

Urinary tract infection is a disease in which microorganism invades the genitourinary tract. In anatomically abnormal

Corresponding Author
Dr. Saman Mashkoor, MSc Student, Department of Microbiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Uttar Pradesh, India.

urinary tract complication UTI occurs due the inflammation of the urothelium is an very common condition that occurs in male and females. Gram negative bacteria constitute the major causative organism to infect urinary tract around the world. It has been evaluated that symptomatic urinary UTI occurs in around 70,00,000 patients visiting to emergency units and 100,000 hospitalized patients per annum. In spite of, easily available medicine as well as the antimicrobials, UTI is the most common cause of infection in hospitalized patients which is responsible for 40% of hospital acquired infections.[1,2] It is also a second most common cause of bacteraemia in hospitalized patients.[3] The incidence and prevalence rate of UTI is higher in females.[4] mainly in pregnant females than in males. UTI is a most common medical condition in pregnancy and in catheterized diabetic patients. In Pregnant woman from 6th to maximum in 24th weeks, 90% of them develop urethral dilatation which

increases the threat of long time retention of urine and causes vesico urethral reflux. In urinary stasis, glycosuria and aminoaciduria give exceptional culture media for the growth of bacteria. Urinary tract infection is mostly caused by gram negative aerobic bacilli. E coli is most common causative agent of UTI along with other gram negative and gram positive organisms.[5] Other major causative agents are *Klebsiella, Enterobacter, Citrobacter, Proteus and serratia species*, and the common pathogenic bacteria include *Staphylococcus epidermidis, Staphylococcus saprophyticus* and *Enterococcus species* which results in UTI subsequent the colonization of the vagina and perianal skin. Less common organisms which may cause infection in patients with irregular catheters are *Gardenella vaginalis, Mycoplasma species* and *Ureaplasma urealyticum*.[6] Bacteria are knoswn as the main causative organism for UTI infection in humans but fungi and virus role cannot be over looked. Urine culture is used for the identification of the organism and their antibiotic susceptibility. The antibiotic therapy is given to the patient to reduce the existing symptoms and for the prevention of renal complications. Urine culture is used for the identification of the organism and their antibiotic susceptibility. The excessive use of antibiotics leads to the development of resistance which is a subject of concern worldwide. The present study is done to determine the trends of occurrence and the antimicrobial sensitivity pattern of pathogen isolated at T.M.M.C & R.C & hospital and will enable the clinicians to develop an experienced and realistic antibacterial policy to reduce the incidence and prevalence rate of UTI in India.

The aims & objective of present study is

i. To study the prevalence of UTI and its etiology in patients attending the hospital.
ii. To study the antibiotics susceptibility pattern of the isolates.

METHODS

The present study was conducted in the Department of Microbiology, Teerthanker Mahaveer Medical College & Research Centre, Moradabad over a period of one year from February 2016 to January 2017. Total 630 mid-stream urine sample were collected from patients with clinical history of any age group patients either male or female attending OPD & IPD of T.M.M.C & R.C. Mid-stream urine sample collected prior to administering the antibiotics in a sterile urine container. In catheterized patients it is collected directly from catheter and transported in good culture medium with minimum delay. If there is delay then sample is refrigerated at 4° C. The samples of urine were centrifuged and deposits were examined using microscopes under 10X and 40X. The samples are also analysed by culture growth of bacteria on culture plates. A calibrated sterile nicrome wire loop for the semi-quantitative method was used for the plating and it has a 4.0 mm diameter designed to deliver 0.01 ml. A loopful of the well mixed urine sample was inoculated into duplicate plates of CLED agar. All plates were then incubated at 37ºC aerobically for

24 h. The plates were then examined macroscopically and microscopically for bacterial growth. The bacterial colonies were counted and multiplied by 100 to give an estimate of the number of bacteria present per milliliter of urine. Samples having significant bacteraemia (10^5 cfu/ml) were taken and bacterial count between 10^4/ml to 10^5 /ml was considered equivocal and sample was repeated.

RESULTS

The study was conducted in Department of Microbiology, TMMC & RC from February 2016 to January 2017. Routine examination including microscopic examination was done along with culture and antibiotic sensitivity on all the samples. A total 630 urine samples were processed from outdoor and indoor patients out of which 215 were found to be culture positive.

Table I: Sex wise distribution

Sex	Positive cases	%	Negative cases	%
Male	51	23.72	270	65.06
Female	164	76.28	145	34.93
Total	**215**	**100**	**415**	**100**

Table I & Figure I shows out of 630 specimens of urine collected from outdoor and indoor patients 215 were positive for bacterial isolates thus showing overall positivity of 34.12 %. Out of these one fourth cases 51 (23.72%) are male and nearly two third 164(76.28%) are female. This shows a female predominance over male.

Table II: Organism wise distribution

Type of Organisms	Positive Cases	%
E.Coli	98	45.59
Klebsiella	35	16.27
Enterococcus	26	12.09
Staphylococcus aureus	15	6.97
Enterobacter	5	2.33
Citrobactersp	17	7.91
Pseudomonassp	9	4.19
Acinetobacter	3	1.39
Proteus mirabilis	7	3.26
Total	**215**	**100**

Table III: Antibiotic sensitivity pattern of Gram Negative isolates

Antibiotic	E coli n=98	Klebsiella spp n=35	Citrobacter spp n=17	Pseudomonas spp n=9	Proteus mirabilis n= 7	Acinetobacter spp n=3
Amikacin	36 (36.73%)	11 (31.42%)	0	0	0	0
Ampicillin/Sulbactum	45 (45.91%)	13 (37.14%)	0	0	0	0
Co-trimoxazole	27 (27.55%)	7 (20%)	0	3 (33.33%)	0	0
Amoxycillin	47 (47.95%)	11 (31.42%)	3 (17.64%)	0	3 (42.85%)	0
Cefuroxime	75 (76.53%)	25 (71.42%)	0	0	0	0
Cefoperazone	72 (73.46%)	22 (62.85%)	4 (23.52%)	0	0	0
Ciprofloxacin	31 (31.63%)	16 (45.71%)	4 (23.52%)	3 (33.33%)	0	0
Ofloxacin	41 (41.83%)	25 (71.42%)	5 (29.41%)	4 (44.44%)	0	0
Gentamicin	53 (54.08%)	15 (42.85%)	4 (23.52%)	2 (22.22%)	0	1 (33.33%)
Levofloxacin	84 (85.71%)	28 (80.00%)	11 (64.70%)	0	0	0
Imipenem	86 (87.75%)	29 (82.85%)	12(70.58%)	8 (88.89%)	0	2(66.67%)
Meropenem	93 (94.89%)	11 (31.42%)	11 (64.70%)	7 (77.79%)	0	2(66.67%)
Polymixin-B	96 (97.95%)	12 (34.28%)	14 (82.35%)	8 (88.89%)	0	3(100%)

Table IV: Antibiotic sensitivity pattern in Gram positive organisms

Antibiotic	Enterococcus n=26	Staph aureus n=15
Amoxy/Clavulanic acid	7(26.92%)	3(20.00%)
Amoxycillin	10(38.46%)	5(33.33%)
Ampicillin/Sulbactum	19(73.07%)	8(53.33%)
Cefotaxime	13(50.00%)	7(46.66%)
Cephalixin	6(23.07%)	6(40.00%)
Co-trimoxazole	5(19.23%)	4(26.66%)
Erythromycin	13(50.00%)	8(53.33%)
Norfloxacin	9(34.61%)	5(33.33%)
Ciprofloxacin	10(38.46%)	4(26.66%)
Levofloxacin	15(57.69%)	13(86.67%)
Vancomycin	25(96.15%)	14(93.33%)
Amikacin	17(65.38%)	10(66.67%)
Linezolid	24(92.30%)	13(86.67%)
Ofloxacin	12(46.15%)	6(40.00%)
Clindamycin	16(61.53%)	9(60.00%)
Tobramycin	20(76.92%)	12(80.00%)

Table II and Figure II shows the distribution of pathogenic bacteria. Out of 215 positive cases 41 (19.06%) were gram positive organisms and rest 174 (80.94%) were gram negative organisms. Thus gram negative organism was

more common affecting the younger females. Out of gram negative organism E coli 98 (45.59%) was most common followed by Klebsiella 35 (16.27%) and least common was Acinetobacter 3 (1.39%).

Table III shows the sensitivity pattern of gram negative organisms isolated from urine for the antibiotic drugs. E coli showed maximum sensitivity with Polymixin-B (97.95%) followed by Meropenum (94.89%) and least sensitive with cotrimoxazole (27.55%). Klebsiella showed maximum sensitivity with Imipenem (82.85%) followed by Levofloxacin (80.00%) and least sensitivity with cotrimoxazole (20.00%). Acinetobacter showed 100% sensitivity with Polymixin-B. Other antibiotics also showed sensitivity with pathogens.

Table IV shows the sensitivity pattern of gram positive organisms isolated from urine for antibiotic drugs. Enterococcus showed maximum sensitivity with Vancomycin (96.15%) followed by Linezolid (92.30%) with Ampicillin/Sulbactum (73.07%) followed by Erythromycin (50.00%) and least sensitivity was with Cotrimoxazole(19.23%) followed by Ofloxacin (46.15%). Staphylococcus showed maximum sensitivity with vancomycin (93.33%) followed by Linezolid and Levofloxacin (86.67%) with Erythromycin and Ampicillin/Sulbactum (53.33%), Cefotaxime (46.66%) and least sensitivity was with Amoxycillin/Clavulanic acid (20.00%) followed by Ofloxacin (40.00%). Staph aureus showed less than 50 % sensitivity with most of the drugs.
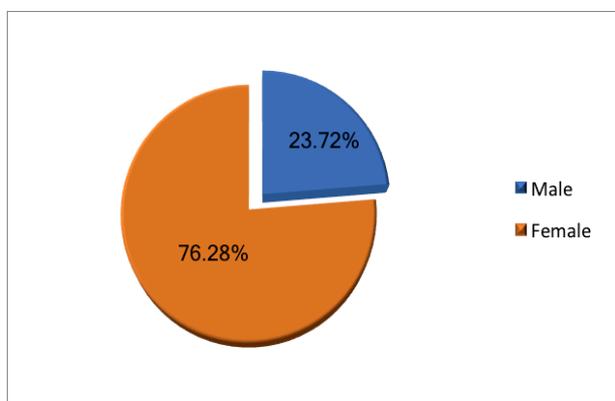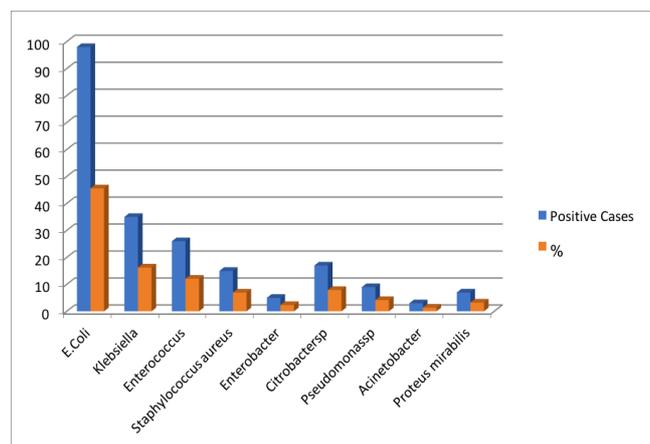

Figure I: Sex wise distribution

Figure II: Organism wise distribution

DISCUSSION

The high risk of urinary tract infection with the rising resistance against antimicrobial agents, are matter of worldwide concern. Keeping an eye through adequate precautions and also through the health advances by medicine, UTIs still stays the second most common infections, each within the hospitalized patients and within the out patients. In our study 630 clinically diagnosed patients 215 patients were found to be infected with pathogenic organisms rest 415 are sterile. Thus prevalence of UTI in the population was 34.12% in comparison to higher than the prevalence rate of 31.35% significant bacteriuria recorded by Savitha T et al.[7] As it is less than prevalence rate of 66.78% recorded by Mahesh EL et al.[8] In our study, the females are more prevalent to UTI than males. From the total 215 isolates obtained, 164(76.28%) were from female patients while 51(23.72%) were from males. This proves that UTI is more frequent in females as compared to males. While comparing the study of Akram M. et al[9] incidence rate in female (70.50%) and male (29.5%) and Kolawole et al.[10] prevalence rate in female (66.67%) and male (33.33%). It is also comparable with the study done by Oladiende BH et al.[11], Ahmad SM et al.[12], and Barate DL et al.[13] The reason being the females are more susceptible for developing urinary tract infection may be because of short length of urethra, characteristic anatomical course and physiological changes. Urethral proximity to anus is also an important factor for acquiring infection. Other reason being the stasis of urine during pregnancy, dilatation of urethra and trauma to urethra during sexual intercourse. E.coli (81.5%) is a most common or bacteria isolated in these patients, Klebsiella (1.5%) P. aeruginosa (%), and S. aureus (10.5%). This type of pattern was similar with study of Chedi BAZ et al[14] Savitha T et al.[7] The important barricade that interferes with the effective treatment is the development of antimicrobial resistance within uropathogens. This study has thrown light over the anti-microbial sensitivity pattern among the gram negative bacteria isolated and it is shown in Table III. Enterobacteriaceae family showed heavy resistance to amoxicillin, Cotrimoxazole and some Cephalosporins. E. coli & Klebseilla showed maximum sensitivity with first line drugs like cefuroxime 76.53% and 71.42% respectively and is in accordance with the study done by Rizvi M et al[15], Akram M et al[9] and Barate DL et al.[13] The probable reason may be for this is due to irrational and prophylactic uses of antibiotics without proper prescription and the availability of these drugs over medical stores. Urinary tract infection by Enterococcus was also quite common in our study showing 26 (12.09%) of case next to the gram negative bacilli especially in the patients who received antibiotic treatment or who were treated by instrumentation in the urinary tract. It was reported by the previous studies that prevalence of enterococci as a cause of nosocomial infection is increased during the last three decades. Maximum sensitivity was shown with Vancomycin (96.15%) followed by Linezolid

(92.30%%) and least sensitive with Levofloxacin (57.69%). and is in accordance with the study done by Patel SK et al[17], Rizvi M et al[15], Kolawole et al[10] and Arul Prakasam KC et al.[16]

Gram positive bacteria played lesser role in UTI. However Staphylococcus aureus was isolated and accounted for 6.97% of acute infection in young females. Maximum sensitivity was shown with Vancomycin (93.33%) followed by Linezolid (86.67%%) and least sensitive with clindamycin (60%). Similar finding is with the study done by Hazarika J[18], Mokta KK et al.[19] and Naik H et al.[20] So the Vancomycin, Tobramycin and linezolid can be used as drug of choice in against UTI caused by Gram positive cocci. Thus emergence of drug resistance among uropathogens is a worldwide concern and is posessing a global threat. Wide spread usage of cotrimoxazole and penicillin has led to the emergence of resistant strains. Another latest drugs like fluoroquinolones and cephalosporins are also being affected day by day. So optimum prophylactic therapy should be ascertained by having in depth knowledge of causative agent, predisposing factors and culture positivity and to avoid irregular drug usage.

CONCLUSION

The results of this study and those of others may not be representative of the general population; urinary tract infections are often treated empirically and susceptibility tests are often carried out only when the patient has failed one or more courses of antibiotics. Even though the susceptibility pattern shown by this study need for *in-vitro* sensitivity reports before antibiotics therapy initiation, however, it should be born in mind that *in-vitro* antimicrobial sensitivity is only a guide. The findings suggested the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used anti-microbial agents. These data may be used to determine trends in antimicrobial susceptibilities, to formulate local antibiotic policies, to compare local with national data and overall to assist clinicians in the rational choice of antibiotic therapy to prevent misuse, or overuse, of antibiotics. Also, the results from this study revealed that the important infecting organisms were found to be the commensals of perianal and vaginal regions. This calls for increase in personal hygiene. Finally, since the hospital environment is a sort of collection agency for many pathogenic microorganisms by virtue of the many seriously ill patients who passes through it. Therefore, it is extremely important for the hospital managements to do everything possible to minimize the spread of these organisms to other patients.

REFERENCES

1. Kamat US, Fereirra A, Amonkar D, Motghare DD, Kulkarni MS. Epidemiology of the hospital acquired urinary tract infections in a medical college hospital in Goa. IJU. 2009; 25(1):76.
2. Babypadmini S, Appalaraju B. Extended spectrum-lactamases in the urinary isolates of Escherichia coli and Klebsiella pneumoniae- the prevalence and the susceptibility patterns in a tertiary care hospital. Indian Journal of Medical Microbiology. 2004; 22(3):172.
3. Naeem Akhtar. Urinary tract bacterial pathogens; their antimicrobial Susceptibility patterns at Bahawalpur. The Professional, 7(2):131-137.
4. Acharya, VN, 1992. Urinary Tract infection – a dangerous & unrecognized fore under of systemic sepsis. J. Post Grad Med., 38: 52-54.
5. Pallavi K, Georgi A, Asik MA, Prathiba M, Milly M. Urinary tract infections in the era of newer immunosuppressant agents: A tertiary care center study. Saudi Journal of Kidney Diseases and Transplantation. 2010; 21(5): 876-80
6. Antoine (2008). An introduction to botanical medicines : history, science, uses, and dangers. Westport, Conn.: Praeger Publishers. p. 126.
7. Savitha, T. International Journal of Current Research Vol. 2, Issue, 1, pp. 067- 072, January, 2011
8. Mahesh El Complicated Urinary Tract Infection in a Tertiary Care Center in South India, Al Ame en J Med Sci (2010)3 (2) :120 -127
9. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in J N M C Hospital Aligarh, India. Ann Clin Microbiol Antimicrob. 2007 Mar 23; 6:4.
10. Kolawole et al Prevalence of urinary tract infections (UTI) among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria. International Journal of Medicine and Medical Sciences Vol 1. (5) pp.163-167, May, 2009.
11. Oladeinde BH, Omoregie R, Olley M, Anunibe JA. Urinary tract infection in a rural community of Nigeria. N Am J Med Sci. 2011 Feb;3(2):75-7
12. Syed Mustaq Ahmed, Ramakrishna Pai Jakribettu, Shaniya koyakutty, Arya B, Shakir VPA. Urinary Tract Infections – An overview on the Prevalence and the Anti-biogramof Gram Negative Uropathogens in A Tertiary Care Centre in North Kerala, India. Journal of Clinical and Diagnostic Research, 2012 September (Suppl), Vol-6(7): 1192-1195
13. Barate D. L. and Ukesh C.S. Bacterial profile and antibiotic resistance pattern of urinary tract infections. International Journal of Science Volume-1, Issue-1 January, 2012
14. Chedi, B.A.Z. Wannang, N.N, Halliru, M.A. Bichi, L.A., A seven months retrospective study of urinary tract infection among patients at Aminukano teaching hospital, Kano-Nigeria, Bayero journal of pure and applied sciences, 2009; 2(2): 95-98
15. Meher Rizvi, Fatima Khan, Indu Shukla, Abida Malik, Shaheen. Rising Prevalence of Antimicrobial Resistance in Urinary Tract Infections during Pregnancy: Necessity For Exploring Newer Treatment Options. Journal of Laboratory Physicians./Jul-Dec 2011/ vol-3/Issue-2
16. Arul Prakasam K.C., K. G. Dileesh Kumar, M. Vijayan. A Cross Sectional Study on Distribution of Urinary Tract Infection and Their Antibiotic Utilisation Pattern In Kerala. International Journal of Pharm Tech Research Vol.4, No.3, pp 1309-1316, July-Sept 2012
17. Shirish kumar Patel, Pankajkumar P Taviad, Mala Sinha, T B Javadekar, Vipul P Chaudhari. Urinary Tract Infections (UTI) Among Patients at G.G.Hospital & Medical College, Jamnagar. National Journal of Community Medicine Vol 3 Issue 1 Jan-March 2012
18. Hazarika J. Nitrofurantoin Susceptibility Pattern in Urinary Isolates of E.coli in a Tertiary Care Hospital in North East India. Medical Science Volume : 5 | Issue : 9 | September 2015 |
19. Kiran K Mokta , Jatinder K Mokta , Santawana Verma , Digvijay Singh , Anil Kanga. Bacterial etiology and antibiotic susceptibility pattern of urinary tract infection in sub-himalayan region of india - A retrospective study of clinical isolates. National Journal of Medical and Allied Sciences ,Vol 4, Issue 1, 2015 Page 38-45
20. Harish Naik, Anupama Devi, Sudha MJ. Pattern of Antibiotic prescription in Urinary tract Infection. Indian Journal of Pharmacy and Pharmacology, April-June 2016;3(2);59-62