International Journal of Advances in Medicine
Rajendran V et al. Int J Adv Med. 2017 Oct;4(5):1401-1405
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20174292

Original Research Article

A study on urinary tract infection in a tertiary care hospital

V. Rajendran[1], R. Nepoleon[2], Prashant V. Solanke[3]*, M. Shahbaz Zailu[4], P. Valli[3]

[1]Department of Medicine, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, India
[2]Department of Microbiology, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, India
[3]Department of Community Medicine, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, India
[4]Department of General Medicine, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, India

Received: 07 July 2017
Accepted: 03 August 2017

***Correspondence:**
Dr. Prashant V. Solanke,
E-mail: drprashantsolanke@rediffmail.com

ABSTRACT

Background: Urinary tract infection is defined as bacteriuria along with urinary symptoms. It is one of the most common bacterial infections in humans and a major cause of morbidity. UTI has become difficult to treat because of appearance of pathogens with increasing resistance to antimicrobial agents. The objective of this study was to determine the bacteriological profile of pathogens responsible for urinary tract infection and to assess the antibiotic sensitivity pattern of the causative uropathogens.
Methods: This cross-sectional study was performed at the hospital of Sree Mookambika Institute of Medical Sciences, Kulasekharam during January 1, 2016 to December 12, 2016. Institutional ethical committee clearance was obtained. We surveyed 628 patients, who had clinical manifestations of UTI. Urine specimens were cultured for isolation of the microbial agents of UTI. The isolated bacteria were identified using biochemical tests. Data was entered in Microsoft Excel Version 2016.Statistical analysis was done using SPSS TRIAL VERSION 21C.
Results: The commonest organism isolated overall was extended spectrum beta lactamase positive *E. coli* (35.5%) followed by extended spectrum beta lactamase negative *E. coli* and *Enterococcus.* Females (68.63%) were mostly affected than males in our study. The people in the age group of 41-60 years are found to be more (48.46%) affected than the people of other age groups. The most sensitive oral antibiotic to almost all organisms in our study is Nitrofurantoin followed by Cotrimoxazole and Norfloxacin and among parenteral antibiotics, Amikacin stands first followed by Piperacillin-Tazobactam and Gentamicin. Apart from the above antibiotics, *Klebsiellapnemoniae* also shows good response to Cefotaxime (96.15%) and Cefipime (96.15%) and Aztreonam (92.3%).
Conclusions: From our study, it is observed that the most common causative organism for Urinary tract infection is found to be extended spectrum beta lactamase positive *E. coli* followed by Extended Spectrum Beta Lactamase negative *E. coli* and *Enterococcus.* The current status of sensitivity of common organism rests mainly on Nitrofurantoin (oral) and Amikacin, Piperacillin-Tazobactam (parenteral).

Keywords: Antibiotic sensitivity, Bacteria, Urinary tract infection, Uropathogens

INTRODUCTION

Urinary tract infection is defined as bacteriuria along with urinary symptoms. It may involve only the lower urinary tract or may involve both the upper and lower tract.[1] Urinary tract infections (UTIs) are the most common bacterial infection encountered in tertiary care settings. Etiological agents of UTI are variable and usually depend on time, geographical location and age of patients.[2] *Escherichia coli* (*E. coli*) is the most common etiological agent, approximately isolated from 75 to 90% of uncomplicated patients, while complicated ones show a broader bacterial spectrum as the cause of infection. In comparison with men, UTI is reported more in women.[3] UTI is more common in females than in males as female urethra is structurally found to be less effective for preventing the bacterial entry. It may be due to the proximity of the genital tract and urethra and adherence of urothelial mucosa to the mucopolysaccharide lining. The other main factors which make females more prone to UTI are pregnancy and sexual activity.[4] Women are more susceptible than men, due to several clinical factors including anatomic difference, hormonal effects and behavioural pattern.[5] In almost all cases of UTI, empirical antimicrobial treatment initiates before the laboratory results of urine culture are not available; thus, antibiotic resistance may increase.[6] In almost all cases there is a need to start treatment before the final microbiological results are available. Area-specific monitoring studies aimed to gain knowledge about the type of pathogens responsible for UTIs and their resistance patterns may help the clinician to choose the right empirical treatment.[7] In spite of the availability and use of the antimicrobial drugs, UTIs caused by bacteria have been showing increasing trends in recent years. Much of the increase has been related to the emerging antibiotic resistance among urinary tract pathogens.[8] Therapeutic decision should be based on accurate, up-to date anti-microbial susceptibility pattern.[9] Investigating epidemiology of UTIs (prevalence, risk factors, bacterial isolates and antibiotic sensitivity) is fundamental for care givers and health planners to guide the expected interventions.[10]

The objective of this study was to identify the spectrum of most common organisms responsible for urinary tract. To evaluate the pattern of antibiotic sensitivity in the organisms and to determine the most sensitive oral and parenteral antibiotic to almost all organisms in our study.

METHODS

This is a cross sectional study conducted from January 1, 2016 to December 31, 2016 at the hospital of Sree Mookambika Institute of Medical Sciences, Kulasekharam. Institutional ethical committee clearance was obtained. The sample size 5 is (4PQ/d2) 628. Samples were collected from all patients who presented with the symptomatology of UTI to our Medicine OPD. The clean-catch technique of midstream urine was used and 10-20ml of sample was obtained. Antimicrobial sensitivity tests were performed on bacteria considered significant. The inclusion criteria are people who are willing. We collected samples from patients presenting with the symptoms of UTI in the age group of 1-100.The exclusion criteria is people who are not willing. We also did not take samples from pregnant women, breast feeding women and women on oral contraceptives. The sampling technique is systematic and random sampling. Data was entered in Microsoft Excel Version 2016. Statistical analysis was done using SPSS TRIAL VERSION 21C.

RESULTS

35.5% of cases of urinary tract infection are caused by extended spectrum beta lactamase positive *E.Coli*. Percentage of cases of UTI caused by extended spectrum beta lactamase positive *E.Coli* - Age Groups: 1-20 years : 11.84%, 21-40 years:25.19%, 41-60 years : 48.46%, Above 60 years: 38.22%. Percentage of cases of Urinary Tract infection according to sex distribution- Males: 31.36%, Females: 68.63%. Antibiotic sensitivity pattern: extended spectrum beta lactamase positive *E.Coli* is 86.9% sensitive to Amikacin,79.82% sensitive to Nitrofurantoin and 62.3% to Piperacillin-Tazobactam: extended spectrum beta lactamase negative *E.Coli* is 98.51% sensitive to Cefotaxime and 95.71% sensitive to both Amikacin and Cefepime. *Enterococcus* is 74.10% sensitive to Nitrofurantoin, 61.29% to Piperacillin-Tazobactam and 54.83% to Cotrimoxazole. Extended spectrum beta lactamase positive *Klebsiella* is 74.35% sensitive to Amikacin,53.84% to Piperacillin-Tazobactam and 35.89% to Gentamicin. Methicillin Sensitive Enterococcus is 89.18% sensitive to both Amikacin and Nitrofurantoin and 70.27% to Gentamicin. *Klebsiellapnemoniae* is 96.15% sensitive to Cefotaxime, Amikacin, Cefepime, Piperacillin-Tazobactam and Ceftazidime. Citrobacter is 74.07% sensitive to Amikacin, 70.37% to Piperacillin-Tazobactam and 57.4% to Nitrofurantoin. Acinetobacter is 87.5% sensitive to Piperacillin-Tazobactam, 79.16% to Amikacin and 70.83% to Cotrimoxazole. Methicillin Sensitive *Staphylococcus aureus* is 100% sensitive to Amikacin, 93.33% to Nitrofurantoin and 86.66% to Cotrimoxazole. *Pseudomonas aeruginosa* is 73.68% sensitive to Piperacillin-Tazobactam and 47.36% to Amikacin, Ceftriaxone, Norfloxacin. Antibiotic resistant pattern: extended spectrum beta lactamase positive *E. Coli* is 99.10% resistant to Aztreonam,97.7% to both Ceftriaxone and Cefotaxime. Extended spectrum beta lactamase negative *E. Coli* is 27.14% resistant to Cotrimoxazole, 22.85% resistant to Norfloxacin and 8.57% resistant to Gentamicin. *Enterococcus* is 59.67% resistant to Norfloxacin, 45.16% to ceftriaxone and 41.9% to Cotrimoxazole. Extended spectrum beta lactamase positive *Klebsiella* is 100% resistant to both Aztreonam and Cefotaxime and 97.43% to Ceftriaxone. Methicillin sensitive *Enterococcus* is 48.64% resistant to Piperacillin-Tazobactam, 32.43% to Cotrimoxazole and 24.32% to Gentamicin. *Klebsiella* is 46.15% resistant to

Nitrofurantoin, 11.53% to Cotrimoxazole, 7.6% to Ceftriaxone, Norfloxacin and Gentamicin. Citrobacter is 59.25% resistant to Cefotaxime, Ceftazidime and Aztreonam. Acinetobacter is 79.16% resistant to Nitrofurantoin, 66.66% to Aztreonam and 62.5% to Ceftazidime. Methicillin sensitive *Staphylococcus aureus* is 66.66% resistant to Piperacillin-Tazobactam, 46.66% to Norfloxacin and 26.60% to Gentamicin. *Pseudomonas aeruginosa* is 84.21% resistant to Nitrofurantoin and 52.63% to, Norfloxacin and Gentamicin.

Table 1: Antibiotic sensitivity and resistant pattern of common urinary tract organisms in present study.

Antibiotics	ESBL+ve*E.coli*		ESBL -ve*E.coli*		*Enterococcus*		ESBL+ve*Klebsiella*		Methicillin sensitive *Enterococcus*	
	S (%)	R	S (%)	R	S (%)	R	S (%)	R	S (%)	R
Piperacillintatazobactam	62.3	42.44	92.85	1.42	61.29	35.48	53.84	35.89	48.64	48.64
Amikacin	86.90	12.10	95.71	2.80	37.09	59.67	74.35	25.64	89.18	10.81
Gentamicin	31.3	62.78	88.57	8.57	3.22	1.61	35.89	64.10	70.27	24.32
Nitrofurantoin	79.82	16.59	91.42	4.28	74.10	20.96	23.07	51.28	89.18	8.10
Norfloxacin	19.73	77.13	74.28	22.85	37.09	59.67	25.64	66.66	51.35	4.32
Cotrimoxazole	36.77	62.7	70	27.14	54.83	41.90	23.07	74.35	64.86	32.43
Ceftriaxone	1.79	97.7	91.42	2.85	46.70	45.16	0	97.43	75.67	13.51
Cefotaxime	0.89	97.70	98.51	0	53.22	37.09	0	100	0	0
Cefipime	21.52	71.3	95.71	2.85	Not tested	Not tested	33.33	58.97	Not tested	Not tested
Aztreonam	0.89	99.10	94.28	2.85	Not tested	Not tested	0	100	Not tested	Not tested

Sensitivity-S, Resistant-R

DISCUSSION

There has been considerable variability in microbial etiology as well as antibiograms for urinary tract infections over the decades. Moreover, different regional and socioeconomic milieus seem to have an effect on patterns of UTI and their management protocol.

In our present study, 35.5% of cases of urinary tract infection are caused by extended spectrum beta lactamase positive *E. Coli* which is the most common organism in present study but it is extended spectrum beta lactamase negative *E. Coli* causing 74.3% cases in Bency J study, 56.8% in Niranjan study and 70.96% in Dharmishtha T et al, study.[2,11,12]

Percentage of cases of UTI caused by extended spectrum beta lactamase positive *E. Coli* according to the age groups in present study (1-20 years : 11.84%, 21-40 years : 25.19%, 41-60 years : 48.46%, above 60 years: 38.22%) and in the study by Razak SK et al, the results are: (<20 years: 24.81%, 21-40 years: 54.98%, 41-60 years: 11.43%, 61-80 years: 6.32%, above 80 years: 2.43%) whereas in the study by Beyene et al, the distribution is: (18 years and below: 9.6%, 19-39 years: 53.5%, 40-59 years: 25.9%, 60 years and above:11%).[10,13]

Percentage of cases of urinary tract infection according to sex distribution in present study is males: 31.36%, females: 68.63% and it is 33% males and 67% females in Dharmishtha T et al, study and in study by Prakash D et al, it is 48.49% males and 51.51% females whereas it is 27.92% males and 87.82% females in Razak SK et al, study.[4,12,13]

Antibiotic sensitivity pattern of various organisms was studied in our present study. Among that extended spectrum beta lactamase positive *E. Coli* is 86.9% sensitive to Amikacin, 79.82% sensitive to Nitrofurantoin and 62.3% to Piperacillin-Tazobactam. Extended spectrum beta lactamase negative *E. Coli* is 98.51% sensitive to Cefotaxime and 95.71% sensitive to both Amikacin and Cefepime. In study by Razak SK et al, extended spectrum beta lactamase negative *E. Coli* is 81.92% sensitive to Nitrofurantoin,69.88% to Amikacin, 31.32% to Cotrimoxazole and in the study by Niranjan, it is 82.6% sensitive to Amikacin, 82.1% to Nitrofurantoin and 78.2% to Piperacillin-Tazobactam whereas in Bencystudy J et al, it is 100% sensitive to Imipenem, Amikacin and Piperacillin.[2,11,13] In our present study, *Enterococcus* is 74.10% sensitive to Nitrofurantoin, 61.29% to Piperacillin-Tazobactam and 54.83% to Cotrimoxazole whereas it is 90% sensitive to both Linezolid and Vancomycin in Bency J et al, study.[2] In our present study, *Klebsiellapnemoniae* is 96.15% sensitive to Cefotaxime, Amikacin, Cefepime, Piperacillin-Tazobactam and Ceftazidime and in Atker T et al, study *Klebsiellapnemoniae* is 88% sensitive to

Imipenem, 70% to Azithromycin and 60% to Ciprofloxacin and Gentamicin and in Onoh RC et al study it is 100% sensitive to Levofloxacin, Cefpodoxime, Ceftriaxone whereas in study by Prakash D et al, it is 89.66% sensitive to Levofloxacin, 86.21% sensitive to Meropenem and 82.76% to Ofloxacin.[4,14] In our present study, Citrobacter is 74.07% sensitive to Amikacin, 70.37% to Piperacillin-Tazobactam and 57.4% to Nitrofurantoin and in Onoh RC et al, study it is 100% sensitive to Ciprofloxacin, 80% to Levofloxacin and Cefpodoxime.[4,14] In our present study, *Pseudomonas aeruginosa* is 73.68% sensitive to Piperacillin-Tazobactam and 47.36% to Amikacin, Ceftriaxone, Norfloxacin and in study by Prakash D et al, it is 100% sensitive to Meropenem, 95% to Imipenem and Ciprofloxacin, 90% to Gentamicin and in study by Atker T et al, it is 60% sensitive to Imipenem and Azithromycin and 40% to Cotrimoxazole whereas it is 100% sensitive to Levofloxacin and Cefpodoxime in Onoh RC et al, study.[9,14]

Antibiotic resistant pattern of various organisms was studied in our present study. Among that extended spectrum beta lactamase positive *E. Coli* is 99.10% resistant to Aztreonam, 97.7% to both Ceftriaxone and Cefotaxime and extended spectrum beta lactamase negative *E. Coli* in our present study is 27.14% resistant to Cotrimoxazole, 22.85% resistant to Norfloxacin and 8.57% resistant to Gentamicin and in Beyene G et al, study it is *E. Coli* which is 100% resistant to Amoxicillin, Ampicillin and in Farajina S et al, study it is 93.1% resistant to Ampicillin, 51.8% to Trimethoprim-Sulphamethoxazole and 24% to Cephalexin whereas in Prakash D et al, study it is 96.97% resistant to Tobramycin, 90.91% to Nalidixic acid, 87.88% to Cefotaxime.[4,8] In our present study, Enterococcus is 59.67% resistant to Norfloxacin, 45.16% to ceftriaxone and 41.9% to Cotrimoxazole and it is 100% resistant to Ampicillin and 87.5% to Oxacillin and to Trimethoprim-Sulphamethoxazole in Farajina S et al, study whereas it is 70% resistant to Ampicillin and 60% to Tetracycline in Bency J et al, study.[2,8] In our present study, *Klebsiella* is 46.15% resistant to Nitrofurantoin, 11.53% to Cotrimoxazole, 7.6% to Ceftriaxone, Norfloxacin and Gentamicin and 100% resistant to Ampicillin in Bency J et al, study and in Farajina S et al, study, 91.1% resistant to Ampicillin, 45.6% to Nitrofurantoin, 40.5% to Trimethoprim-Sulphamethoxazole and in Beyene G et al, study it is 100% resistant to Ampicillin, Amoxicillin and Clindamycin.[2,8,10] In our present study, Citrobacter is 59.25% resistant to Cefotaxime, Ceftazidime and Aztreonam and in Beyene G et al, study, it is 100% resistant to Ampicillin, Amoxicillin and Clindamycin.[10] In our present study, *Pseudomonasaeruginosa* is 84.21% resistant to Nitrofurantoin and 52.63% to, Norfloxacin and Gentamicin and in Prakash D et al, study it is 95% resistant to Amikacin, 90% to Cefotaxime and Nitrofurantoin whereas in Farajina S et al, study it is 100% resistant to Ampicillin, Cephalexin, Nalidixicacid, Nitrofurantoin and Trimethoprim-Sulphamethoxazole.[4,8]

The study is conducted in only one tertiary care centre. So, the study cannot be generalized.

CONCLUSION

From our study we found that the most common causative organism for urinary tract infection is found to be extended spectrum beta lactamase positive *E. coli* followed by extended spectrum beta lactamase negative *E.coli* and *Enterococcus.* It is observed that the most sensitive oral antibiotic to almost all organisms in our study is Nitrofurantoin followed by Cotrimoxazole and Norfloxacin and among parenteral antibiotics, Amikacin stands first followed by Piperacillin-Tazobactam and Gentamicin. It is also observed that the newer drug Aztreonam is highly sensitive (94.28%) to ESBL-ve *E. coli* and to (92.30%) to Klebsiella pneumonia (92.30%). And regarding gender preponderance it is the females who are affected more than the males. So, in our setting the above-mentioned antibiotics can be used as an empirical therapy to treat patients suffering from UTI considering the causative organism to be one among the common organisms in our setting before the culture and sensitivity reports are available.

Recommendation

The study must involve a large number of populations.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Angami S, Jamir N, Sarma PC, Deka. Urinary tract infection, its causative microorganism and antibiotic susceptibility in Nagaland. Arch Med Health Sci. 2015;3(1):40-3.
2. Jubina Bency AT, Priyanka R, Jose P. A study on the bacteriological profile of urinary tract infection in adults and their antibiotic sensitivity pattern in a tertiary care hospital in central Kerala. Int J Res Med Sci. 2017;5(2):666-9.
3. Angoti G, Goudarzi H, Hajizadeh M, Tabatabaii Z. Bacteria isolated from urinary tract infection among patients and determination of the antibiotic susceptibility patterns of the gram negative bacteria in Iran. Novelty Biomed. 2016;1:1-4.
4. Prakash D, Saxena RS. Distribution and antimicrobial susceptibility pattern of bacterial pathogens causing urinary tract infection in urban community of Meerut city. ISRN Microbiol. 2013:Article ID 749629.
5. Yasmeen BHN, Islam S, Uddin MM, Jahan R. Prevalence of urinary tract infection, its causative agents and antibiotic sensitivity pattern. Northern Int Medi Colle J. 2015;7(1):105-9.

6. Maji SK, Mandal PK, Panja C, Dolai TK, Samanta A, Kundu PK, et al. Studies on drug sensitivity and bacterial prevalence of UTI in tribal population of Paschim Medinipur. Int J Curr Microbiol App Sci. 2016;5(6):406-12.
7. Hryniewicz K, Szczypa K, Sulikowska A, Jankowski K, Betlejewska K, Hryniewicz W. Antibiotic susceptibility of bacterial strains isolated from urinary tract infections. J Antimicrob Chemother. 2001;47(6):773-80.
8. Farajnia S, Alikhani MY, Ghotaslou R, Naghili B, Nakhlband A. Causative agents and antimicrobial susceptibilities of UTI Northwest Iran. Int J Infect Dis. 2009;13(2):140-4.
9. Akter T, Mia Z, Shahriar M. Antibiotic sensitivity of pathogens causing urinary tract infection Bangladesh Pharmaceutical J. 2013;16(1):53-8.
10. Beyene G, Tsegaye W. Bacterial uropathogens in urinary tract infection and antibiotic susceptibility pattern in Jimma University Specialized Hospital, Southwest Ethiopia: Ethiop J Health Sci. 2011;21(2):141-6.
11. Niranjan V, Malini A. Antimicrobial resistance pattern in Escherichia coli causing urinary tract infection among inpatients. Indian J Med Res. 2014;139(6):945-8.
12. Tada Dharmishtha G, Gandhi Paragi J, Patel Kiran N. A study on antibiotic related resistance in uti patients. National J Community Med. 2012;3(2):255-8.
13. Razak SK, Gurushantappa V. Bacteriology of urinary tract infection and antibiotic susceptibility pattern in a tertiary care hospital in South India. Int J Med Sci Public Health. 2012;1(2):109-12.
14. Onoh RC, Umeora OUJ, Egwuatu VE, Ezeonu PO, Onoh TJP. Antibiotic sensitivity pattern of uropathogens from pregnant women with urinary tract infection in Abakaliki, Nigeria. Infect Drug Resist. 2013;6:225-33.

Cite this article as: Rajendran V, Nepoleon R, Solanke PV, Zailu MS, Valli P. A study on urinary tract infection in a tertiary care hospital. Int J Adv Med 2017;4:1401-5.