Original Research Article

Antibiotic resistance pattern of urine culture isolates from patients with community acquired UTI

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Abstract

Background: Urinary tract infections (UTI) are among the most common infections in outpatients and in-patients. In almost all cases, empirical antibiotic treatment is started before the results of urine culture are available. For this reason, knowledge of the causative agents of UTIs and their antibiotic resistance patterns in specific institutional settings and geographical areas may help clinicians in choosing the appropriate empirical antimicrobial treatment. The data will also help antibiotic stewardship policies of the hospital. The objective of this study was to determine the Antibiotic resistance pattern of urine culture isolates from patients with UTI (Community acquired). **Materials and Methods:** The study included adult subjects above 18 years who came to OPD with symptoms of UTI (dysuria, frequency, urgency and suprapubic tenderness with or without fever) and/or patients in whom physicians suspected Uncomplicated Community acquired UTI. Urine samples were processed in Microbiology Laboratory for Microscopy and Culture Identification and Antibiotic Susceptibility Test by VITEK COMPACT 2 method. **Results:** The total number of patients was 50. 31 (62%) were males and 19 (38%) were females. The commonest organism to be isolated was E. coli (72%) followed by Klebsiella pneumoniae (18%), Citrobacter koseri (4%), Pseudomonas aeruginosa (2%), Serratia marcescens (2%) and Enterobacter cloacae (2%). Resistance to Ampicillin, Cefuroxime axetil, and Ciprofloxacin was high. Amikacin and Nitrofurantoin had least resistance. E coli showed maximum resistance to Ampicillin and Ciprofloxacin and least resistance to Nitrofurantoin. Klebsiella pneumoniae showed maximum resistance to Ampicillin, Cefuroxime axetil and Cotrimoxazole and least resistance to Nitrofurantoin and Amikacin. **Conclusion:** This study shows that E Coli is the commonest organism isolated in our patients with community acquired UTI. This study showed a pattern of resistance towards Fluoroquinolones, Cephalosporins and least resistance to Amikacin and Nitrofurantoin. Since Amikacin is a parenteral antibiotic, Nitrofurantoin could be used as a first choice Oral Empirical Antibiotic for treating uncomplicated community acquired UTI (pending culture sensitivity reports) in patients attending our OPD. However, urine culture and sensitivity testing is necessary in all cases and antibiotic therapy has to be modified based on the isolate and sensitivity report.

Key Word: Urinary tract Infection; Antibiotic resistance; Urine culture

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INTRODUCTION

Urinary tract infection (UTI) is a very common medical problem. Urinary tract infections (UTIs) are among the most common infections in outpatients and in-patients. It is one of the most common infection that we come across in day-to-day medical practice among patients of all age groups, from the neonate to the geriatric age group.[1, 2]UTI may involve only the lower urinary tract or may involve both the upper and lower tract. The term cystitis has been used to describe lower UTI. Most infections are caused

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by retrograde ascent of bacteria from the faecal flora via the urethra to the bladder and kidney.[3]Virtually, in every patient, empirical antibiotic treatment is started before urine culture and sensitivity reports are available. Therefore, information about the etiological agents of UTIs and their antibiotic resistance patterns in specific institutional settings and geographical areas may help clinicians in choosing the appropriate empirical antimicrobial treatment for their patients. The data will also help antibiotic stewardship policies of the hospital.[1] The bacteria causing UTI have developed extensive resistance against most of the commonly used antibiotics. The emergence of antibiotic resistance among the bacteria causing UTIs is a public health problem as well, especially in a developing country like ours; indiscriminate use of antibiotics has resulted in the emergence of antibiotic resistance.[4] It is imperative for every institution to study the antibiotic resistance pattern of bacteria causing community acquired UTI. The etiology of UTI and the antibiotic resistance pattern of bacteria causing community acquired UTI keep changing over the years.[5]

OBJECTIVES OF THIS STUDY

- To determine the Antibiotic resistance pattern of urine culture isolates from patients with UTI (community acquired)
- To identify the spectrum of organisms responsible for urinary tract infections

MATERIALS AND METHODS

This study was conducted at JSS Medical college Hospital, 1600 bedded tertiary care referral hospital attached to JSSAHER at Mysuru, Karnataka state, South India. It was a prospective observational study. Institutional ethics committee approval was obtained. Recruitment of subjects and collection of data was spread over a period of 3 months. Informed consent was obtained from patients. Sample size was calculated using the software- Epi Info™ for Windows version 7.2 (https://www.cdc.gov/epiinfo/pc.html).Urine specimens were collected from 50 consecutive patients attending OPD at JSS hospital who were clinically diagnosed to have uncomplicated community acquired UTI. Patients who came to the OPD with symptoms of UTI (dysuria, frequency, urgency and suprapubic tenderness with or without fever) or any patients in whom the physician suspected uncomplicated UTI were included in the study. The study was conducted on 50 consecutive patients over a period of 3 months. Patients with signs of pyelonephritis (a body temperature >38°C orally and flank pain or costovertebral angle tenderness), three or more episodes of UTI in the past year, symptoms of UTI in the last 3 months, previous upper UTI, other functional and structural urinary tract abnormalities, indwelling or recent use of a catheter, previous history of genitourinary system operation including urinary stones, current pregnancy, antibiotic use during the previous 2 weeks and patients who were hospitalized for any reason during past 3 months were excluded from the study. Clean catch mid-stream urine was collected and sent to microbiology laboratory. Urine samples were processed in Microbiology Laboratory for Microscopy and Culture Identification. Plates showing growth suggestive of significant bacteriuria, with colony counts exceeding 10^5cfu/ml were subjected to standard biochemical tests for identification and “AST” (Antibiotic Susceptibility Test) by VITEK COMPACT 2 method. Interpretation as ‘Sensitive’ or ‘Resistant’ was done on the basis of the diameters of zones of inhibition of bacterial growth as recommended by the disc manufacturer. Antimicrobial sensitivity tests were performed on bacteria considered significant. The antibiotics included in our study were Ciprofloxacin, Cotrimoxazole, Amikacin, Gentamicin, CoAmoxiClav, Ampicillin, Cefuroxime axetil, Nalidixic Acid and Nitrofurantoin. The data were collected in a proforma. The Data were entered in Microsoft EXCEL and analysed using SPSS version 16.0 for Microsoft Windows. Descriptive statistics were employed in terms of frequency and percentages. Chi-Square Test was utilized and differences were considered statistically significant if P-value was less than or equal to 0.05

RESULTS

50 consecutive patients were enrolled and urine cultures were studied. 31(62%) were males and 19(38%) were females. Comorbidities that we came across most commonly were Diabetes mellitus and prostatomegaly. The commonest organism isolated was E. coli (72%) followed by Klebsiella pneumoniae (18%), Citrobacter koseri(4%), Pseudomonas aeruginosa (2%), Serratia marcescens (2%) and Enterobacter cloacae (2%). Resistance to Ampicillin, Cefuroxime axetil and Ciprofloxacin was high. Amikacin and Nitrofurantoin had least resistance. This was same in both males and females. E coli showed maximum resistance to Ampicillin and Ciprofloxacin and least resistance to Nitrofurantoin. Klebsiella pneumoniae showed maximum resistance to Ampicillin, Cefuroxime axetil and Cotrimoxazole and least resistance to Nitrofurantoin and Amikacin. (All the observations were statistically significant P-value< 0.05)

Organism Isolated	Distribution
E Coli	72%
Klebsiella pneumoniae	18%
Citrobacter koseri	4%
Pseudomonas aeruginosa	2%
Serratia marcescens	2%
Enterobacter cloacae	2%

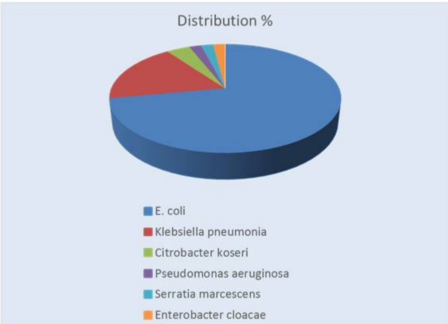


Table 2: Antibiotic Resistance and Sensitivity pattern of urinary tract organisms

A. All Organisms/Overall

Antibiotic		Sensitivity	Resistance
Ciprofloxacin	**47**	**14**	**33**
Tmz	50	26	24
Amikacin	50	45	5
Gentamicin	49	26	23
Amox clav	41	23	18
Ampicillin	38	4	34
Cefuroxime axetil	41	11	30
Nalidixic acid	41	7	34
Nitrofurantoin	**43**	**37**	**6**

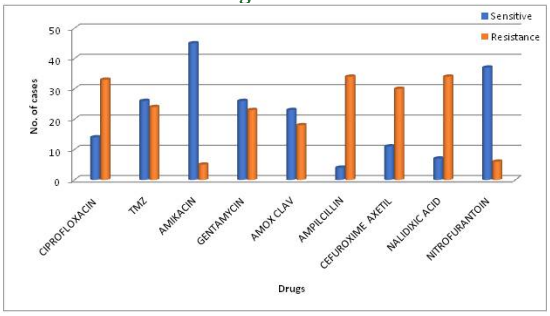
B. E coli (36)

Antibiotic		Sensitivity	Resistance
CIPROFLOXACIN	**34**	**5**	**29**
TMZ	36	17	19
AMIKACIN	36	31	5
GENTAMICIN	35	17	18
AMOX CLAV	29	17	12
AMPICILLIN	29	4	25
CEFUROXIME AXETIL	29	6	23
NALIDIXIC ACID	29	0	29
NITROFURANTOIN	**31**	**27**	**4**

C. Klebsiella (9)

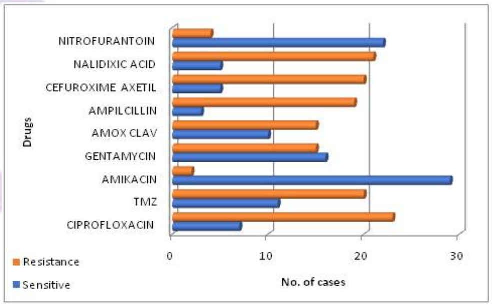
Antibiotic		Sensitivity	Resistance
Ciprofloxacin	**9**	**6**	**3**
Tmz	9	5	4
Amikacin	9	9	0
Gentamicin	9	5	4
Amox clav	9	5	4
Ampicillin	9	0	9
Cefuroxime axetil	9	4	5
Nalidixic acid	9	4	5
Nitrofurantoin	**8**	**8**	**0**

A. All Organisms/Overall



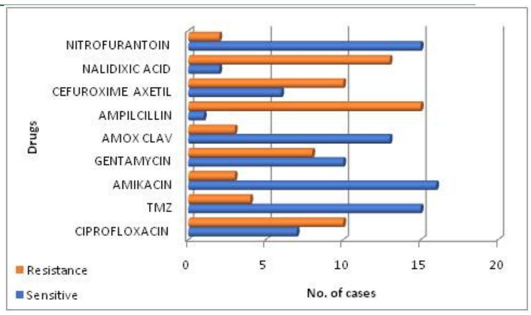
Male

Sensitivity	Resistance	Resistance
Ciprofloxacin	**7**	**23**
Tmz	11	20
Amikacin	29	2
Gentamicin	16	15
Amox clav	10	15
Ampicillin	3	19
Cefuroxime axetil	5	20
Nalidixic acid	5	21
Nitrofurantoin	**22**	**4**



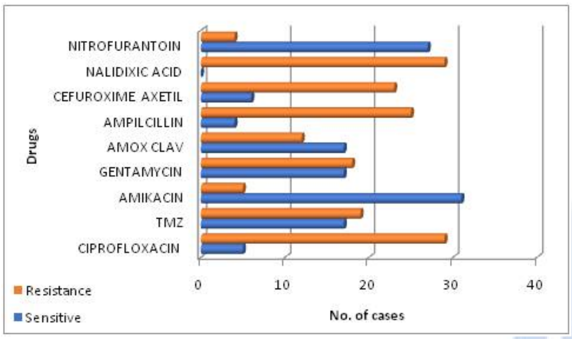
Female

	Sensitivity	Resistance
Ciprofloxacin	**7**	**10**
Tmz	15	4
Amikacin	16	3
Gentamicin	10	8
Amox clav	13	3
Ampicillin	1	15
Cefuroxime axetil	6	10
Nalidixic acid	2	13
Nitrofurantoin	**15**	**2**



E coli Total

	Sensitivity	Resistance
CIPROFLOXACIN	**5**	**29**
TMZ	17	19
AMIKACIN	31	5
GENTAMICIN	17	18
AMOX CLAV	17	12
AMPICILLIN	4	25
CEFUROXIME AXETIL	6	23
NALIDIXIC ACID	0	29
NITROFURANTOIN	**27**	**4**



DISCUSSION

The commonest organism isolated in this study was E. coli (72%). It is a well-known fact in clinical practice and documented by several studies also.[2,3,4,5,6] In this study, the commonest organism isolated was E. coli (72%) followed by Klebsiella pneumoniae (18%). This was similar to a survey conducted by Behzadi P, *et al*.[7]The same picture was also seen in a similar study by Tantry and Rahiman.[8] In our study, Resistance to Ampicillin, Cefuroxime axetil and Ciprofloxacin was high. Amikacin and Nitrofurantoin had least resistance. This was same in both males and females. E coli showed maximum resistance to Ampicillin and Ciprofloxacin and least resistance to Nitrofurantoin. Resistance to ciprofloxacin is increasing among bacteria causing urinary tract infections.[9]In a metaanalysis, Fasugba *et al.* 2015, have demonstrated increasing resistance to Ciprofloxacin in E. coli UTI and they say that use of Ciprofloxacin as empirical therapy for UTI should be reconsidered.[10]In an Indian study by Nandini C *et al*, a similar picture was observed and they say that new generation cephalosporins, quinolones and macrolides cannot maintain efficacy with the emergence of resistant bacteria.[11]Patterns of antibiotic resistance in several types of bacteria may change in a short duration and vary based on environments and hence, a local , frequently repeated audit at regular intervals has to be done to keep track of the antibiotic resistance pattern.[12] Nitrofurantoin is often under-utilized as empirical antibiotic for community-acquired lower UTIs. Though it has been used in clinical practice for 50 years or more, throughout the world, acquired resistance to nitrofurantoin is less.[13] Nitrofurantoin, 100 mg, orally, 12th hourly is tolerated well. The side effects of nitrofurantoin are relatively rare.[14-18] Rarely nausea may occur. With creatinine clearances less than 30 mL/min, therapeutic urinary concentrations are not possible resulting in treatment failure. [14-18] Hence, nitrofurantoin should not be given in patients with creatinine clearance less than 30 mL/min.[17,18] At normal urinary pH, nitrofurantoin is excreted into the lower urinary tract, i.e., bladder urine; thus it is efficacious in lower UTIs.[13,15-17]. It is financially viable also.[19]In view of these reasons and against the backdrop of the results of our study , we recommend that nitrofurantoin should be preferred as the antibiotic of choice for the initial empiric oral treatment of uncomplicated community-acquired lower UTIs(pending culture sensitivity reports) in patients attending our OPD.[20]However, urine culture and sensitivity testing is a must in all cases and antibiotic therapy has to be modified based on the isolate and sensitivity report.

CONCLUSION

This study shows that E Coli is the commonest organism isolated in our patients with community acquired UTI. This study showed a pattern of resistance towards Fluoroquinolones, Cephalosporins and least resistance to Amikacin and Nitrofurantoin. Since Amikacin is a parenteral antibiotic, Nitrofurantoin could be used as a first choice Oral Empirical Antibiotic for treating uncomplicated community acquired UTI (pending culture sensitivity reports) in patients attending our OPD. However, urine culture and sensitivity testing is necessary in all cases and antibiotic therapy has to be modified based on the isolate and sensitivity report.

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REFERENCES

1. M. M. A. Jebouri and N. Atala, "A Study on the Interrelationship between Renal Calculi, Hormonal Abnormalities and Urinary Tract Infections in Iraqi Patients," *Open Journal of Urology*, Vol. 2, No. 1, 2012, pp. 6-10. doi:10.4236/oju.2012.21002
2. Mohemid M. Al-Jebouri, Salih A. Mdish. Antibiotic Resistance Pattern of Bacteria Isolated from Patients of Urinary Tract Infections in Iraq. Open Journal of Urology. 2013; 3: 124-31
3. R. A. Jones, H. I. Inabo and H. B. I. Obanibi. Antimicrobial Susceptibility of Some Urinary Tract Clinical Isolates to Commonly Used Antibiotics. African Journal of Biotechnology.2006; 21(2): 973-78.

4. Goldstein FW. Antibiotic susceptibility of bacterial strains isolated from patients with community-acquired urinary tract infections in France. Multicenter Study Group. Eur J Clin Microbiol Infect Dis.2000; 19:112-7.
5. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in JNMC Hospital Aligarh, India. Ann Clin Microbiol Antimicrob. 2007; 6:4.
6. S. Manikandan, S. Ganesapandian, M. Singh, *et al.*, "Antimicrobial Susceptibility Pattern of Urinary Tract Infection Causing Human Pathogenic Bacteria," *Asian Journal of Medical Sciences*, Vol. 3, No. 2, 2011, pp. 56-60.
7. Behzadi P, Behzadi E, Yazdanbod H, Aghapour R, Akbari Cheshmeh M, Salehian Omran D. A survey on urinary tract infections associated with the three most common uropathogenic bacteria. Maedica (Buchar). 2010; 5(2):111–115.
8. Tantry BA, Rahiman S. 2012. Antibacterial resistance and trend of urinary tract pathogens to commonly used antibiotics in Kashmir Valley West Indian. Med J. 61:703–707.
9. Reis A. C. C., Santos S. R. S., Souza S. C., Saldanha M. G., Pitanga T. N., Oliveira R. R. (2016). Ciprofloxacin resistance pattern among bacteria isolated from patients with community-acquired urinary tract infection. Rev. Inst. Med. Trop. Sao Paulo 58 10.1590/S1678-9946201658053
10. Fasugba O, Gardner A, Mitchell BG, Mnatzaganian G. Ciprofloxacin resistance in community- and hospital-acquired Escherichia coli urinary tract infections: a systematic review and meta-analysis of observational studies. BMC Infect Dis. 2015; 15:545.
11. Nandini C, Chandan C, Sinjan G, Mainak M, Ramkrishna B, Kartik P.Pattern of Urinary Antibiograms in a Tertiary Care Hospital of Eastern India.J Assoc Physicians India. 2016;64(5):26-30
12. Gupta V, Yadav A, Joshi RM. Antibiotic resistance pattern in uropathogens. Indian J Med Microbiol. 2002;20:96–98
13. Cunha BA. New uses for older antibiotics: nitrofurantoin, amikacin, colistin, polymyxin B, doxycycline, and minocycline revisited. Med Clin North Am. 2006;90:1089–1107
14. Brumfitt W, Hamilton-Miller MT. Efficacy and safety profile of long-term nitrofurantoin in urinary infections: 18 years' experience. *J Antimicrob Chemother*. 1998;42:363–371
15. Woodruff MW, Malvin RI, Thompson RI. The renal transport of nitrofurantoin: effect of acid-base balance upon its excretion. *JAMA*. 1961;175:1132–1135
16. Cunha BA, Comer JB. Pharmacokinetic considerations in the treatment of urinary tract infections. *Conn Med*. 1979;43:347–353
17. Cunha BA. Nitrofurantoin: current concepts. *Urology*. 1988;32:67–71
18. Grayson ML, Whitby M. Nitrofurans: nitrofurazone, furazolidone, and nitrofurantoin. In: Grayson ML, Crowe SM, McCarthy JS, *et al*., editors. , eds. *Kucers' The Use of Antibiotics*. 6th ed. London, England: Hodder Arnold; 2010:1195–1204
19. McKinnell JA, Stollenwerk NS, Jung CW, Miller LG. Nitrofurantoin compares favorably to recommended agents as empirical treatment of uncomplicated urinary tract infections in a decision and cost analysis. Mayo Clin Proc. 2011;86(6):480–488
20. Cunha BA, Schoch PE, Hage JR. Nitrofurantoin: preferred empiric therapy for community-acquired lower urinary tract infections. Mayo Clin Proc. 2011; 86(12):1243–1244.

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