

Antibiotic Susceptibility Profile Of E.Coli Isolates In Hospital And Community Acquired Urinary Tract Infections In A Cancer Hospital In South India

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Abstract

Background & Objectives: Urinary tract infection is one of the most common bacterial infection, a major cause of morbidity, and result in serious sequelae if not treated appropriately. E. coli is the most prevalent organism and is solely responsible for the majority of these infections. In view of the increasing bacterial resistance, regular monitoring of resistance patterns is necessary to improve guidelines for empirical antibiotic therapy. This retrospective analysis was designed to assess the recent antibiotic sensitivity pattern of Escherichia coli in urinary tract infection and to compare it between community acquired and hospital acquired infections.

Method: This retrospective study analyzed the data generated from Jan 2018 to December 2018. Bacterial identification was based on standard culture and biochemical characteristics of isolates. Antimicrobial susceptibility was tested by the Kirby Bauer disk diffusion method.

Results: It was observed that among both inpatients and outpatients females were most commonly affected and elderly males were the second most commonly affected group. In general E. coli isolates showed high resistance to Amoxyclav, Cephalosporins, Fluroquinolones and Cotrimoxazole, the isolates from inpatients showed higher resistance to these antibiotics as compared to the isolates from outpatients.

Interpretation & conclusion: Females and elderly males were most commonly affected with UTI. Amoxyclav, Cotrimoxazole, Fluoroquinolones and Cephalosporins have limited value for the treatment of UTI. Sensitivity to Nitrofurantoin, Amikacin and Carbapenems are retained and may be prescribed for complicated UTI.

Keywords: Antibiotics, Bacteruria, Escherichia coli, Resistance, Significant bacteruria, Urinary tract infection

Introduction

Urinary tract infection (UTI) is one of the most common bacterial infection in the human population affecting all age groups[1]. UTIs are often associated with significant morbidity and mortality. Worldwide about 150 million people are being diagnosed with urinary tract infections every year[2].

E. coli is the most common organism causing both community as well as hospital acquired UTI[3]. Studies suggest that the overall prevalence of UTI is higher in women, an estimated 50% of women experience at least one episode of UTI at some point of their lifetime and between 20% and 40% of women can have recurrent episodes[4].

Microorganisms for community acquired UTI are usually associated with a lower level of antimicrobial resistance, whereas higher resistance is rather common among hospital acquired pathogens[5]. In order to achieve a satisfactory therapeutic effect, it is suggested that local information regarding the antimicrobial resistance of frequent pathogens should be established as a reference for the selection of empirical antimicrobial therapy[6].

The objective of the present study is to document resistance patterns of E. coli responsible for urinary tract infections in our hospital. We compared resistance pattern of community acquired and hospital acquired isolates to look for possible differences that could aid clinical decision-making while awaiting laboratory test result.

Materials & Methods

This retrospective study was carried out in the Department of Microbiology, Basavtarakam Indo-American Cancer Hospital & Research Institute, Hyderabad, South India between January to December 2018. The study was conducted after due approval from the institutional ethics committee

This was an analysis of data generated from the records of urine samples received in the laboratory during the study period. Samples showing significant pus cells of >5/HPF on CUE and which grew E.coli with significant colony count (>10⁵ CFU/ml) were included in the study. Only the initial sample of an individual received was included to avoid duplication. Analysis of the data was carried out focusing on the age, gender, whether admitted or not. Statistical analysis was done

by "significance of difference between proportions". The antibiotic susceptibility data of E.coli isolates were reviewed and analyzed.

Samples were processed and isolates were identified as per standard Microbiological methods[7]. All urine samples were inoculated onto Michrome UTI agar (Microexpress, Tulip diagnostics) and Mac Conkey agar (Himedia, Mumbai, India) using a calibrated loop and were incubated for 18-24 h at 37°C. The antibiotic susceptibility testing of the isolated bacteria was carried out by the Kirby Bauer disc diffusion method as per CLSI guide lines 2018 [8]. The antibiotics tested for sensitivity were Amoxyclav, Piperacillin + Tazobactam, Cefuroxime, Ceftriaxone, Cefaperazone + Sulbactam, Cefepime, Norfloxacin, Levofloxacin, Cotrimoxazole, Nitrofurantoin, Amikacin, and Meropenem .

Results

Total of 1618 urine samples were received from Jan 2018 to December 2018, out of which 927 (57.3%) were from out patient department and 691(42.7%) were from in- patients. Females were mostly affected both in out patients and in patients (Table I). The difference was statistically significant (p < 0.05). It was also observed that, infection rate was high in out patients as compared to in patients. The difference was statistically significant (p < 0.05) (Table .I)

Table I. UTI prevalence by patient settings and Gender

Gender	Out-patients	In-patients	Total (%)
Male	416	371	787 (48.6)
Female	511	320	831 (51.4)
Total (%)	927 (57.3)	691 (42.7)	1618

We noted that UTI caused by E.coli was more common in females of age group 15 – 65 years. In

males it was commonly seen in young age below 15 years and in elder age i.e 65 years and above (Table-II).

Table II. Age wise distribution of patients with UTI

Age(years)	Male	Female	Total (%)
Below 15	11	5	16 (0.98)
15-24	19	31	50 (3.10)
25-34	34	60	94(5.80)
35-44	92	110	202 (12.5)
45-54	112	189	301(18.6)
55-64	190	248	438 (27.1)
65-74	228	164	392 (24.2)
75 and above	101	24	125(7.72)
Total	787	831	1618

The infection rates were high in patients more than 40 years of age as compared to less than 40 years of age. The difference was statistically significant (p < 0.05) (Table III).

Table III. Age wise distribution of patients <40 years and > 40 years

Age	IP	OP	Total (%)
Below 40 years	130	141	271 (16.75)
40 years and above	561	786	1347 (83.25)
Total	691	927	1618

A total of 324 non-repetitive urinary isolates of E.coli and their sensitivity pattern pertaining to a period of 12 months (January 2018- December 2018) were analysed. Among 324 E.coli isolates ,97 (29.94%) were from inpatients and 227 (70.06%) from outpatients (Table IV).

Table IV. E.coli isolated in Out patients and In patients

	Out patients (%)	In patients (%)	Total
Samples received	927 (57.3%)	691 (42.7%)	1618
E.coli isolated	227 (70.06%)	97 (29.94%)	324

In the present study the overall sensitivity to Amoxyclav, Cephalosporins & Fluroquinolones was less than 30%. Amikacin & Carbapenems showed highest sensitivity of more than 90 % (Table-V).

E.coli isolated from in- patients showed higher resistance to all the antibiotics tested, but a significant difference in sensitivity pattern of E.coli isolates from In -patients and out patients was observed in Amoxyclav, Cotrimoxazole and Cephalosporins in which, isolates from In- patients were much more resistant as compared to isolates from out patients (Table V).

Table .V. Sensitivity pattern of E.coli isolated from Out patients and In patients

Antibiotic	Disc strength (µg)	Out patient			In-patient		
		Isolates tested	Sensitive (%)	Resistant (%)	Isolates tested	Sensitive (%)	Resistant (%)
Amoxyclav	20/10	213	45(21.1)	168(78.9)	87	11(12.6)	76(87.7)
Piperacilli+Tazobactam	100/10	223	164(73.5)	59(26.5)	96	65(67.7)	31(32.3)
Cefuroxime	30	177	37(20.9)	140(79.1)	96	19(19.8)	77(80.2)
Ceftriaxone	30	193	38(19.7)	155(80.3)	82	10(12.2)	72(87.8)
Cefipime	30	220	67(30.5)	153(69.5)	92	15(16.3)	77(83.7)
Cefperazone+sulbactam	75/30	216	164(75.9)	52(24.1)	95	64(67.4)	31(32.6)
Norfloxacin	10	227	45(19.8)	182(80.2)	97	18(18.6)	79(81.4)
Levofloxacin	5	216	45(20.8)	171(79.2)	88	14(15.9)	74(84.1)
Amikacin	30	227	210(92.5)	17(7.5)	96	87(90.6)	9(9.4)
Cotrimoxazole	1.25/23.75	227	107(47.1)	120(52.9)	93	25(26.9)	68(73.1)
Nitrofurantoin	300	227	203(89.4)	24(10.6)	97	83(85.6)	14(14.4)
Meropenem	10	227	208(91.6)	19(8.4)	97	85(87.6)	12(12.3)

Discussion

Urinary tract infections (UTIs) are among the most common types of bacterial infections occurring both in the community and hospital settings. It is universally accepted that UTI can only be ascertained on the basis of microscopy and microbial culture of urine. For initial therapy, we require knowledge about the prevalent sensitivity pattern among the bacterial causes of UTI in our area and also must have a constant watch over the development of resistance.

The present retrospective study was undertaken to analyse the sensitivity pattern of E.coli isolated from urine cultures in both out patients and In- patients. Out of 324 isolates,227(70.06%) were from out patient department and 97 (29.94%) isolates were from In -patients.

The study finding showed that UTI was more common in females (51.4%) as compared to males (48.6%), which is similar to study done by Seema Mittal et al[9], in which incidence of UTI was more common in females (53.3%) than in males. This finding is also similar to

other studies [3,6,10].Short female urethra, proximity of the female urethral meatus to the vagina and rectal mucosa with their abundant microbial flora and sexual intercourse have been reported asinfluencing factors for the higher occurrence of UTI in women. Men are usually less prone to UTI as compared to females, owing to the longer course of the urethra and bacteriostatic properties of prostatic secretion[11].

In the present study UTI was high in the age group of 55-64 years (27.07%) with a female preponderance. This finding is similar to a study done by Muraleetharan et al.in which females of age group 40-79 were most commonly affected[6] and is in contrast to a study by Dash M et al and Nalini R et al[2,3] where females in reproductive age were predominantly affected.

Among males, UTI caused by E.coli was high in elderly, between 60-80 years. These findings are in correlation with studies done by Madhuri et al and Nalini R,et al [1,2]. This is probably because with advancing age, the incidence of UTI increases among males due to prostate enlargement, neurogenic bladder and requirement of catheterization in the form of intervention[12].

In the present study, it is found that Amoxyclav is a poor choice for empiric therapy of UTI in both community and hospital settings. The other choice of empiric therapy Co-trimoxazole was also found to have high resistance rates in hospital isolates and in community isolates as well. Quinolones were also found to be ineffective against isolates from both outpatients and inpatients. High level of resistance was observed even in case of Cephalosporins. High levels of resistance to Amoxyclav, Cotrimoxazole,Fluroquinolones and Cephalosporins can be explained by the long time period for which these drugs have been available and in use for UTI [13].

Sensitivity to Cefoperazone/sulbactam was 75.92% and 67.36 % in out- patients and in- patients respectively. Piperacillin/ tazobactam had a sensitivity of 67.70% in, in-patients & 73.54% in out-patients.

Nitrofurantoin showed good susceptibility in both groups. This might be due to its unique structure and mechanism of action, localizing only in urinary tract. Considering its safety profile, ease of administration through oral route & good susceptibility, Nitrofurantoin can be a drug of choice for empiric therapy in lower UTI in both out-patients and in-patients[14].

Amikacin also has shown highest sensitivity in both outpatients (92.51%) and inpatients (90.62%). Even though the Aminoglycosides have been around for a long while, resistance to them has not developed as rapidly as to others. The chief reason for this appears to be that these drugs have not been over-used. Since these are administered parentally it

would be difficult to use for empiric therapy in outpatient settings[13].

Sensitivity to Meropenem in the present study was found to be 90.43 %. This finding is in correlation with study done by Devanand Prakash and Ramchandra Sahai Saxen[10] where sensitivity was 95.45%. Increasing resistance to Carbapenems is alarming as there are no new antibiotics in the pipeline.

Kavya et al.[13] recently examined different susceptibility patterns of urinary isolates in a single health care system, comparing a community based uropathogen antibiogram to a hospital based uropathogen antibiogram in south india. Similar to our findings, they determined that there was a significant difference in resistance patterns between outpatient and inpatient uropathogens. In contrast to this finding, Rajesh et al. reports the resistance among hospital and community isolates to be similar[15]. This might indicate the spread of multi drug resistant strains in the community.

Conclusion

To conclude, this study showed high resistance of E. coli to commonly used empirical antibiotics like Amoxyclav, Cephalosporins, and Fluoroquinolones. Thus antibiotic resistance may increase in uropathogens due to frequent misuse of antibiotics. Knowledge of etiological agents causing UTIs and their antimicrobial resistance patterns in specific geographical locations may aid clinicians in choosing the appropriate empirical antimicrobial agent.

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REFERENCES

- [1] Madhuri Ashok Lawhale, Rahul Naikwade. Recent pattern of drug sensitivity of most commonly isolated uropathogens from Central India. *International Journal of Research in Medical Sciences*. 2017 Aug; 5(8): 3631-3636
- [2] Nalini R, Ramya J, Meenakshi B, Palniappan N, Poongodi S. Recent Sensitivity Pattern of Escherichia Coli in Urinary Tract Infection. *Research & Reviews: Journal of Microbiology and Biotechnology*. 2014;3(3):31-5
- [3] Amit Raj Sharma, Dwij Raj Bhatta, Jyotsna Shrestha and Megha Raj Banjara. Antimicrobial Susceptibility Pattern of Escherichia coli Isolated from Urinary Tract Infected Patients Attending Bir Hospital. *Nepal Journal of Science and Technology*, Vol. 14, No. 1 (2013) 177-184
- [4] Muktikesh Dash. Sanghamitra Padhi, and Banojini Parida. Antimicrobial resistance in pathogens causing urinary tract infections in a rural community of Odisha, India *Journal of Family and Community Medicine*. 2013; 20(1):20-6.
- [5] V Gupta , A Yadav , RM Joshi. Antibiotic resistance pattern in uropathogens. *Indian Journal of Medical Microbiology*. 2002;20(2):96-8.
- [6] Muraleetharan M, Viswanathan. T. Epidemiological studies on varying extended-spectrum β -lactamases producing uropathogenic bacteria. *International Journal of Pharmacy and Pharmaceutical Sciences*, ISSN-0975-1491, Vol 6, Issue 11, 2014
- [7] Mackie & McCartney *Practical Medical Microbiology* 14th Edition
- [8] Clinical and Laboratory Standards Institute (CLSI). *Performance Standards for Antimicrobial Disk. Approved Standard M2-A10*. Wayne, PA, USA: Clinical and Laboratory Standards Institute; 2018
- [9] Seema Mittal, Madhu Sharma, Uma Chaudhary. Study of virulence factors of uropathogenic Escherichia coli and its antibiotic susceptibility pattern. *Indian journal of Pathology and Microbiology* - 57(1), January-March 2014
- [10] Devanand Prakash and Ramchandra Sahai Saxena. Distribution and Antimicrobial Susceptibility Pattern of Bacterial Pathogens Causing Urinary Tract Infection in Urban Community of Meerut City, India . *Hindawi Publishing Corporation, ISRN Microbiology* , Volume 2013, Article ID749629, 13pages
- [11] Tada Dharmishtha G, Gandhi Paragi J, Patel Kiran N. A study on antibiotic related resistance in uti patients: a comparison between community acquired and hospital acquired E. coli .*National Journal of Community Medicine* Vol 3 Issue 2 April-June 2012
- [12] Shah DA, Wasim S, Abdullah FE. Antibiotic resistance pattern of Pseudomonas aeruginosa isolated from urine samples of Urinary Tract Infections patients in Karachi. *Pakistan. Pakistan Journal of Medical Sciences*. 2015;31(2):341-5. 17
- [13] Dr. Kavya S., Dr. Anuradha K. Comparison of bacteriological profile and susceptibility patterns to empiric antibiotics in hospital and community acquired urinary tract infection. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 15, Issue 3 Ver. VI (Mar. 2016), pp 05-09
- [14] Shanmugapriya S, Saravanan T, Janani K . Antibiotic sensitivity pattern to urinary tract infections in a tertiary care hospital in South India . *International Journal of Basic & Clinical Pharmacology* , June 2017 , Vol 6 , Issue 6 Page 1445-50
- [15] Rajesh K.R., Mathavi S., Priyadarshini R.I. Prevalence of Antimicrobial Resistance in Uropathogens and determining Empirical Therapy for Urinary Tract Infections. *IJBMS* 2010; 1: 5