



Original Research Article

Identification and antibiotic susceptibility pattern of urinary isolates in out-patients at a tertiary care center in a rural set up

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ABSTRACT

Background: Urinary tract infection (UTI) is most common infections described in out-patients settings. In almost all cases empirical antimicrobial treatment initiates before the laboratory results of urine culture are available, thus antibiotic resistance may increase in uropathogens due to frequent use of antibiotics.

Objective: To identify and to determine antibiotic susceptibility pattern of bacterial pathogens of urinary tract infection reporting at a tertiary care hospital in OPD only.

Study Design: Cross-sectional.

Place and Duration of Study: Department of microbiology, NKP salve institute of medical science, Lata Mangeshkar hospital, Nagpur from July to September 2018.

Methodology: A total of 33 culture positive bacterial isolates from 300 urine samples, submitted over a period of 2 months were included in this study. Identification of bacterial isolates was done by standard biochemical profile of the organism. The antibiotic susceptibility of culture positive bacterial isolates was performed by disk diffusion method as recommended by CLSI.

Result: Out of 33 culture positive samples the most prevalent bacterial isolate was E. Coli(48%) followed by klebsiella(18%), staphylococcus coagulase negative(12%). The susceptibility pattern of E. Coli showed that 81% of bacterial isolates were sensitive to Nitrofurantoin, 75% to CIS and 50% to Gentamicin. Klebsiella was most sensitive to Gentamicin and CIS. Staphylococcus coagulase negative was most sensitive to Cd and Vancomycin.

Conclusion: Majority of bacterial isolates were sensitive to nitrofurantoin, CIS, Gentamicin. Among the oral antibiotics, nitrofurantoin showed good susceptibility against Enterobacteriaceae family and gram positive organisms.

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1. Introduction

Urinary tract infection (UTI) is one of the most common syndrome encountered in general and gynaecological practices. It is the most common infection encountered in out-patients setting and hospital patients.¹ UTI is broad term that encompasses asymptomatic bacteriuria and symptomatic infection with microbial invasion and inflammation of the urinary tract.²

UTI may be community acquired or nosocomial. Community acquired infection are caused by E.coli,

Klebsiella, Pneumoniae, Proteus mirabilis, Staphylococcus, Saprophyticus or Enterococcusfaecalis.² In almost all cases of UTI, empirical antimicrobial treatment initiates before the laboratory results for urine culture are available. In the field of UTIs, there has been a steady increase in the level of resistance to commonly used antibiotics.³ Resistance pattern of microorganisms vary according to geography, from large hospital to small hospital and hospital to community. The emergence of extended spectrum beta-lactamase has threatened the empirical use of cephalosporins and ciprofloxacin.⁴ Microorganisms use various mechanisms to develop any resistance.⁴ Detection of UTI causing pathogens and resistance of these pathogens

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to commonly prescribed antibiotics in clinical set ups is essential and helpful in improving the efficacy of empirical treatment.

Very few studies available on symptomatic community acquired UTI in non-pregnants. Thereby, the present study is undertaken to find out the incidence of UTI in community and to determine the antimicrobial susceptibility patterns of commonly used antibiotics with detection of drug resistance mechanism.

2. Aim

To find the frequency of UTI in community.

To isolate the causative bacterial pathogens of community acquired UTI.

To determine the antibiotic susceptibility pattern of causative pathogens with drug resistance mechanism.

3. Materials and Methods

3.1. Place

Tertiary care center in rural set up Type of study- cross-sectional.

3.2. Sample size

300.

3.3. Duration

2 Months.

3.4. Inclusion criteria

Clinically suspected cases of uncomplicated UTI were selected from patients attending out patients department. Both willing male and female patients were included.

3.5. Exclusion criteria

1. Patients who did not had symptoms at the time of observation.
2. Patients suffering from chronic diseases and pregnant female..
3. Patients with immunosuppressive therapy.

4. Methodology

The necessary information was collected from patients using the interview technique after obtaining informed consent. Information regarding socio-demographic characteristics, hygiene and urinary symptoms were asked.

All study subjects were advised to collect the midstream urine sample in wide mouthed sterile containers after urogenital cleaning. Samples were processed within 1 hour of collection in microbiology laboratory.⁵ Screening tests

like wet film preparation and direct gram staining were performed. In Wet film preparation- presence of one pus cell /7 hpf was considered significant pyuria.⁶ Direct Gram staining- detection of one or more morphologically similar bacteria per oil immersion field was treated as significant.⁶

Urine samples were inoculated on blood agar and macConkeysagar using a standard loop method (semiquantative method).⁷ The plates were read after 24 hours of aerobic incubation at 37° C. They were further incubated for another 24 hours before a negative report is issued. A single organism obtained in counts of >100000 CFU/ml will be considered as significant bacteriuria. Further identification of pathogen was done by standard biochemical techniques.⁸

Kirby Bauer disk diffusion technique was used for antibiotic susceptibility testing of gram negative or gram positive pathogens. Interpretation of results were done according to CLSI guidelines. ATCC control strains were used.⁹

Drug resistance mechani was detected if any.¹⁰

4.1. Review of Literature

A retrospective analysis of culture isolates obtained from urine samples received at department of microbiology, St. John's Medical College Hospital, Bengaluru India, was performed between January 2012 and May 2012. According to study of Bhuvanesh Sukhlal Kalal and Savita Nagaraj on Urinary tract infection, descriptive study of causative organisms and antimicrobial pattern of samples received for culture, from a tertiary care settings, shows out of 5592 urine specimens 28.2% showed significant growth. E. Coli was most common pathogen (54.6%) followed by klesiella (9.7%).

Enterobacteriaceae was susceptible for carbapenems (93%).¹¹

According to study of Ines Linhares, Teresa Raposo, Antonio Rodrigues and Adelaide Almeida on resistance pattern of bacteria implicated in community urinary tract infection, ten years surveillance (2000-2009) 12.1% patients were positive for bacterial infection. E.Coli was the most common pathogen implicated in urinary tract infection.¹²

In study which was held in 2002 by James A. Karlowasky and team showed E.Coli was most common pathogen causing urinary tract infection in community. In 2000-2002 E.Coli was most sensitive to Nitrofurantoin and ciprofloxacin. This study is similar to our study.¹³

According to study of Sumera Sabir, Aftab Ahmad Anjum, Tayyaba Ijaz, Muhammad Asad Ali, Muti ur Rehman khan, Muhammad Nawaz on isolation and antibiotic susceptibility of E. Coli urinary tract infections in a tertiary care hospital showed E. Coli was most common pathogen causing urinary tract infection. E. Coli was most resistant to penicillin (100%), cefotaxime (89.7%), cephadrin (73.8%), tetracycline (69.4%). This study of

retrospective case series from July 2000 through June 2001 identified a total of 880 patients with positive urine culture. ⁴

In 2013 study by Satish Patil and Kanchan Mahale found that males were the most common gender compared to female but in our study female were the most common gender for causing urinary tract infection. ¹⁴

According to study done by Inam Ullah Khan and team in December 2012 found that out of total 1110 urine specimens 440 yielded bacterial growth. The incidence rate was 40% which is more than our study. They also showed that females are more prone to cause urinary tract infection than males. E. Coli was most common pathogen associated with urinary tract infection and was most susceptible to Amikacin (85%) and nitrofurantoin (73%). ¹⁵

4.2. Statistics

Statistical analysis was done by chi-square test and fisher exact test Software - Epi info software version 7.

4.3. Observation

Total number of sample = 300, Total number of isolates = 33, Frequency = 11%.

Table 1:

Name of bacteria grown	Total number
E. Coli	16
Proteus	1
Staphylococcus spp.	1
Staphylococcus coagulase negative	4
Serratia	1
Pseudomonas	2
Enterococci	1
Non fermentive growth	1
Klebsiella	6
Total bacteria grown	33

According to above survey most common organism causing urinary tract infection is E.coli followed by Klebsiella.

Sensitivity for

1. Enterobacteriaceae
2. Staphylococcus
3. Pseudomonas

As most common bacteria under enterobacteriaceae causing urinary tract infection is E.coli. E.coli is most sensitive for drug NIF(81%) followed by CIS(75%), G(50%), I(43%), CTX(43%), NX(37%), CTR(37%), IMP(37%), COT(25%) other drugs such as cotri, IONP, NF, Colistin, CIT, Poly B, DM, IMP, NR are less sensitive; less than 25%.

Non fermentive species which found is 100% sensitive for drugs G, NIF, COT, NX, CIS, CTX, CTR, IMP.

Table 2: Sensitivity for Enterobacteriaceae is as follows:

Total No. of Bact.	Species of bacteria	Drugs sensitive to bacteria																						
		G	I	NIF	COT	NX	CIS	CEF	COTRI	IONP	NF	COLISTIN	CIT	POLY B	DM	CTX	CTR	IPM	NR	IMP	L2	TE	Va	
1	Non fermentive	1		1	100	100	1									1	1		1					
16	E.coli (percent %)	8	7	1	4	6	12				1	1	1	1	2	7	6	3	1	6				
		50	43	3	25	37	75				6	6	6	6	12	43	37	19	6	37				
1	Proteus (percent%)	1	1	1	1	1	1	1	1	1										1				
6	Klebsiella (percent %)	100	100	100	100	100	100	100	100	100										100				
		6	1	4	4	3	6													6				
1	Serratia (percent %)	100	17	67	67	50	100													5	5	3	2	2
		1				1														83	83	50	33	33
1	Enterococci (percent %)	100				100														1				
		1		1	100															1				
26	Total	17	9	20	10	12	20	1	3	1	2	1	1	1	2	13	12	6	3	9	100	100	100	100
	Total Percent %	65	34	77	38	46	77	4	11	4	8	4	4	4	8	50	46	23	11	35	1	1	1	1

Most sensitive drugs for enterobacteriaceae: NIF(77%), CIS(77%), G(65%), CTX(50%), NX(46%), CTR(46%), COT(38%), IMP(35%), I(34%), IPM(23%), COTRI(11%), NR(11%), NF(8%), DM(8%), CEF(4%), COLISTIN(4%), CIT(4%), POLY B(4%), L2(4%), TE(4%), Va(4%).

Table 3: Sensitivity for staphylococcus is as follows

Sensitive drugs	Staphylococcus [Total 1 bacteria] (percent%)	Staphylococcus coagulase-ve [Total 4 bacterias] (percent%)	Total [5 bacteria]	Percentage (%)
G		1(25%)	1	20%
NIT	1(100%)	3(75%)	4	80%
COT		3(75%)	3	60%
NX		3(75%)	3	60%
Cd	1(100%)	4(100%)	5	100%
L2	1(100%)		1	20%
Va	1(100%)	4(100%)	5	100%
E		1(25%)	1	20%
TE		1(25%)	1	20%

Table 4:

Bacteria	Sensitive to number of drugs	Non sensitive to number of drugs
Staphylococcus positive (1 bacteria found)	4	5
Staphylococcus negative (4 bacteria found)	8	1

Total bacteria - 5

Total number of drugs - 9

Proteus bacteria is 100% sensitive for drugs I, G, NIF, COT, NX, CIS, CEF, COTRI.

Klebsiella is second most member of enterobacteriaceae causing urinary tract infection. The sensitivity for drugs are G(100%), CIS(100%), CTX(83%), CTR(83%), NIF(67%), COT(67%), IPM(50%), NR(33%), IMP(33%), I(17%).

Serratia is 100% sensitive for drugs G and NX. Enterococci is 100% sensitive for drugs NIF, L2, TE, Va.

Fisher Exact - 0.13

Level of significance is 0.5

Most sensitive drugs for both staphylococcus are Cd(100%), Va(80%), NIT(80%), COT(60%), NX(60%), G(20%), L2(20%), E(20%), TE(20%).

Staphylococcus bacteria causing urinary tract infection is 100% sensitive for drugs G, Cd, L2 and Va.

Staphylococcus coagulase -ve bacterias are sensitive for drugs Cd(100%) and Va(100%), NIT(75%), COT(75%), NX(75%), G(25%), E(25%), TE(25%).

5. Discussion

Bacterial infections of urinary tract are one of the frequent cause for seeking medical attention in community. Effective management of patients suffering from bacterial UTIs commonly relies on Identification of bacterial isolate and selection of an effective antibiotic agent used for treatment.

In our study, the bulk of urinary isolates were from female patients (75%) as UTIs are frequent in females due to short urethra. The most common urinary tract bacteria was found to be E.Coli(48%), a frequent causative agent of UTIs. A similar study conducted at Department of Microbiology, Armed Forces Institute of Pathology,

Rawalpindi in 2010 and at Mayo Hospital, Lahore in 2013 revealed E. Coli as most common bacteria accounting for 63% and 80% of total culture positive isolates. However, the frequency was found to be 80-90% in two similar studies carried out in Canada and Ethiopia. The study done by Satish Patil in 2013 showed, male were the most common gender compared to female. This study doesn't match with our study.

The frequency of causing Urinary Tract Infection in community was found 11%. Similar study in 2012 by Smita Sood and Ravi Gupta showed that 17% of urine samples from patients attending to OPD yielded significant pathogens. This study matches with our study. However, according to study of Inam Ullah Khan and team in 2012 incidence rate was 40% and study which was done in 2013 by Devanan Prakash and Ramchandra Sahal Saxena should 53% prevalence. This both showed higher frequency than our study. It might be due to large number of samples and patients taken from hospital acquired as well as community.

The most common pathogens called E. Coli is most susceptible to Nitrofurantoin(81%) and CIS(75%). Klebsiella is most susceptible Gentamicin and CIS. However in 2012 study by Ullah Khan and team found E. Coli was most susceptible for Amikacin(85%) and nitrofurantoin(73%). In study which was held in 2000-2002 by James A. Karlowsky and team found E.Coli was most susceptible to nitrofurantoin and ciprofloxacin. These studies are quite similar to our study.

Table 5: Sensitivity for Pseudomonas is as follows

Drugs	NIT	COT	NX	CIS	CL	Poly B	CTX	CTR	IMP
Pseudomonas	1	1	1	1	1	1	1	1	1
TOTAL (2)	1	1	1	1	1	1	1	1	1
Percentage (%)	50%	50%	50%	50%	50%	50%	50%	50%	50%

The sensitivity for drugs in pseudomonas is equal for drugs NIT, COT, NX, CIS, CL, Poly B, CTX, CTR, IMP (50%).

6. Results

According to our study the most common pathogen in community acquired urinary tract infection is E.Coli (48%), followed by klesiella(18%), staphylococcus coagulase negative (12%). The frequency rate of causing urinary Tract Infection in community is 11%. In which female(75%) are more prone to cause Urinary Tract Infection due to short urinary tract than male(25%). Most sensitive drug for E.Coli is NIF (81%) and CIS(75%), klesiella is G and CIS (100%), and for staphylococcus coagulase negative is Cd and Va (100%).

7. Conclusion

Introduction of commonest pathoge of urinary tract infection and its Antibiotic susceptibility pattern in out-patients departments will help in starting of empirical antibiotic therapy in community acquired urinary tract infection.

8. Source of Funding

None.

9. Conflict of Interest

None.

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