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Bacteriological study of uropathogens with correlation of various screening test with culture and their antimicrobial susceptibility

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ABSTRACT

Background: Urinary Tract Infection (UTI) is the most common, amongst the community and hospitalized patients suffering from bacterial infection. **Aims & Objectives:** It affects persons throughout their life span. It may be characterized as uncomplicated (occurring without an anatomic or other predisposing reason) or complicated (associated with structural or functional abnormalities of the urinary tract and kidney). A single bacterial species of *Escherichia coli*, causes majority of UTI. **Materials & Methods:** A total of four hundred twenty-six clinically diagnosed UTI cases were subjected to culture and its correlation with various screening tests such as wet film microscopy, Triphenyl Tetrazolium Chloride (TTC) and gram stain followed by its sensitivity, specificity, positive and negative productive value was determined along with its anti-microbial susceptibility. Virulence factor of *E. coli* & Extended Spectrum of Beta Lactamase (ESBL) production were also studied. **Results:** Present study showed, UTI was more common in females, 281 in number (65.96%), as compared to 145 (34.03%) in males. Cultures, sensitivity of TTC, wet film microscopy were positive in 78.22%, 81.91% & 97.41% of cases respectively. Amongst total 271 culture isolates *E. coli* were more common, highest resistance was observed to ampicillin (90.78%) followed by amoxyclav (86.64%), cotrimoxazole (82.23%) and carbenicillin (78.94%), whereas highest sensitivity noted to imipenem (100%). **Conclusion:** It is evident UTI is more common in reproductive females & in case of males in older age.

Key word: UTI, TTC, Wet film microscopy, Antibiotic susceptibility, CMMCH

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INTRODUCTION

Urinary tract infection (UTI) is one of the most common bacterial infections. The term UTI encompasses a variety of clinical entities, ranging from asymptomatic bacteriuria to cystitis, prostatitis, and pyelonephritis. UTI may be community acquired and nosocomial (generally, catheter associated).[1]

Infections of the urinary tract are most common after upper respiratory infections. However, the requests for detection of bacteriuria far exceed those for detection of respiratory pathogens. Most upper respiratory infections are only mildly symptomatic and majority of the times have a viral etiology; therefore, medical intervention is not needed. In contrast, urinary tract infections are usually caused by bacteria and require antimicrobial therapy for elimination of the infectious organisms. The infections may be symptomatic or asymptomatic, and either type of infection may cause serious sequelae if untreated.[2]

Recent studies confirm that uropathogenic *E.coli* have several attributes that are lacking in commensal *E. coli*. They carry chromosomal gene clusters on "Pathogenicity Island", encoding adhesions and other virulence factors. The most important among them are adhesion that helps them to adhere to uroepithelium, these include type 1, type S, and type P fimbriae and adhesions. The role of P fimbriae in upper UTI is well documented and can be detected by mannose resistant hemagglutination (MRHA) of human erythrocytes.

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The most significant change in resistance among uropathogens has been the increase in the prevalence of resistance to newer generation of cephalosporins and fluroquinolones.

Urinary tract infection continues to pose a challenge to the physicians and microbiologists due to their common occurrence, progressive course, leading to serious complications and their increasing resistance to antibiotics.[3]

MATERIAL AND METHODS

The present study was carried out in the Department of Microbiology, Chandulal Chandrakar Memorial Medical College and Hospital, Durg, Chhattishgarh during July 2014 to August 2015. Hospitalized and OPD patients of all ages, either sexes, with a clinical diagnosis of UTI were included in the study.

PROCESSING OF SPECIMEN

The midstream, clean catch specimens of urine were collected in sterile universal container from both hospitalized and OPD patients with clinical diagnosis of UTI.

Urine specimens were screened for significant bacteriuria by following screening tests:

a. Wet Film Examination
b. Triphenyl Tetrazolium chloride reduction test (TTC test)
c. Gram Staining.

CULTURE

Urine specimens from 426 clinically diagnosed UTI patients were subjected to culture for identification of different micro-organisms.

Quantitative culture

Calibrated bacteriological loop (calibrated to 1µl) was used to inoculate urine sample to the culture media (Blood agar and MacConkey agar).

IDENTIFICATION OF BACTERIA[4]

All bacteria are identified by routine standard technique.

Virulence characteristics of uropathogenic *E. coli:*

For this procedure we are followed

1. Detection of hemolysin production
2. Haemagglutination test.

Statistical analysis

Sensitivity, specificity, positive and negative predictive value were calculated according to the following formulae

1. Sensitivity = True positive/(True positive + False negative), the probability that the screening test will be positive in patients with urinary infection (positive culture).
2. Specificity = True negative/(True negative + false positive) the probability that the screening test will be negative in patients without urinary infection (negative culture).
3. Positive predictive value = True positive/(True positive + false positive), the probability that urinary infection is present when the screening test is positive.
4. Negative predictive value = True negative/(True negative + False negative), the probability that a urinary tract infection is not present when the screening test is negative.

True positive stands for (Screening test & culture both positive), False positive stands for (Positive screening test & negative culture), True negative stands for (Screening test & culture both negative) & False negative stands for (Screening test negative & culture positive).[5]

ANTIMICROBIAL SUSCEPTIBILITY TEST

Antimicrobial susceptibility test was performed by using Kirby Bauer disc diffusion method by following the Clinical Laboratory Standards Institute (CLSI) guidelines.

All Enterobacteriaceae were tested against the anti microbial agent: amikacin (30 mcg), ampicillin(10 mcg), cefotaxime (30 mcg), cotrimoxazole (30 mcg), gentamicin (10 mcg), nitrofurantoin (300 mcg), norfloxacin(10 mcg), tetracycline (30 mcg), ciprofloxacin (5 mcg), gatifloxacin (5 mcg), carbenicillin (100 mcg), amoxyclav (30 mcg), cephalothin (30 mcg), cefazolin (30 mcg), cefuroxime (30 mcg), imipenem (10 mcg).

For Gram positive cocci, penicillin (10 unit), nitrofurantoin (300 mcg), norfloxacin (10 mcg), cotrimoxazole (25 mcg), gatifloxacin (5 mcg), oxacillin (1 mcg), gentamicin (10 mcg), amikacin (30 mcg), tetracycline (30 mcg), ciprofloxacin (5 mcg), vancomycin (30 mcg), linezolid (15 mcg) were used.

Pseudomonas aeruginosa was tested against norfloxacin (10 mcg), cotrimoxazole (25 mcg), carbenicillin (100 mcg), gatifloxacin (5 mcg), cefotaxime (30 mcg), ceftazidime (30 mcg), piperacillin (100 mcg), piperacillin-tazobactam (100/10 mcg), imipenem (10 mcg), aztreonam (30 mcg), gentamicin (10 mcg), amikacin (30 mcg), tetracycline (30 mcg), ciprofloxacin (5 mcg), colistin(10 mcg).

Extended spectrum β lactamase(ESBL) production in *Escherichia coli*, *Klebsiella pneumonia* & *Proteus* spp. was tested as per CLSI guidelines.[6]

RESULTS

The study was carried out in the Department of Microbiology, Chandulal Chandrakar Memorial Medical College & Hospital, Durg, Chhattishgarh during July 2014 to August 2015.

Urine samples from total 426 clinically diagnosed UTI patients were included in the study. Of the total 426 samples 184 samples were collected from OPD patients and 242 were collected from hospitalized patients.

Age and sex distribution of the patients with UTI is shown in Table 1. It shows that, UTI was more common in females accounting for 281 (65.96%) cases as compared to 145 (34.03%) males. In females majority of patients were in age group of 21 to 30 yrs, 95 (22.30%), followed by age group of 31 to 40 yrs, 89 (20.89%), while in males the infection is more frequently encountered in the age group> 50 yrs (8.92%).

Table 2 show out of the total 426 samples, significant growth was detected in 271 samples. 96 (35.42%) were from the OPD patients and 175 (64.57%) were from the hospitalized patients.

Table 3 shows results of various screening tests. It is observed that of the total 426 samples, 244 (57.27%) were TTC positive, pus cells were seen in 235 (55.16%) samples on microscopy, whereas organisms were observed in 281 (65.96%) samples on Gram staining. Table 4 shows correlation of culture with TTC test.

Sensitivity = 212/(212+59) x 100 = 78.22%

Specificity = 123/(123 + 32) x 100 = 79.35%

Positive predictive value = 212/(212 + 32) x 100 = 86.88%

Negative predictive value = 123/(123 + 59) x 100 = 67.58%

Table 1: Age and sex distribution of cases of UTI

Age group (year)	Male (%)	Female (%)	Total (%)
<10	13 (3.05)	21 (4.92)	34 (7.98)
11-20	17 (3.99)	12 (2.81)	29 (6.80)
21-30	31 (7.27)	95 (22.30)	126 (29.57)
31-40	30 (7.04)	89 (20.89)	119 (27.93)
41-50	16 (3.75)	19 (4.46)	35 (8.21)
> 50	38 (8.92)	45 (10.56)	83 (19.48)
Total	145 (34.03)	281 (65.96)	426 (100)

Of the total 244 TTC positive samples, 212 were both TTC as well as culture positive and showed sensitivity of 78.22% while 123 samples were both culture as well as TTC negative showing specificity of 79.35%. False positive TTC was seen in 32 samples and false negative was in 59 samples and giving positive and negative predictive value of 86.83% and 67.58% respectively. Table 5 shows correlation of culture with wet film microscopy.

Sensitivity = 222/(222 + 49) x 100 = 81.91%

Specificity = 142/(142 + 13) x 100 = 91.61%

Positive predictive value = 222/(222 + 13) x 100 = 94.46%

Negative predictive value = 142/(142 + 49) x 100 = 74.34%

Of the total 235 microscopy positive samples, 222 were both microscopy as well as culture positive and showed sensitivity of 81.91% while 142 samples were both culture as well as microscopy negative and showed specificity of 91.61% False positive results were seen in 13 samples and false negative results were in 49 samples, giving positive

Table 2: Culture positive among OPD and hospitalized patients

Patients	Culture positive (%)
OPD	96 (35.42)
Hospitalized	175 (64.57)
Total	271

Table 3: Screening tests

Test	Positive samples n=426	Percentage
TTC	244	57.27
Microscopy	235	55.16
Gram Stain	281	65.96

Table 4 : Correlation of culture with TTC test

Culture	TTC Test				Total
	Positive	Percentage	Negative	Percentage	
Positive	212	78.23	59	21.77	271
Negative	32	20.65	123	79.35	155
Total	244	57.27	182	42.72	426

Table 5: Correlation of culture with wet film microscopy

Culture	Microscopy				Total
	Positive	Percentage	Negative	Percentage	
Positive	222	81.92	49	18.08	271
Negative	13	8.39	142	91.61	155
Total	235	55.16	191	44.83	426

and negative predictive value of 94.46% and 74.34% respectively. Table 6 shows correlation of culture with Gram stain.

Table 6: Correlation of culture with gram stain

Culture	Gram stain				Total
	Positive	Percentage	Negative	Percentage	
Positive	264	97.42	7	2.58	271
Negative	17	10.97	138	89.03	155
Total	281	65.96	145	34.03	426

Table 7: Distribution of uropathogens among OPD and hospitalized patients

Organism	Outpatient (%) n=96	Inpatient (%) n=187	Total (%) n=283
Gram negative bacilli	83 (86.45)	166 (88.77)	249 (87.98)
E. coli	65 (67.70)	87 (46.52)	152 (53.71)
K. aerogenes	5 (5.20)	14 (7.48)	19 (6.71)
K. pneumonia	6 (6.25)	20 (10.69)	26 (9.18)
P. aeruginosa	5 (5.20)	31 (16.57)	36 (12.72)
P. mirabilis	1 (1.04)	8 (4.27)	9 (3.18)
P. valgaris	0 (0.00)	2 (1.06)	2 (0.70)
C. koseri	1 (1.04)	1 (0.53)	2 (0.70)
C. freundii	0 (0.00)	1 (0.53)	1 (0.35)
Enterobacter spp.	0 (0.00)	2 (1.06)	2 (0.70)
Gram positive Cocci	13 (13.54)	21 (11.22)	34 (12.01)
S. aureus	0 (0.00)	5 (2.67)	5 (1.76)
S. saprophyticus	10 (10.41)	3 (1.60)	13 (4.59)
S. epidermidis	1 (1.04)	7 (3.74)	8 (2.82)
Enterrococcus spp.	2 (2.08)	6 (3.20)	8 (2.82)

Table 8: Hemolysin and haemagglutination production among uropathogenic *E. coli* (n=152)

Test	Positive strains (%)
Hemolysin	47 (30.92)
Haemagglutination	79 (51.97)
MRHA	51 (64.55)
MSHA	28 (35.44)

Sensitivity = 264/(264+7) x 100 = 97.41%

Specificity = 138/(138 + 17) x 100 = 89.03%

Positive predictive value = 264/(264 + 17) x 100 = 93.95%

Negative predictive value = 138/(138 + 7) x 100 = 95.17%

Of the total 281 positive samples, 264 were both Gram stain as well as culture positive showed sensitivity of 97.41% while 138 samples were both culture as well as Gram stain negative showed specificity of 89.03% False positive results were seen in 17 samples and false negative results were in 7 samples giving positive and negative predictive value of 93.95% and 95.17% respectively.

Of the 271 cultures positive, total bacterial isolates were 284. Out of which 265 were monomicrobial whereas two types of organisms were detected in 6 samples.

Distribution of uropathogens between OPD and hospitalized patients is shown in Table 7. It is observed that the maximum no. of bacterial isolates were from hospitalized patients, 187 (66.07%) as compared to OPD patients, 96 (33.92%).

Hemolysin and haemagglutination production among the uropathogenic *E.coli* is shown in table 8. Hemolysin production was observed in 30.92% stains of uropathogenic *E.coli*, whereas haemagglutination was seen in 51.97% strains. The haemagglutination type distribution showed that amongst the 79 haemagglutnating *E.coli* 51 (64.55%) were mannose resistant haemagglutinating type, while the 58 (35.44%) isolates showed mannose sensitive haemagglutinating.

Table 9 showed antimicrobial resistance of uropathogens. Out of total 152 *E.coli* highest resistant was observed to ampicillin

Table 9: Antibiotic resistance of *Enterobacteriaceae isolates*

Antibiotic	*E. coli* (%) n=152	*Klebsiella* spp. (%) n=45	*Proteus spp.* (%) n=11	*Enterobacter* spp. (%) n=2	*Citrobacter* spp. (%) n=3
Nitrofurantoin	14 (9.21)	18 (40)	5 (45.45)	1 (50)	1 (33.33)
Norfloxacin	84 (55.26)	17 (37.77)	4 (36.36)	2 (100)	1 (33.33)
Cotrimoxazole	125 (82.23)	36 (80)	9 (81.81)	2 (100)	0 (0.00)
Carbenicillin	120 (78.94)	35 (77.7)	9 (81.81)	2 (100)	0 (0.00)
Gatifloxacin	49 (32.23)	14 (31.11)	5 (45.45)	0 (0.00)	1 (33.33)
Ampicillin	138 (90.78)	42 (93.33)	10 (90.90)	2 (100)	3 (100)
Amoxyclav	132 (86.84)	40 (88.88)	10 (90.90)	2 (100)	3 (100)
Cephalothin	47 (30.92)	15 (33.33)	6 (54.54)	1 (50)	1 (33.33)
Cefazolin	47 (30.92)	15 (33.33)	6 (54.54)	1 (50)	1 (33.33)
Cefuroxime	41 (26.97)	14 (31.11)	5 (45.45)	1 (50)	1 (33.33)
Cefotaxime	38 (25)	13 (28.88)	4 (36.36)	0 (0.00)	0 (0.00)
Imipenem	0 (0.00)	2 (4.44)	1 (09.09)	0 (0.00)	0 (0.00)
Gentamicin	52 (34.21)	27 (60)	3 (27.27)	1 (50)	1 (33.33)
Amikacin	23 (15.13)	10 (22.22)	2 (18.18)	0 (0.00)	0 (0.00)
Tetracycline	128 (84.21)	38 (84.44)	9 (81.81)	2 (100)	2 (66.66)
Ciprofloxacin	79 (51.97)	17 (37.77)	6 (54.54)	1 (50)	1 (33.33)

(90.78%) followed by amoxyclav (86.64%), cotrimoxazole (82.23%) and carbenicillin (78.94%), whereas lowest resistance were seen to nitrofuratoin (9.21%) and amikacin (15.13%), 100% sensitivity were noted against imipenem.

A nearly similar pattern was seen amongst *Klebsiella spp*. Isolates with 93.33% strains resistant to ampicillin followed by amoxyclav 88.9%, cotrimoxazole 80% and carbenicillin 77.7%. Lowest resistance was seen against imipenem (4.44%) and amikacin (22.22%).

In *Proteus spp*. isolates 90.09% strains were resistant to ampicillin and amoxyclav each. 81.81% strains showed resistance to cotrimoxazole & carbenicillin, while lowest resistant was seen against imipenem (9.09%), amikacin (18.18%) and gentamicin (27.27%).

Table 10: Antibiotic resistance of *Enterobacteriaceae* isolates among OPD patients

Antibiotic	*E. coli* (%) n=65	*Klebsiella* (%) n=11	*Proteus* spp. (%) n=1	*Citrobacter* spp. (%) n=1
Nitrofurantoin	5 (7.69)	03 (27.27)	01 (100)	0 (0.00)
Norfloxacin	32 (49.23)	02 (18.18)	01 (100)	0 (0.00)
Cotrimoxazole	50 (76.92)	09 (81.81)	01 (100)	0 (0.00)
Carbenicillin	51 (78.46)	09 (81.81)	01 (100)	01 (100)
Gatifloxacin	20 (30.76)	02 (18.18)	0 (0.00)	0 (0.00)
Ampicillin	57 (87.69)	10 (90.90)	01 (100)	01 (100)
Amoxyclav	54 (83.07)	08 (72.72)	01 (100)	01 (100)
Cephalothin	18 (27.69)	03 (27.27)	0 (0.00)	0 (0.00)
Cefazolin	18 (27.69)	03 (27.27)	0 (0.00)	0 (0.00)
Cefuroxime	16 (24.61)	02 (18.18)	0 (0.00)	0 (0.00)
Cefotaxime	15 (23.07)	02 (18.18)	0 (0.00)	0 (0.00)
Imipenem	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Gentamicin	19 (29.23)	04 (36.36)	0 (0.00)	0 (0.00)
Amikacin	09 (13.84)	02 (18.18)	0 (0.00)	0 (0.00)
Tetracycline	54 (83.07)	09 (81.81)	01 (100)	01 (100)
Ciprofloxacin	32 (49.23)	03 (27.27)	0 (0.00)	0 (0.00)

In *Enterobacter spp*. and cirobacter spp. 100% resistant was seen to ampicillin and amoxiclav whereas 100% sensitivity was seen to imipenem and amikacin.

Table 10 shows antimicrobial reistance amongst OPD patient. All the OPD isolates were 100% sensitive to imipenem. Highest reistance was noted ampicillin and amoxyclav. *Citrobacter spp* and *proteus spp* were 100% resistance to both the drug. 87.69% of *E.coli* isolates and 90.9% of *klebsiella spp*. isolates were resistant to ampicillin. Lowest resistant amongst *E.coli* isolates was observed for imipenem (0.00%), nitrofurantoin (7.69%) and amikacin (13.84%). In *klebsiella spp*. Imipenem (0.00%), norfloxacin (18.18%), gatifloxacin (18.18%), cefuroxime (18.18%), cefotaxime (18.18%) and amikacin (18.18%) showed lowest resistance.

Table 11 showed antimicrobial resistance amongst hospitalized patient. All the isolates showed highest resistance to ampicillin and amoxyclav. *Citrobacter spp* and *proteus spp* were 100% resistant to both drug. 93.1% of *E.coli* and 94.11% of *klebsiella spp*. isolates were resistant to ampicillin. Lowest resistance amongst *E.coli* isolates was observed for imepenem (0.00%), nitrofurontoin (10.34%) and amikacin (16.09%). In *klebsiella spp* imipenem (5.88%), amikacin 8(23.52%), gatifloxacin (35.29%) and cifrofloxacin (41.17%) showed lowest resistance.

Proteus spp showed maximum reistance to ampicillin (90%) and amoxyclave (90%), followed by clotrimoxazole (80%), carbenicillin (80%) and tetracycline (80%).

Enterobacter spp and *Citrobacter spp* showed 100% resistance to ampicillin and amoxiclav and they were 100% sensitive to imipenem and amikacin.

Table 11: Antibiotic resistance of *Enterobacteriaceae* isolates among hospitalized patients

Antibiotic	*E. coli* (%) n=87	*Klebsiella* spp. (%) n=34	*Proteus* spp. (%) n=10	*Enterobacter* spp. (%) n=02	*Citrobacter* spp. (%) n=02
Nitrofurantoin	9 (10.34)	15 (44.11)	4 (40)	1 (50)	1 (50)
Norfloxacin	52 (59.77)	15 (44.11)	3 (30)	2 (100)	1 (50)
Cotrimoxazole	75 (86.20)	27 (79.41)	8 (80)	2 (100)	0 (0.00)
Carbenicillin	69 (79.31)	26 (76.47)	8 (80)	2 (100)	0 (0.00)
Gatifloxacin	29 (33.33)	12 (35.29)	5 (50)	0 (0.00)	1 (50)
Ampicillin	81 (93.10)	32 (94.11)	9 (90)	2 (100)	2 (100)
Amoxyclav	78 (89.65)	31 (91.17)	9 (90)	2 (100)	2 (100)
Cephalothin	29 (33.33)	12 (35.29)	6 (60)	1 (50)	1 (50)
Cefazolin	29 (33.33)	12 (35.29)	6 (60)	1 (50)	1 (50)
Cefuroxime	25 (28.73)	12 (35.29)	5 (50)	1 (50)	1 (50)
Cefotaxime	23 (26.43)	11 (32.35)	4 (40)	0 (0.00)	1 (50)
Imipenem	0 (0.00)	2 (5.88)	1 (10)	0 (0.00)	0 (0.00)
Gentamicin	33 (37.93)	23 (67.64)	3 (30)	1 (50)	1 (50)
Amikacin	14 (16.09)	8 (23.52)	2 (20)	0 (0.00)	0 (0.00)
Tetracycline	74 (85.05)	29 (85.29)	8 (80)	2 (100)	1 (50)
Ciprofloxacin	43 (49.42)	14 (41.17)	6 (60)	1 (50)	1 (50)

Table 12 shows out of the total pseudomonas isolates maximum reistance was observed to tetracycline (91.66%), followed by cotrimoxazole (75%), carbenicillin (75%), aztreonam (75%) and piperacillin (66.66%). All the isolates were 100% sensitive to imipenem. Lowest resistance was seen in piperacillin tazobactum (19.44%), colistin (22.22%), ceftazidime (25%) and amikacin (25%).

Table 13 shows antimicrobial resistant among Gram-positive isolates. Of the *S.aureus* isolates highest resistant was observed to tetracycline (100%) and cotrimoxazole (60%). Whereas 100% sensivity were noted for gatifloxacin, ciprofloxacin, vancomycin and linezolid. Amongst total coagulase negative staphylococci maximum resistant was observed against penicillin (80.95%), cotrimoxazole (71.42%), gentamycin (47.61%) and tetracycline (47.61%). *Enterococcal spp* showed highest resistance to penicillin (75%) and tetracycline (75%) and were 100% sensitive to vancomycin and linezolid.

Table 12: Antibiotic resistance in *Pseudomonas* isolates

Antibiotic	OPD patients (%) n=5	Hospitalized patients (%) n=31	Total isolates (%) n=36
Norfloxacin	03 (60)	17 (54.83)	20 (55.55)
Cotrimoxazole	03 (60)	24 (77.41)	27 (75.00)
Carbenicillin	04 (80)	23 (74.19)	27 (75.00)
Gatifloxacin	01 (20)	15 (48.38)	16 (44.44)
Cefotaxime	01 (20)	11 (35.48)	12 (33.33)
Ceftazidime	00 (00)	09 (29.03)	09 (25.00)
Piperacillin	01 (20)	23 (74.19)	24 (66.66)
Piperacillin-tazobactam	00 (00)	07 (22.58)	07 (19.44)
Imipenem	00 (00)	00 (00.00)	00 (00.00)
Aztreonam	01 (20)	25 (80.64)	26 (72.22)
Gentamicin	03 (60)	13 (41.93)	15 (44.44)
Amikacin	01 (20)	08 (25.80)	09 (25.00)
Tetracycline	04 (80)	29 (93.54)	32 (91.66)
Ciprofloxacin	01 (20)	16 (51.61)	17 (47.22)
Colistin	00 (00)	08 (25.80)	08 (22.22)

It is observed form the table that ESBL producer showed higher resistance to most of the antibiotics as compared to non producer ones.

DISCUSSION

The study was carried out in the Department of Microbiology, Chandulal Chandrakar Memorial Medical College & Hospital, Durg, Chhattishgarh from July 2014 to August 2015.

A total of 426 OPD and hospitalized patients with the clinical diagnosis of UTI of Chandulal Chandrakar Memorial Medical College & Hospital, were studied. Female (65.96%) were more frequently infected than the male (34.03%).[7]

On the other hand 271 (63.61%) were culture positive, 244 (57.27%) were TTC positive, 235(55.16%) were wet film microscopy positive & 281(65.96%) were gram stain positive.[8-10]

In the present study the total bacterial isolates were higher in hospitalized patient (66.54%) as compared to OPD patient (33.45%).[11]

In our study, *E.coli* was a common pathogen followed by *Klebsiella pneumonia*. Gram positive pathogens were more common in OPD patients (13.54%) as compared to indoor patients (11.22%). The overall prevalence of enterococci in our study is 2.82%.[3]

On the other hand, out of 152 uropathogenic *E.coli*, we found 30.92% hemolytic strains. Haemagglutination production in our study is found to be 51.97%.[12]

We also found the high resistance in hospitalized as compared to OPD patients (Tables 11 & 12). Gram

Table 13: Antibiotic resistance pattern of gram positive isolates

Antibiotics	OPD patient		Hospitalized patient			Total isolates		
	CONS (n=13)	*Enterococcus* spp. (n=3)	*S.aureus* (n=5)	CONS (n=8)	*Enterococcus* spp. (n=5)	*S.aureus* (n=5)	CONS (n=21)	*Enterococcus* spp. (n=8)
Nitrofurantoin	3 (23.03)	0 (0.00)	2 (40)	2 (25)	2 (40)	2 (40)	5 (23.8)	2 (25)
Norfloxacin	4 (30.76)	1 (33.33)	1 (20)	3 (37.5)	3 (60)	1 (20)	7 (33.3)	4 (50)
Cotrimoxazole	8 (61.53)	-	3 (60)	7 (87.5)	-	3 (60)	15 (71.42)	-
Gatifloxacin	2 (15.38)	-	0 (0.00)	2 (25)	-	0 (0.00)	4 (19.04)	-
Penicillin G	10 (76.92)	2 (66.66)	2 (40)	7 (87.5)	4 (80)	2 (40)	17 (80.95)	6 (75)
Oxacillin	2 (15.38)	-	2 (40)	3 (37.5)	-	2 (40)	5 (23.8)	-
Gentamicin	4 (30.76)	-	2 (40)	6 (75)	-	2 (40)	10 (47.61)	-
Amikacin	3 (23.07)	-	1 (20)	3 (37.5)	-	1 (20)	6 (28.57)	-
Tetracycline	4 (30.76)	2 (66.66)	5 (100)	6 (75)	4 (80)	5 (100)	10 (47.61)	6 (75)
Ciprofloxacin	2 (15.38)	1 (33.33)	0 (0.00)	3 (37.5)	2 (40)	0 (0.00)	6 (28.57)	3 (37.5)
Vancomycin	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Linezolid	2 (15.38)	0 (0.00)	0 (0.00)	4 (50)	0 (0.00)	0 (0.00)	6 (28.57)	0 (0.00)

Table 14: Antibiotic resistant among ESBL producer and non producer

Antibiotic	ESBL producer n=70 (%)	Non ESBL producer n=180 (%)
Nitrofurantoin	22 (31.42)	17 (09.44)
Norfloxacin	55 (78.57)	72 (40.00)
Cotrimoxazole	59 (84.28)	140 (77.77)
Gatifloxacin	42 (60.00)	43 (23.88)
Amoxyclav	54 (77.14)	135 (75.00)
Imipenem	3 (04.28)	0 (00.00)
Gentamicin	52 (74.28)	48 (26.66)
Amikacin	31 (44.28)	13 (07.22)
Tetracycline	70 (100.00)	143 (79.44)
Ciprofloxacin	48 (68.57)	69 (38.33)

negative isolates of hospitalized & OPD patients showed maximum resistance to ampicillin & cotrimoxazole. However comparatively less resistance was seen with nitrofurantoin, amikacin & imipenem.[13]

We also observed ESBL production in 70 (28%) out of total 250 Gram negative isolates.[14]

1. From the above discussion and summary, it is evident that urinary tract infection is more common amongst females especially in reproductive age group, while in males it is common in the older age group.
2. Uncerntrifuged Gram staining as a screening test was found to be more sensitive as compared to other sceening test, however, the significant bacteriuria as an alternative to culture, as false results do occur.
3. The study revealed that hemolysin production and hemagglutination typing are useful marker for uropathogenic E.coli.
4. It is quite alarming to note that almost all of the isolates included in our study were found resistant to two or more antibiotics.

CONCLUSION

UTI was more common amongst female. Uncentrifuged Gram staining as screening test was found to be more sensitive as compare to other screening test. Knowledge of resistance pattern of bacterial strains in a geographical area will help to guide the appropriate and judicious antibiotic use. With the spread of ESBL producing strains in hospitals all over the world, it is necessary to know the prevalence of ESBL positive strains in a hospital so as to formulate a policy of empirical therapy.

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SB, SKE and AP- Conceptualized study, literature search, statistically analyzed and interpreted, prepared first draft of manuscript and critical revision of the manuscript; **DHC-** Concept of study, collected data and review of study.

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