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Aerobic bacterial profile and antimicrobial resistance in bacterial isolates causing urinary tract infection in patients attending at integral institute of medical sciences and research hospital Lucknow

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Abstract
Background: Emergence of antibacterial resistance and production of extended spectrum β-lactamases (ESBLS) are responsible for the frequently observed empirical therapy failures. Most countries have experienced rapid dissemination of esbls producing Enterobacteriaceae isolates, particularly *E. coli* and *Klebsiella pneumoniae*. Esbls are clinically significant and when detected, indicate the need for the use of appropriate antibacterial agents. But antibacterial choice is often complicated by multi-resistance.
Methods: This study was carried from January to June study the multidrug resistant (MDR) Enterobacteriaceae and ESBL producing *E. coli* among urine isolates in hospital setting. Isolates from urine samples were primarily screened for possible ESBL production, ampc production, mbl production followed by phenotypic confirmation. Antibiotic susceptibility testing (AST) was done by Kirby Bauer disk diffusion method following Clinical and Laboratory Standard Institute (CLSI) guidelines.
Results: Total number of 354 sample were included in this study. Out of which 149 sample were positive by culture. The culture was positive for Enterobacteriaceae and non Enterobacteriaceae family. In this study total 149 (42.09%) sample were positive for culture. Out of 149 sample 95 samples were positive for Enterobacteriaceae and 54 samples were positive for non Enterobacteriaceae. Enterobacteriaceae included 75(50.33%) *E. coli*, 14 (9.39 %) *Klebsiella*, 5(3.35%) Proteus, 1 (0.67%) Citrobacter. Other non enterobacteriace isolates were 2(1.34%) Acinetobacter, 2(1.34%) Pseudomonas, 9(6.04%) Staphylococcus, 1(0.67%) Streptococcus, 29(19.46%) Enterococcus and 11(7.38%) Candida. Total 354(100%), Positive 149(42.09%), Resistance 58(38.93%0), Esbl 30 (51.72%), 19 *E.coli*, 10 *Klebsiella*, 1 Proteus, Ampc17 (29.31%), 10 *E.coli*, 6 Klebsiella, 1 Proteus, Mbl4 (6.89%), 3 *E.coli*, 1 Proteus, Mrsa5(8.62%), 5 Staphylococcus, Vre2(3.44%), 2 Enterococcus.
Conclusions: Using the phenotypic confirmatory test forwarded by the CLSI, relatively significant *E. coli* isolates tested were ESBL producers. Also high numbers of MDR organisms were isolated among Enterobacteriaceae. Isolates showed significant resistance to the commonly prescribed drugs. These findings suggest for further study in this field including the consequences of colonization with MDR and ESBL-producing bacteria both in the community and in the hospital setting.

Keywords: antibiotic resistance, *E. coli*, enterobacteriaceae, ESBL, multidrug resistance, urine, UTI

1. Introduction
A urinary tract infection (UTI) occurs when one or more parts of the urinary system (kidneys, ureters, bladder, or urethra) become infected with a pathogen (most frequently, bacteria). UTIs most commonly occur in females; about 50% of all females get a UTI during their lifetime. Many UTIs are not serious but if infection reaches the kidneys, serious illness, and even death, can occur. UTI is characterized as being either upper urinary tract (ureter, kidney) or lower Urinary tract (bladder, urethra) based on anatomic location of the infection. (Patrick *et al*., 2013) [1]. Lower UTI may infect the urethra and the bladder (cystitis). Upper UTI affects the ureter (ureteritis), or renal parenchyma (pyelonephritis). Urinary tract infections (UTIs) are among the most common infectious diseases occurring in either the community or healthcare setting (Nicolle L *et al*., 2005) [2]. Uncomplicated UTIs Typically occur in the healthy adult non-pregnant woman, while complicated UTIs (cUTIs) may occur in all sexes and age groups and are frequently associated with either structural or functional urinary tract abnormalities. Examples include foreign bodies such as calculi (stones), indwelling catheters or other drainage devices, obstruction, immunosuppression, renal failure, renal transplantation and pregnancy (Lichtenberger *et al*., 2008) [3]. cUTI in the elderly is always complicated in men with prostatic hypertrophy and in post-menopausal women who may have an increased post-void residual volume particularly the development of antimicrobial resistance, is more common in cUTI. The causative uropathogens included *Escherichia coli* (86%), *Staphylococcus saprophyticus* (4%), *Proteus* species (3%), *Klebsiella* species (3%), *Enterobacter* species (1.4%), *Citrobacter* species (0.8%), and *Enterococcus* species (0.5%). Other less-frequent isolates in aggregate caused 1.3% of infections (Gupta, *et al*., 1999). *Escherichia coli* often occurs in the community and *E. coli* is one of the commonest organisms causing urinary tract infections (UTIs) the choice of agents to treat these infections is diminishing. Asymptomatic bacteriuria (ASB) is common in the elderly, rising with age to >50% in women and >35% in men over the age of 80 years (Wagenlehner, *et al*. 2005) [8]. They occur mainly in specialist units and are often hospital acquired (Livermore, *et al*. 2007). Bladder infections are the most common type of UTI. Some individuals may have few or no symptoms; however, the usual symptoms include dysuria (pain or burning during urination), low abdominal pain, and/or

urine that is cloudy or smells bad or unusual. (Patrick, *et al.*, 2013) [1]. The quantitative criterion appropriate for the microbiological identification of significant bacteriuria is generally considered to be at least 10^8 cfu/mL. In some specific groups it is less: for men $\geq 10^6$ cfu/mL; and for women with symptoms of UTI it is $\geq 10^5$ cfu/mL. (Intercollegiate, *et al*., 2006) [7] Extended-spectrum β-lactamases (ESBLs), which confer resistance to and hydrolyzed the extended-spectrum cephalosporins like ceftazidime, cefotaxime, monobactam-aztreonam and related oxyimino β-lactams as well as older penicillins and cephalosporins are produced by many gram negative bacteria. AmpC β- lactamases are clinically significant, since these confer resistance to cephalosporins in the oxyimino group (cefotaxime, ceftazidime, ceftriaxone), 7-α methoxy cephalosporins (cefoxitin or cefotetan) and are not affected by available β-lactamase inhibitors (clavulanate, sulbactam, tazobactam) (Phillipon, *et al*., 2002) [11]. MBLs are broad–spectrum enzymes that hydrolyse most beta lactam antibiotics, except monobactams, and are not inhibited by conventional β- lactamase inhibitors like clavulanic acid or sulbactam. High rates of multi-drug resistance have been observed among enterobacteriaceae uropathogens, (87.4%). Very high resistance was reported to Ampicillin, followed by cotrimoxazole and Chloramphenicol. Isolates of *K. pneumonia* and *E. coli* were the principal MDR isolates. Overall prevalence of CPE (carbapenese producing enterobactericeae) 2.73 has been Reported take in study. *Tsakris et al., 2015* found 93.3 per cent of patients with MBL were males and concluded that male gender was an independent high risk association. From North India, 20 % of *P. aeruginosa* (Delhi) and 20.7 % of Gram-negative organisms (Aligarh) and 47.8% *E.coli*, 17.3% *P. aeruginosa*, *13% K. pneumoniae* (Kolkota) were reported as AmpC β – lactamase Producers (Manchanda, *et al*., 2003) [14]; (Suranjana, A, *et al*., 2005). From South Indian states, 24.1 % of *Klebsiella* spp. and 37.5 % of *E. coli* were AmpC producers from Chennai*;* In Karnataka, 3.3 % of *E. coli*, 2.2 % of *K. pneumoniae*, 5 % of *C. freundii*, and 5.5 % *E. aerogenes*were found to harbour AmpC enzymes (Ratna Subha *et al*., 2003;) [10]. We have planned this study to evaluate the aerobic bacterial profile of isolates causing urinary tract infection their ressistance to various antimicrobial agents.

2 Aim & Objectives of the Study

AIM: To determine aerobic bacterial profile and antimicrobial resistance in bacterial isolates causing urinary tract infection in patient attending Integral Institute of Medical Science Research Hospital Lucknow.

Objectives

1. To isolate and identify the various pathogens from the cases of urinary tract infection.
2. To find out the types of antimicrobial resistance among the bacterial isolates tests.

3. Material and Methods

It is observational study of clinically suspected cases of urinary tract infection attending the OPD and IPD of Integral Institute of Medical Science And Research Hospital. Samples would be sent to microbiology laboratory for bacteriological examination

3.1 Statistical Analysis

The categorical data will be analyzed by calculating proportion. Mean & standard deviation will be calculated for quantative data. The chi square test will be used to see the association among categorical variable. $p<0.05$ will be taken as significant. From the clinically suspected patients of urinary tract infection, will be take clean midstream.

1. The sample will be inoculated on cystine lactose electrolyte deficient agar (CLED), MaConkey agar and blood agar plates.
2. After culture for differentiation of isolates gram positive and gram negative will be done by gram stain smear. Smear will be examined under oil immersion.
3. Uropathogens will be identified on the basis of gram's reaction, colony morphology, motility, catalase test, oxidase test, and standerd biochemical test like-triple sugar iron agar, hydrogen sulfide test, phenylalnine deaminase test, indole test, Methyl red test, voges proskauer test, nitrate reduction test, urease test, citrate utilization test.

3.2 Antimicrobial Susceptibility Test

The antimicrobial susceptibility testing will be done by Kirby-Bauer's Disk Diffusion Method on Mueller Hinton Agar and interpreted as per Clinical Laboratory Standard Institution guidelines (CLSI. 2014) and antibiotics disk will be use according to bacterial isolate.

3.3 Detection of Antibiotic Resistance

3.3.1 Extended Spectrum Beta Lactamase (esbl) Detection

Disc Diffusion Test (CLSI M100 S24., 2015)

Procedure - Standard inoculums of test strains will be prepared according to McFarland 0.5 turbidity standard and Mueller Hinton agar plate will be inoculated by lawn culture method. The lawn of test strain will be exposed to:

1. Cefotaxime (30µg)- Cefotaxime clavulnic acid (30µg/10µg) &
2. Ceftazidime (30µg) - Ceftazidime clavulnic acid (30µg/10µg).

Interpretation: After 16-18 hours incubation ≥ 5 mm diameter increase in a zone diameter for either antimicrobial agent tested in combination with clavulnic acid the zone diameter of the agent when tested in alone will be confirm ESBL producing by the strain (CLSI., 2015) [13]

3.3.2 Ampc disc test (Black, *et al*., 2005) [18]

Procedure– All gram negative bacilli which yield ≤ 18mm zone size for cefoxitin (30µg) and also resistance against 3rd generation cephalosporins, will be tested for AmpC enzyme production by AmpC disc test. On Mueller Hinton agar plate, we will do a lawn culture of *E.coli* ATCC 25922. A cefoxitin (30µg) would be placed on the lawn culture. Another sterile plain/ Tris EDTA disc would be inoculated with several colonies of the test strain (disc would be rehydrated with 20µl of sterile saline). This inoculated disc would be placed with inoculated face down on the lawn culture beside the cefoxitin (30µg) (almost touching it).

Interpretation- After overnight incubation at 37ºC. Plates will

be examined for either an indentation or flattening of the zone of inhibition.

3.3.3 Imipenem- EDTA Disc Test (Yong *et al*., 2002) [15]

The IMP-EDTA test will be performed to detect MBL production. The overnight broth cultures of test isolates (opacity adjusted to 0.5 McFarland opacity standard) will be inoculated onto Mueller-Hinton agar plates as lawn culture according to the National committee for clinical laboratory standards recommendations. Imipenem-EDTA disk method (CDT) will be performed as described by Yong *et al*. A lawn culture of test isolates will prepared. After allowing it to dry for five minutes, two 10µ imipenem discs, one alone imipenem and one with EDTA imipenem disc,(commercially available imipenem EDTA) will be placed on the surface of agar plates approximately 30mm apart. The plates were incubated overnight at 37°C.

Interpretation*:* An increase in zone diameter of ≥ 7mm around imipenem +EDTA disk in comparison to imipenem disk alone indicated production of MBL.

4. Result

Total number of 354 sample were included in this study. Out of which 149 sample were positive by culture. The culture was positive for Enterobacteriaceae and non Enterobacteriaceae family. In this study total 149 (42.09%) sample were positive for culture. Out of 149 sample 95 samples were positive for Enterobacteriaceae and 54 samples were positive for non Enterobacteriaceae. Enterobacteriaceae included 75(50.33%) *E. coli*, 14 (9.39 %) *Klebsiella*, 5(3.35%) Proteus, 1 (0.67%) Citrobacter. Other non enterobacteriace isolates were 2(1.34%) Acinetobacter, 2(1.34%) Pseudomonas, 9(6.04%) Staphylococcus, 1(0.67%) Streptococcus, 29(19.46%) Enterococcus and 11(7.38%) Candida.

Table 1: Culture Positive Isolates

0rganism	NO.	%
E. coli	75	50.33%
Klesiellsa	14	9.39%
Proteus	5	3.35%
Citrobacter	1	0.67%
Acinetobacter	2	1.34%
Pseudomonas	2	1.34%
Staphylococcus	9	6.04%
Streptococcus	1	0.67%
Enterobacter	29	19.46%
Candida	11	7.38%
Total	149	100%

Table 2; Antimicrobial resistance among type of culture isolates

Total		354(100%)
Positive		149(42.09%)
Resistance		58(38.93%0)
ESBL	30 (51.72%)	19*E.coli* 10 *Klebsiella* 1 Proteus
Ampc	17 (29.31%)	10 *E.coli* 6 Klebsiella 1 Proteus
MBL	4(6.89%)	3 *E.coli* 1 Proteus
MRSA	*5(8.62%)*	*5 Staphylococcus*
VRE	*2(3.44%)*	*2 Enterococcus*

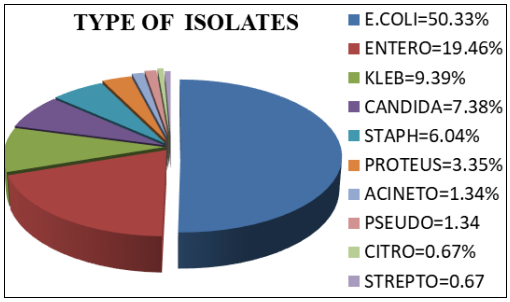

Fig 1: Types of isolates in %

Table 3: Culture Positive Male and Female

Total No. Sample	IPD	OPD	IPD M	IPD F	OPD M	OPDF	IPD M (+) P	IPD F (+) P	OPD M (+) p	OPD F (+) P
354	225	129	97	127	43	86	35	55	12	40

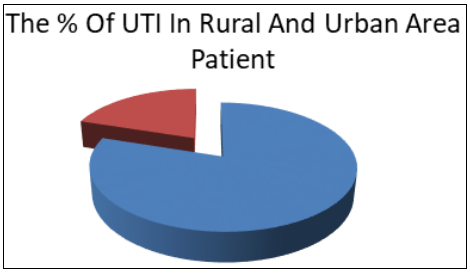

Fig 2: Graphical distribution of patient in rural and urban area

Table 4: Socio Economic Status

	NO. of Patient	%
upper	1	0.28%
middle	70	20%
lower	183	80%
total	354	100%

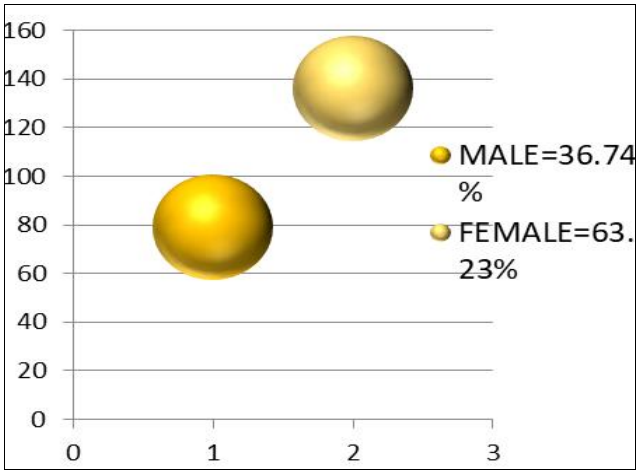

Fig 3: Positive culture Ratio among Male and Female UTI

Table 5: Distribution Of Patient Age in study population

Age	Number	Percentage (%)
0 – 10	55	15.53
11 – 20	32	9.03
21 – 30	89	25.14
31 – 40	56	15.81
41 – 50	55	15.53
51 – 60	40	11.9
61 – 70	18	5.08
71 – 80	7	1.97
81 – 90	1	0.28
91 – 100	1	0.28

Table 6: Results of Culture in Indoor Patients

Department	Sample	Male	Female	Positive male	Organism	Positive female	Organism
Medicine	57	20	37	8	4 *E.coli* 2 *klebsiella* 1 *enteococcus* 1 *citrobacter*	*15*	7*E.coli 1Klebsiella* 4*Enterococcus* 3 *Staphylococcus 1candida*
Surgery	43	32	11	12	4 *klebsiella 2 E. coli* 1 *pseudomonas 2staphylococcus* 2 *enterococcus* 1 *proteus*	*2*	2*E.coli* 1 Enterococcus Sz
Casuality	42	19	23	7	6 *E.coli* 1 *enterococcus*	11	4 *E.coli* 1*klebsiella* 7 *Enterococcus* 1 *Citrobacter* 1 *candida*
Pediatrics	35	23	12	7	4 *E.coli* 1 *candida* 1 *enterococcus* 1*staphylococcus*	6	*3enterococcus 1staphylococcus* 1*candida 1 E.coli*
Orthopedics	5	1	4	0	*0*	2	1 *candida* 1 *E.coli*
Opthalmoloy	3	0	3	0	*0*	3	1*acinetobacter*
Skin/VD	3	1	2	0	*0*	1	*E. coli*
TB/Chest	4	1	3	1	1 *E.coli*	2	1 *Entero* 1 *E.coli*
OBS & Gynaecology	32	0	32	0		11	7 *E.coli* 1 *proteus* 1 *staphylococcus* 1 *candida* 1 *klebsiella*

Table 7: Results of Culture Indoor Patients

Department	S	M	F	P(+) Male	Organism	P(+) Female	Organism
Medicine	36	21	15	9	5 *E.coli* 3 *Pseudomonas* 1 *enterococcus*	10	7 *E.coli* 3 *Enterococcus* 1 *Pseudomonas*
Surgery	19	10	9	3	2 *E. coli*1 *Proteus*	2	2 *E.coli* 1 *Enterococcus* 1 *Klebsiella*
Casuality	0	0	0	0	*0*	0	*0*
Pediatric	16	10	6	2	1 *Enterococcus* 1 *E.coli*	3	3 *E.coli*
Orthopedics	4	3	1	0	*0*	0	
Opthomology/ENT	0	0	0	0	*0*	0	
Skin/VD	2	0	2	0	*0*		
TB/Chest	0	0	0	0	*0*	0	*0*
OBS & Gyne	48	0	48	0	*0*	26	15 *E.coli* 4 *Klebsieella* 2 *Enterococcus* 2 *Staphylococcus* 1*proteus Mirabilus 1 Candida*

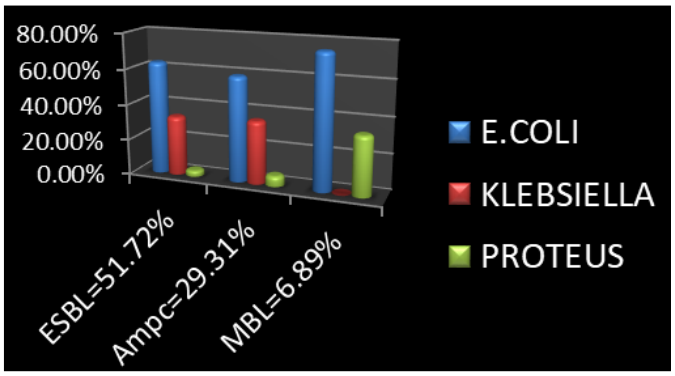

Fig 4: Types of resistance gram negative isolates

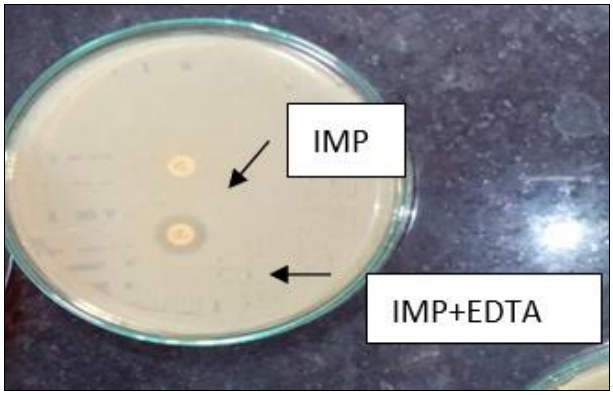

Fig 5A: MBL Production

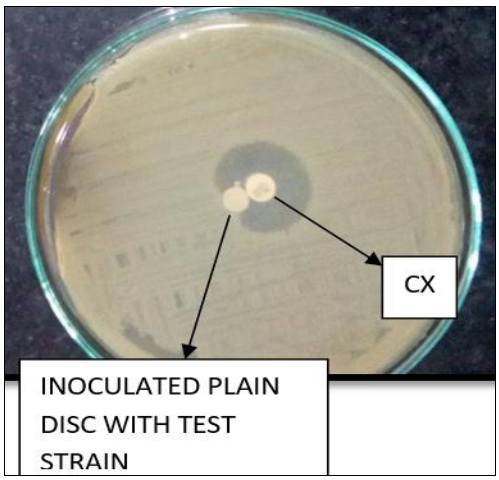

Fig 5B: AmpC Production

5. Discussion

This study evaluates the susceptibility and resistance pattern of bacterial strains isolated from community acquired UTIs, health acquired UTI at IIMS&R in Lucknow (U.P). This study provides valuable laboratory data and allows comparison of the situation in IIMS&R Lucknow with other parts of the country. The results show that 14.68% of urine samples from patients attending the outpatient clinics at our hospital yielded significant pathogens and 25.42% of urine samples from patients attending Inpatient of our hospital yielded significant pathogens. Community acquired infection is less than other study (Sood *et al*., 2016). The culture positive rate for community acquired uropathogens was higher in our study than that reported at Aligarh, India (10.86%) (Akram *et al*., 2007) [22]

The result of this study showed that female UTI (63.23%) and male UTI (36.74%) were similar with UTIs reported in 62.42% of females and in 37.67% of males in another study (Sood *et al*., 2016).

It has been extensively reported that adult women and (61 years or more) or males had a higher incidence of UTI (49.23%) compared to the elderly females (21.75%). have a higher prevalence of UTI than men, principally owing to anatomic and physical factors. (Akram *et al*., 2007) [22]. This is probably because with the advancing age, the incidence of UTI increases is men due to prostate enlargement and neurogenic bladder (Chandrasekhar *et al*., 2006). elderly 61 years or more (7.62%).

In this study Enterobacteriaceae are major causes of UTI (64%) than non Enterobacteriaceae (36%). In Enterobacteriaceae family species *E. coli* is most frequent causes of UTI 75 (50.33%) *E. coli*, 14(%) *Klebsiella*, 5(9.39%) *Proteus*, 1(3.35%) *Citrobacter*. Non Enterobactericae agent causes the UTI are 2(1.34%) *Acinetobacter*, 2(1.34%) *Pseudomonas*, 9(6.04%) *Staphylococcus*, 1(0.67%) *Streptococcus*, 29(19.46%) *Enterococcus*, 11(7.38%) *Candida*.

The second most prevalent species in my study was Enterococcus 29(19.46%) Another study has reported Enterococcus species (9.24%) (*Sood et al., 2012).* Non fermenter isolated in this study was (2.25%)

In this study showed Ampc, A/S, Amp, in Citrobacter showed 100% resistance. In Saudi Arabia study, the high antibiotic resistance against ampicillin and co-trimoxazole, nalidixic acid, ciprofloxacin, tetracycline, norfloxacin against UTI.

In this study total number of 149 sample was positive, 51 strain of Enterobacteriaceae found resistance. 1 Ampc of *E. coli* found without ESBL only cefoxitin resistanse. All resistance of Ampc found correlated with ESBL in which 30 (20.13%) ESBL producer included organism *E.coli* 19 (63.33%), *Klebsiella* 10 (33.33%), *Proteus* 1 (3.33%).

Table 8: Percentage distribution of extended spectrum beta‾ lactamase Ambler classification, Matello- β- lactamase producing uropathogens isolated over the study period

Organism	ESBL	Ampc	MBL
	(n=30)	(n=17)	(n=4)
E.coli	19 (63.33%),	10 (58.82%)	3 (75%)
Klebsiella	10 (33.33%),	6 (35.29%)	0 (0%)
Proteus	1 (3.33%)	1 (5.88%)	1 (25%)

In this study all imipenem resistance showed MBL producer 3 resistance imipenem, 1 intermidiate showed MBL producer. All (4) MBL producer showed correlation with ESBL and Ampc producer. This study correlated with another study at Puducherry, India. *(*Noyal *et al*., 2008).

In this study showed that pyuria associated bacteuria. how which similar to each other. Pyuria means 1 pus cell seen 7 field per HPF (uncentrifuged urine) have taken significant in this study. In this study most cases have pyuria but not have culture positive I have concluded that patient have significant Asymtomatic pyuria. The reason may be patient have another infection like clamydial infection, tuberculosis infection and

fungal infection cancerous condition according to previous study. In this study we find four patient of asymptomatic bacteuria which have no complication of UTI (infrequent urination, no pain and burning during urination, fever. Four patient have no bacteuria only pyuria not have any complication had been associated with tuberculosis, cancer, other physiological abnormality.

The drawbacks of this study are the relatively small sample size and simple screening method for detection of ESBL, Ampc, MBL and not use for any molecular level detection which enzyme responsible for ESBL like as (CTX-M, SHV, TEM) and Ampc enzyme (Plasmidic AmpC beta-lactamase eg. DHA-1, CMY-2) MBL, (blaIMP-1 genes, bla(VIM) genes).PCR and other molecular method use in present time at research institute. This study limited only bacterial culture not use other culture like tuberculosis culture, clamydial culture.

6. Conclusion

- I have conclude that the culture positive rate for nosocomial acquired infection (40%) was almost equal to community acquired infection (40.31%) but community acquired infection in some percent higher than nosocomial acquired infection.
- As expected, *E. coli* was the most common etiological agent identified and remains susceptible to nitrofurantoin. This drug should therefore be the ideal antibiotic to use for uncomplicated UTI.
- Female UTI (63.23%) had higher incidence than in male (36.74%). This study prevalence rate was (42.09%) was so than previous study conducted at IIMS&R Luck now prevalence was (36.56%).
- Out of 354 patient consider in this research 149 were positive. I found that in which 58 sample resistance by different mechanism including β lactamase mechanism like as ESBL enzyme, Ampc enzyme, MBL enzyme in gram negative strain and gram positive have resistance against Methicillin resistance in staphylococcus (MRSA) and vancomycin resistance in *Enterococcus* (VRE).ESBL found *E.coli*, *klebsiella* and *proteus*.
- This study concluded that the prevalence of UTI resistance was (38.92%)
- This study concluded that immunocompromised people and elderly female is more susceptible for UTI.
- This study showed that the prostrate enlargement old male were more susceptibility.
- This study sometimes prove the some previous study results on pyuria causes. Pyuria is not associated only bacterial infection. Asymtomatic pyuria were associated with other disease like tuberculosis infection,clamydial infection, caculi in kidney, protrate enlargement.
- This study showed that culture positive not have pyuria were associated with immunodeficiency.

References

1. Reviewed By Charles Patrick Davis, Md, Phd on Friday. 2013 urinary Tract Infection (Uti) Pictures Slideshow: Bladder Infection Symptoms, Causes and Treatments sources© Medicine Net, 1996-2015.
2. Nicolle Complicated L. urinary tract infection in adults. Can J Infect Dis Med Microbiol. Medline Google Scholar. 2005; 16:349-60.
3. Lichtenberger P, Hooton TM. Complicated urinary tract infections. Curr Infect Dis Rep. 2008; 10:499-504. doi:10.1007/s11908-008-0081-0.CrossRefMedline
4. Nicolle LE. A practical guide to antimicrobial management of complicated urinary tract infection. Drugs Aging. 2001; 18:243-54. doi:10.2165/00002512-200118040-00002.CrossRefMedlineWeb of Science
5. Gopal Rao G, Patel M. Urinary tract infection in hospitalized elderly patients in the United Kingdom: the importance of making an accurate diagnosis in the post broad-spectrum antibiotic era. J Antimicrob Chemother. 2009; 63:5-6.doi:10.1093/jac/dkn458.Abstract/FREE Full Text
6. Neal DE Jr. Complicated urinary tract infections. Urol Clin North Am2008; 35:13 22. doi:10.1016/j.ucl.2007.09.010.CrossRefMedlineWeb of Science.
7. Scottish Intercollegiate Guidelines Network. Management of suspected bacterial urinary tract infection in adults. NHS Quality Improvement. 2006. Scotland. http://www.sign.ac.uk/guidelines/fulltext/88/index.html (7 April 2010, date last accessed).
8. Jacoby GA, Han P. Detection of Extended–Spectrum β-Lactamases in clinical isolates of *Klebsiella* pneumonia and *Escherichia coli*. J Clin Microbiol.1996; 4:908-11. [PMC free article] [PubMed]. Wagenlehner FM, Naber KG, Weidner W.
9. Asymptomatic bacteriuria in elderly patients: significance and implications for treatment. Drugs Aging 2005; 22:801-doi: 10.2165/00002512- 200522100-00001.
10. Ratna AK, Menon I, Kapur I, Kulkarni R. Occurrence & Parveen, M. *et al*. detection of Amp C β-lactamases at a referral hospital in Karnataka. Indian J Med Res. 2003; 118:29-32.
11. Phillipon A, Arlet G, Jacoby GA. Plasmid determined Amp C type β-lactamases. Antimicrob Agents Chemother. 2002; 46:1–11. [PMC free article] [PubMed]
12. Sanders CC, Sanders WE, Goering HV. In vitro antagonism of β -lactam antibiotics by cefoxitin. J Antimicrob Chemother Link 1982; 21:968-75.
13. CLSI. Perfomance Standards for antimicrobial disc susceptibility tests. CLSI:Wayne PA. 2015, 100-S15.
14. Manchanda V, Singh NP. Occurrence and detection of AmpC b-lactamases among Gram negative clinical isolates using a modified three-dimensional test at Guru Tegh Bahadur Hospital, Delhi, India. J Antimicrob Che mother. 2008; 51: 415-418.
15. Yong D, Lee K, Yum JH, Shin HB, Rossolini GM, Chong Y. Imipenem–EDTA disk method for differentiation of metallo β lactamase-producing clinical isolates of Pseudomonas spp. and Acinetobacter spp. J Clin Microbiol. 2002; 40(4):3798-801.
16. Brenwald NP, Jevons G, Andrews JM, Xiong JH, Hawkey PM, Wise R. An outbreak of a CTX-M-type beta-lactamase producing *Klebsiella pneumoniae*: the importance of using cefpodoxime to detect extended-spectrum beta-lactamases. J Antimicrob Chemother. 2003; 51:195-6.

17. Tsakris A, Poulou A, Kristo I, Pittaras T, Spanakis N, Pournaras S, Markou F. Large dissemination of VIM-2-metallo-beta-lactamase-producing Pseudomona aeruginosa strains 11causing health care-associated community-onset infections. J Clin Microbiol. 2009; 47:3524-9. [PMC free article] [PubMed]
18. Black JA, Moland ES, Thomson KS. J Clin Microbiol. Amp C disk test for detection of plasmid-mediated Amp C beta-lactamases in Enterobacteriaceae lacking chromosomal Amp C beta-lactamases. 2005; 43(7):3110-3.
19. Ambler RPT1. he structure of β-lactamases. Philos Trans R Soc Lond B. 1980; 289:321-31.
20. 20. Bush K, Jacoby GA, Medeiros AA. A functional classification 2. scheme for β-lactamases and its correlation with molecular structure. Antimicrob Agents Chemother 1995; 39:1211-33.
21. Mac Kie, Cartney pratical medical microbiology edition, 2014, 86.
22. 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; 6:6.
23. Thana Khawcharoenporn, Shawn Vasoo, and Kamal jit Singh Division of Infectious Diseases, Faculty of Medicine,Thammasat University, Pathum Thani12120, Thailand 2 Section of Infectious Diseases, Rush University Medical Center, Chicago, IL60612,USA
24. Jacoby GA. Epidemiology of extended-spectrumbeta-lacta mases, Clinical Infectious Diseases. 1998; 27(1):81-83.
25. Paterson DL. Collateral damage from cephalosporin or quinolone antibiotic therapy, Clinical Infectious Diseases, vol. 38, supplement 4, pp.S341-S345, University Hospital in Taiwan.J.Clin. Microbiol Links. 2004; 40(9):3121-3126.
26. Mac Cann, Carolyn and others. Coping mediates the relationship between emotional intelligence (EI) and academic achievement. Contemporary Educational Psychology. 2011; 36(1):60-70, 11.
27. Matthews G. Emotional intelligence, personality and task-induced stress. Journal of Experimental Psychology: Applied 12(2) Jun p 96-107.55. Morales, Erik E (2008) the resilient mind: The psychology of academic resilience. Educational Forum. 2006, 72(2):152-167.
28. Murphy ML. The Relationship of Selected Variables on Stress and Job satisfaction of Elementary School Principals. Dissertation, 1986.
29. Nelson D, Low G. Emotional Intelligence: Achieving Academic and career excellence. Upper Saddle River, NJ: Prentice – Hall, 2003.
30. Behera L, Roul SK. Performance of B.Ed. Trainee in relation to their Gender, Academic Background and Type of Institution. The Educational Review. (Indian Educational Abstracts. 2004; 47(11):6-11, 59.
31. Nicole M, Broekema Tam T, Van Timothy A, Monson Steven A, Marshall David M. Warshauer Wisconsin State Laboratory of Hygiene, Communicable Disease Division, 465 Henry Mall, Madison, Wisconsin 53706
32. 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; 6:6.
33. Borah VV, Saikia KK, Chandra P, Hazarika NK, Chakravarty R. Department of Bioengineering and Technology (VVB, KKS), Gauhati University, Guwahati, Assam, India,, Assam Received: 11-02-2015 Accepted, 2015.
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