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## Multiple Drug Resistance Pattern in UTI Patient

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**Abstract** The aim and objective of this study was to determine multiple drug resistance patterns in UTI patients an objective is to determine the antimicrobial susceptibility pattern of bacterial pathogens in the Patients of urinary tract infection, to determine the prevalence of multidrug resistant bacteria causing community acquired urinary tract infection. This observational study was conducted on UTI patients in Teerthanker Mahaveer hospital and research centre Moradabad. In this study 120 urine sample were collected in which 80 sample were found positive. The individual were advised to collect urine sample using the clean catch method or midstream method. And then antimicrobial susceptibility test done by manual culture method. Also the demographic details were collected. The collected data were analyse by statistical method. **RESULT**-The 120 urine sample was collected and out of this 80sample will found positive. In this maximum patient was found in age group20-30. The female were highly infected form UTI then male. The amoxicillin drug (75%) was mostly resistance against microorganism and highly isolated microorganism is Escherichia coli (43.75%). In this study bacteria were resists against multiple drug and the resistance were mainly found in urban area people. The bacteria were highly resist against amoxicillin (75%) and then ciprofloxacin (75%), ciprofloxacin (68.75%), ceftriaxone (57%), ofloxacin (56%), norfloxacin (48.75%), Amikacin (37.5%), Nitrofurantoin (17.5%). And isolated microorganism is Gram negative bacteria Escherichia coli (43.75%), Klebsiella pneumonia (8.75%), Citrobacter koseri (6.25%), Pseudomonas species (6.25%), Acinetobacter (3.75%, Citrobacter freundil (2.5%), Enetrobacter aerogens (2.5%), Enetrobacter cloave (1.25%). The highly isolated microorganism is Gram negative bacteria Escherichia coli (43.75%), Klebsiella pneumonia (8.75%), Citrobactekoseri (6.25%), Pseudomonas species (6.25%), Acinetobacter (3.75%), Citrobacter freundil (2.5%), Enetrobacter aerogens (2.5%), Enetrobacter cloave (1.25%). The amoxicillin were highly resist against bacteria. In this UTI is mainly causes by E.Coli gram negative bacteria .This bacteria other bacteria were develop resistant against multiple drug which is typical to treat disease. Surveillance of antibiotic resistance is necessary to the physician and patients who were develop resistance against multiple drug. The drug resistance develop in urban area according to this study to misuse and due to the lack of knowledge about antibiotic drugs. The female was more suffering form UTI and also develop resistant against antimicrobial against. The antibiotic drug which may easily resistant against is Amoxicillin, levofloxacin, ciprofloxacin, ceftriaxone, amikacin, Nitrofurantoin.

**Keywords** Multiple Drug Resistance, UTI Patient

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### Introduction

Urinary tract infection is the most common among all hospital acquired infections globally [1]. In female Urinary tract infection is the most common contamination than male. Urinary tract infection defines as the microorganism presence in urine that can't be account by the contamination [2]. UTI infected the urethra, bladder and kidney of patient.



Incidence of UTI is an excessively in woman than males. Of all infections is the most common bacterial contamination is UTI which accounting for 25% of all infections. The single pathogens species which causing more than 95% of urinary tract infection is E. Coli.

Their most common organism which mostly isolated microorganism in UTI is E. Coli. The E. Coli microorganism is accountable for hospital acquires infection they have susceptibility to increase multi drug resistance (MDR). Although the commonly availability of antimicrobial drugs [1, 4].

In UTI universasally One fifty million people were diagnosed with UTI every year. The UTI were occur all age group some times its not severe but some time it very severe disease and UTI will not treated for long time the infection was increase and damage the kidney and renal function. The women are more suspected form UTI than male because of small urethra [4].

In infant UTI may lead to serious difficulties like sepsis and Kidney scaring and kidney scaring is the most regular cause of HTN in presently youth and kidney failure in middle age [5].

In female increases risk factor of UTI because of the nonexistence of prostatic secretions, small urethra easy infection of urinary tract in pregnancy [3].

Multi drug resistance in UTI is more common in present days and the resistance pattern of microbes is different from nation to nation and state to state, big hospital to little hospital and hospital to society. In India, the difficulty of antimicrobial resistance is associate because of do to excess use and wrong of antibiotics. In related to the antibiotic resistance their was no any surveillance by government and. unsatisfactory data is presented to quantify the complication. The MDR is occurring people in India because of not sufficient information about antibiotic drug and their doses and not awareness about antibiotic resistant drug [6].

The UTI mainly affected the urethra, bladder uterus and kidney. When infection reach to the kidney it is dangerous for the patient life. The risk factor is UTI is poor personal hygiene, urine catheter, sexual intercourse, common in female because of short urethra [7].

Present days Antimicrobial resistance of microorganism is a serious health issue in health sector, because of extremely occur and spread of microorganism that are unsusceptible to management therapy. The appearance of antimicrobial resistance in treatment of Urinary tract infection (UTIs) is a serious community medical problem, mainly in developing country everywhere apart from maximum level of deficiency, lack of knowledge and poor healthful habit. There is as well high incidence of fake and specious medicine of doubtful quality in spread [8].

When the people either male and female suffering from burning micturation ,urgency of urine, frequently pass urine, Cloudy urine and many other symptoms they were susceptible to UTI. To find out the UTI infection the patient were diagnosed by physician to test the urine routine examination and the infection in not find out by this test then the doctor will done CT scan, cystoscopy x-rays and other examination will done.

And sometimes patients will develop resistance against some antibiotics then UTI is complicate to treat. In urinary tract infection mainly treated with broad-spectrum antimicrobial agents that effective equally in Gram-positive and Gram-negative microbes. The Fluoroquinolone was selected as primary substitute for empiric treatment of UTI in which resistance is possible to be of worry [2].

The antibiotic resistance is more common in different disease like tuberculosis, malaria, urinary tract infection, diarrheal disease. In previous years, many kind of strains have been observed. For example-staphylococcus aureus resist methicillin Resistance Pseudomonas aeruginosa Enterococcus resist against, Vancomycin drug.

### **Epidemiology**

The prevalence rate of UTI in developing countries is higher than the developed countries such as United States (5%–6%) [5]. Every year universally One fifty million (150 million) population were determined among Urinary tract infection several year. The Urinary tract infection (UTI) their causes and antimicrobial resistance have been altered in community and hospital acquired infection have been changed over the previous year [9].

In developing countries like India, E. Coli accounts for most of the UTI cases across all age groups, in both sexes with variable clinical presentation ranging from mild asymptomatic cases to severe complicated UTI [10].



### Classification of UTI

The Urinary tract infection from the kidney to urethral meatus which is normally sterile and resist to bacterial colonization against frequent contamination of distal urethra with bacteria...

#### 1) Uncomplicated UTIs

The causes of uncomplicated UTIs has persist stable more than the previous 2 to 3 years with E. coli bacteria infected the huge majority of patient. In the past, woman cases with uncomplicated UTIs usually continue sensitive to the sulphamethoxazole- trimethoprim mixture with the usual approach to treatment have be an experimental short-time therapy with this antimicrobial treatment.

#### 2) Complicated UTIs

Basic risk factors such as age, spinal cord injury, catheterisation and diabetes mellitus influence to complicated UTIs. In the complicated UTIs less harmful bacteria (this is infrequently cause difficulty in a normal urinary tract) can cause important injure to an irregular urinary tract. Studies has confirmed between Group B Enterococcus, streptococcal bacteraemia, Candida and Enterococcus with complicated UTIs in the old age.

### Sign and Symptoms

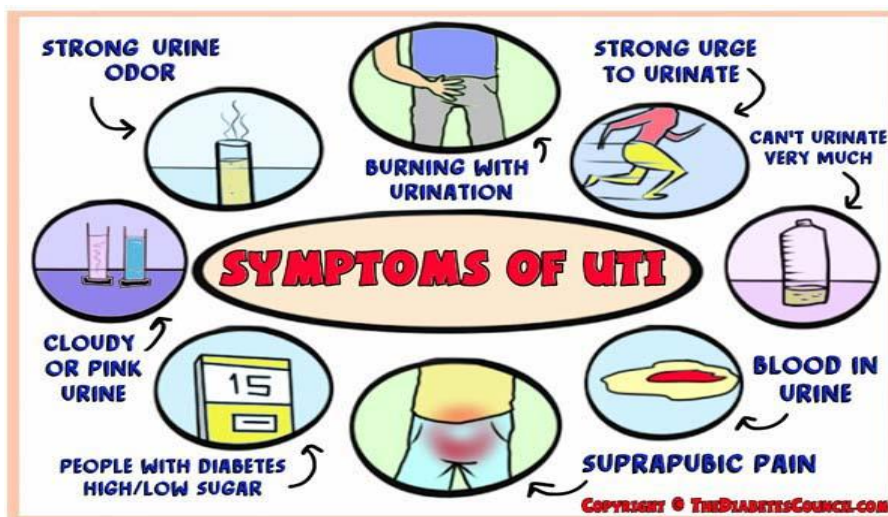


Figure 1: Sign and Symptoms

#### Risk Factor

- Female gender
- Sexual behaviour
- Birth control
- Abnormalities of the urinary tract
- Obstruction of the urinary tract
- Impaired immune system
- Using catheter
- Poor personal hygiene

#### Diagnosis of UTI

The physician were ask the patients to described the complication is occur during UTI and the patient suffering from UTI. The doctor were firstly ask for Routine urine examination and the result of this test the pus cell were present and 1-4 in normal in women and in male any number of pus cells was present that mean the patient urinary tract is infected. Then physician were start antibiotic therapy for 5 days. After that patient was no filling well then antimicrobial susceptibility test were done in clean catch or superapibic acid urine sample And the bacteria were in



24 hours isolated and then check the susceptibility against antibiotic . Some other patient was suffering from cystitis and kidney stone than other examination and surgery were required. The other diagnostic test is:

- Kidney and bladder Ultrasound
- X-rays(Voiding cystourethrogram)
- CTscan
- MRI
- Cystoscopy (11,12)

### Treatment of UTI

**Table 1:** Treatment of UTI

Antibiotic Therapy in UTI		
Condition	Antibiotic (Initial Therapy)	Therapy Duration (Total)
Acute uncomplicated cystitis	Trimethoprim-sulfamethoxazole (TMP-SMX), nitrofurantoin	3-5 days
Acute uncomplicated cystitis with comorbid conditions	Trimethoprim-sulfamethoxazole (TMP-SMX), nitrofurantoin, or fluoroquinolone	7 days
Acute uncomplicated pyelonephritis	Mild to moderately ill	Oral fluoroquinolone or trimethoprim-sulfamethoxazole (TMP-SMX)
	Hospitalized	IV fluoroquinolone or ampicillin/gentamicin or third-generation cephalosporin
Complicated UTI	Mild to moderately ill	Oral fluoroquinolone or trimethoprim-sulfamethoxazole (TMP-SMX)
	Hospitalized	IV ampicillin/gentamicin or imipenem-cilastin or fluoroquinolone or third-generation cephalosporin
Pregnancy	Amoxicillin or trimethoprim-sulfamethoxazole (TMP-SMX) (not in late third trimester) or nitrofurantoin (not in late third trimester), cephalexin	7 days
Pregnant with pyelonephritis	Hospitalized	IV ampicillin/gentamicin or third-generation cephalosporin

**Table 2:** Empiric Antimicrobial Agents for Oral Treatment UTI

Antimicrobial agents	Dosage
Amoxicillin-clavulanate	20-40mg/kg per day in 3 doses
<b>Sulphonamide</b>	
Trimethoprim-Sulphamethoxazole	6-12mg/kg trimethoprim and 30-60mg/kg sulphamethoxazole
Sulfisoxazole	120-150mg/kg per day 4 doses
<b>Cephalosporin</b>	
Cefixime	8mg/kg per day in 1 dose
Cefpodoxime	10mg/kg per day in 2 doses
Cefuroxime axetil	20-30mg/kg per day in 2 doses
Cephalexin	50-100mg/kg per day in 4 doses
Cefprozil	30mg/kg per day in 2 doses



## Aim and Objective

### Aim

To determine multiple drug resistance pattern in UTI patient.

### Objective

- To determine the antimicrobial susceptibility pattern of bacterial pathogens in the Patients of urinary tract infection.
- To determine the prevalence of multidrug resistant bacteria causing community Acquired urinary tract infection.

### Methodology

**Study design:** It is prospective observational study conducted during the period of six month. In this study positive culture 120 urine samples were included. The study was conducted at Teerthanker Mahaveer hospital and research centre Moradabad. The patients were included in the study are 120 both male and female. In this study all age group people were included. Outpatient were included with their sex, age, address, past history, family history, mensutritional status, pregnant. Most of the samples are clean catch mid-stream samples and the rest, catheter samples and supra pubic aspirates.

As samples received in microbiology laboratory for routine culture and sensitivity test was only processed during this study, no patient consent was required.

**Procedure:** As per study criteria

### Study Criteria:

#### Inclusion criteria:

This study will include all those patients in whom UTIs infection are suspected and their urine culture and antibiotic sensitivity pattern have been sent. Both paediatric and adults are included, out patients are included.

#### Exclusion criteria:

Patients urine culture and or antibiotic sensitivity pattern have not been done, before starting antibiotic therapy.

#### Urine sampling:

Urine sample collection is an important part of study that needs to be carryout under sterile conditions for the accurate diagnosis of the microorganism. The samples were collected from outdoor who suffering from symptomatic UTI and acute pain in kidney or bladder.

#### Procedure for Sample collection:

To prevent the contamination of urine from the normal flora of the urethra and urinary tract, The individual were advised to collect urine sample using the clean catch method or midstream method. This method of sample collection is applicable only for adults and cannot be done in infants or children owing to their no retractable prepuce. In catheters patients Suprapubic aspiration method were apply for sample collection .The sample was collected in red top sterile container.

### Statistical Analysis

In this study statically analysis done using the SPSS version 16.0. The statistics was apply against age, gender, microorganism and resistance drugs or chi test were apply on this data.

The results were considered statistically significant if the *P*-value was <0.05.

### Result

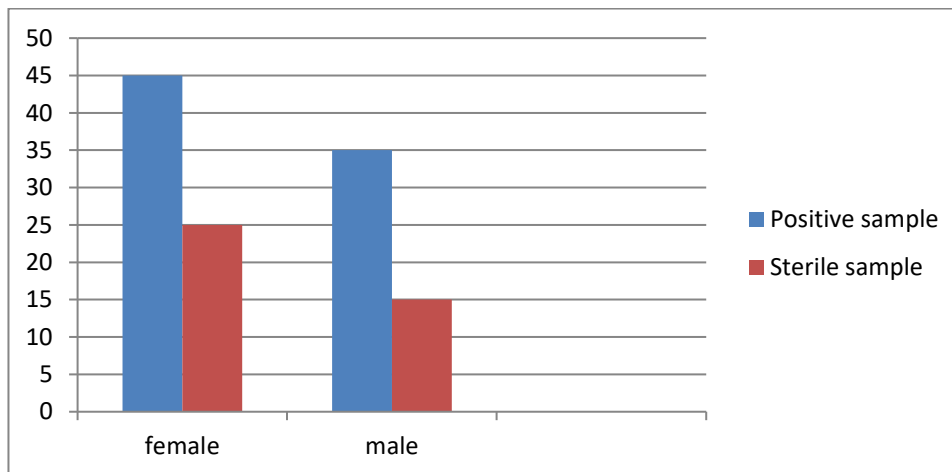
Out of the 120 urine sample were taken and 80 sample will positive and other were sterile. Out of this MDR positive sample 66.66% (n=80). In urine sample male patients were 43.75% (n=35) and female patient were 56.25%(n=45) various ages of group. The mainly isolated organism is Escherichia coli 43.35 % (n=35) was the commonest causative agent in our study. The highest numbers of patients were found between the age group 20-30.



**Table 3:** Prevalence of UTI patient of according to demographic details.

Gender	Positive Urine sample	Sterile urine sample	Total sample	P-value
Female	45	25	70	0.3246
Male	35	15	50	
<b>Age Group</b>				
<50	52	27	79	
>50	28	13	41	0.4758
<b>History of catheterization</b>				
Yes	6	15	21	0.2027
No	72	48	120	
<b>History of UTI</b>				
Yes	10	25	25	0.0525
No	70	85	85	
<b>History of menopausal</b>				
Yes	26	20	46	0.1279
no	8	13	21	
<b>Residence</b>				
Urban	45	24	69	0.4237
Rural	35	16	51	

There was not significant value was observed against male and female gender ( $P=0.3246$ ). The history of catheterization ( $P=0.0525$ ) in UTI patients. The significant UTI among past history of UTI ( $P=0.0525$ ). Maximum resistance were develop in the urban (57.5%) area people and rural area people (42.5%) because of misuse of antibiotic medicine.

*Figure 2: Positive and sterile samples in both Gender Male and Female*

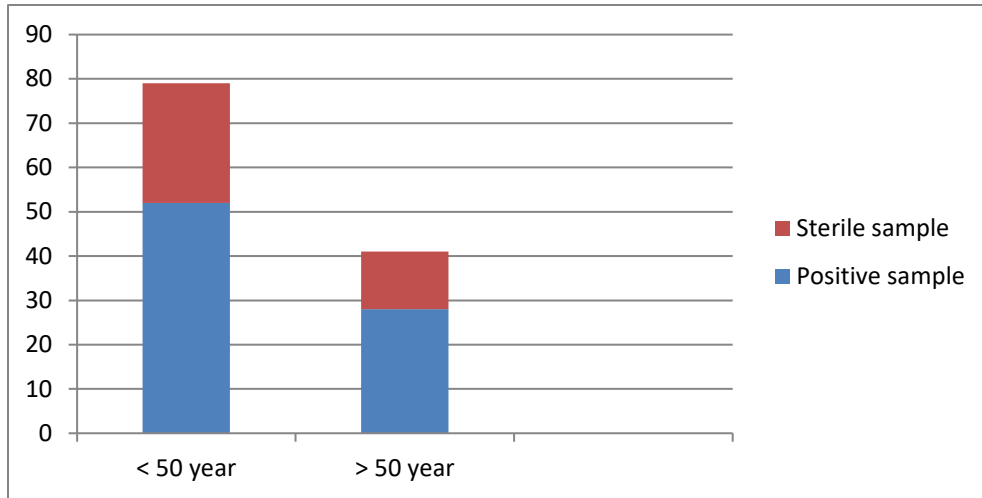


Figure 3: Age Distribution of UTI Patients

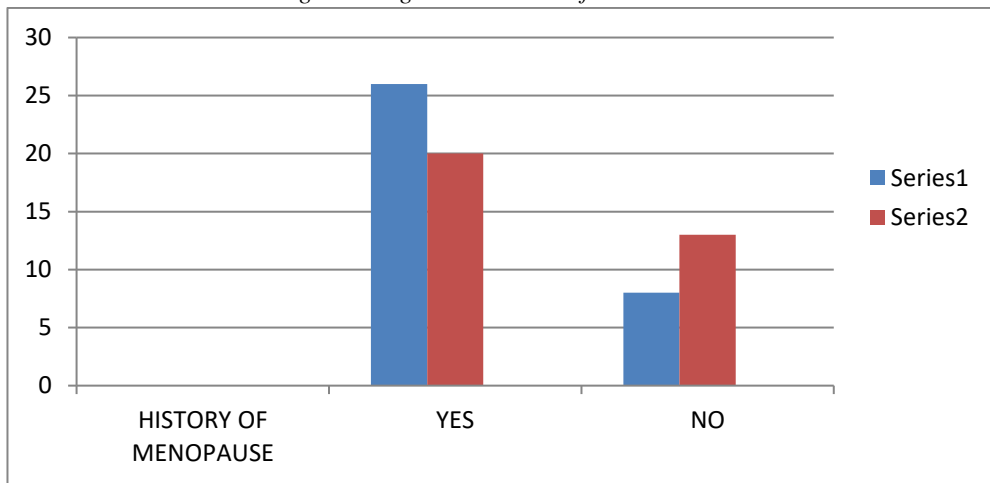


Figure 4: Menopause status of female in both positive and sterile sample

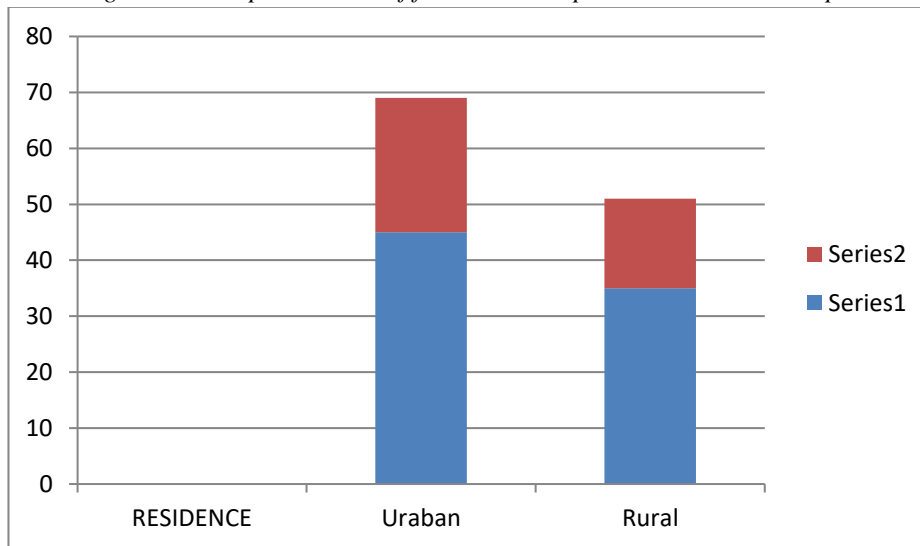


FIGURE 5: RESIDENCE OF PATIENTS WERE SEEN IN URBAN AREA



TABLE4: This table show the p-value and percentage of resistance drug

Resistance drug	AMX	CIP	LEV	CTR	OLX	AK	NOX	NRF
E.coli	29	28	25	32	24	17	15	4
Klebsiella pneumoniae	4	3	2	3	3	2	3	1
Citobacter koseri	2	0	0	2	0	1	0	4
Citobacter freundil	2	2	1	2	1	0	0	0
Pseudomonas species	3	2	2	3	2	1	2	2
Acinetobacter	2	2	4	4	4	3	1	1
Enterobacter species	2	2	1	1	1	1	1	1
Stapylococcus Aureus	5	5	3	0	3	4	4	2
Enterococcus faecalis	10	11	11	1	9	3	13	2
TOTAL	59	55	49	48	47	32	39	17
P-value	0.214	0.210	0.062	0.342	0.066	0.227	0.108	0.589
Percentage	73.5%	68.75%	61.25	60%	58.75%	40%	48.75%	21.25%

\*AMX=Amoxicillin,CIP=Ciprofloxacin,LEV=Levofloxacin,CTR=Ceftriaxone,OLX=Ofloxacin,AK=AmikacinNO R=Norfloxacin,NRF=Nitrofurantoin

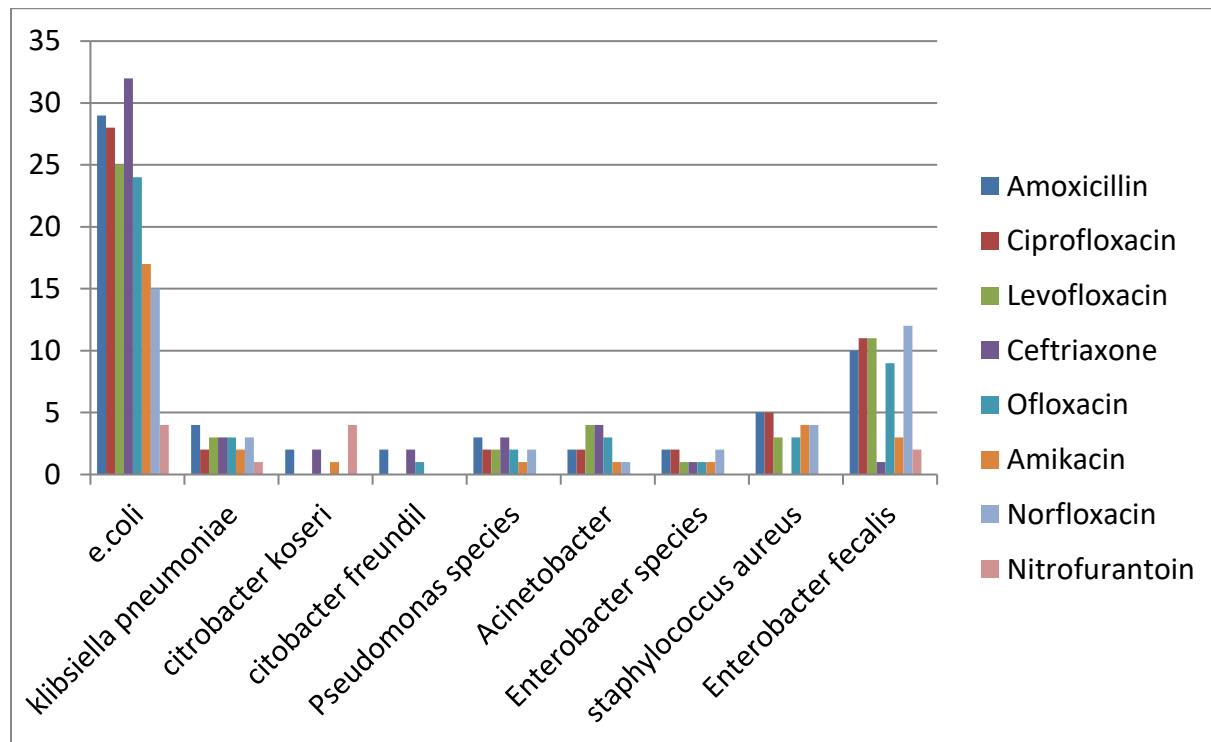


Figure 6 : This graph show the multi drug resistance against bacteria





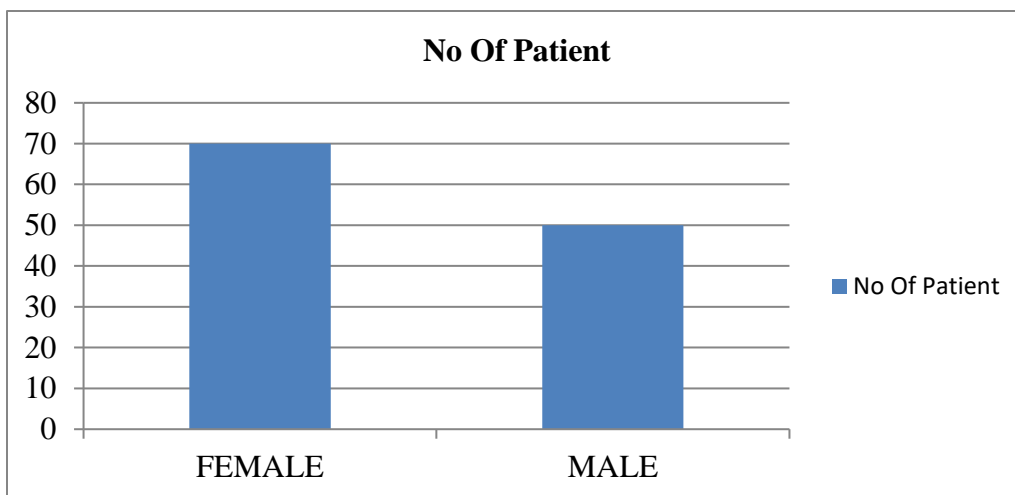


Figure:7 According to this female are more suspected form UTI

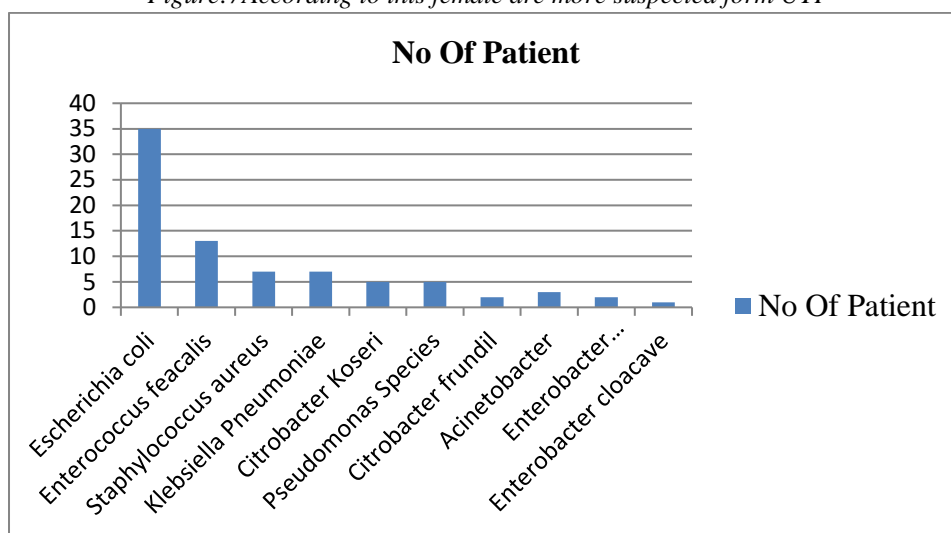


Figure:8 Isolated Microorganism in UTI Patient

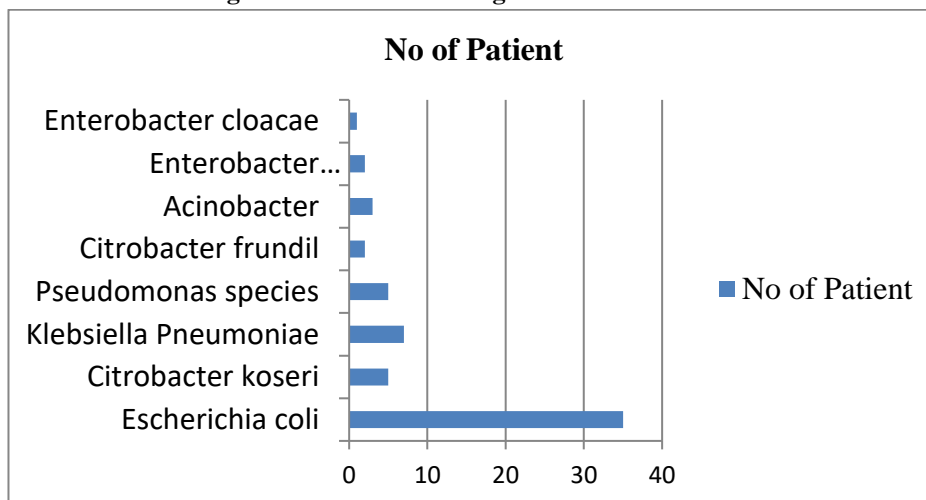


Figure: 9 Escheriachia coli were highly isolated gram negative bacteri



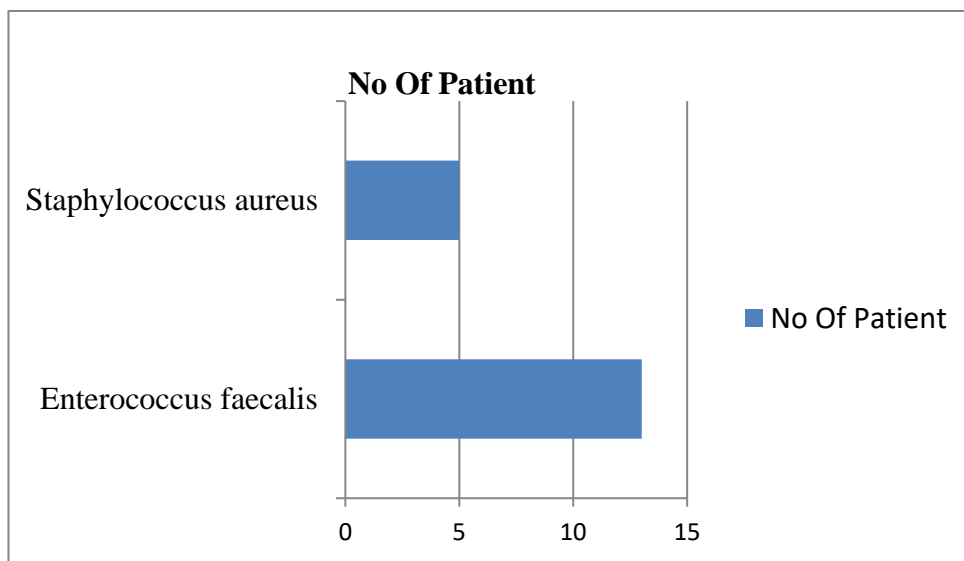


Figure: 10 Enterococcus faecalis highly isolated gram positive bacteria

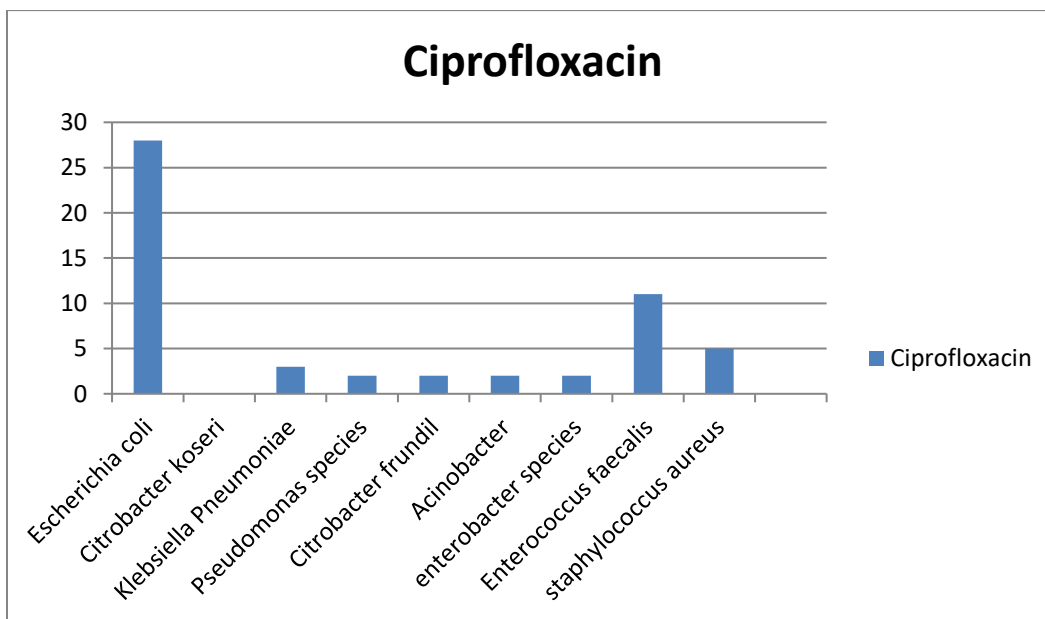


Figure11: Resistance isolated strains of ciprofloxacin

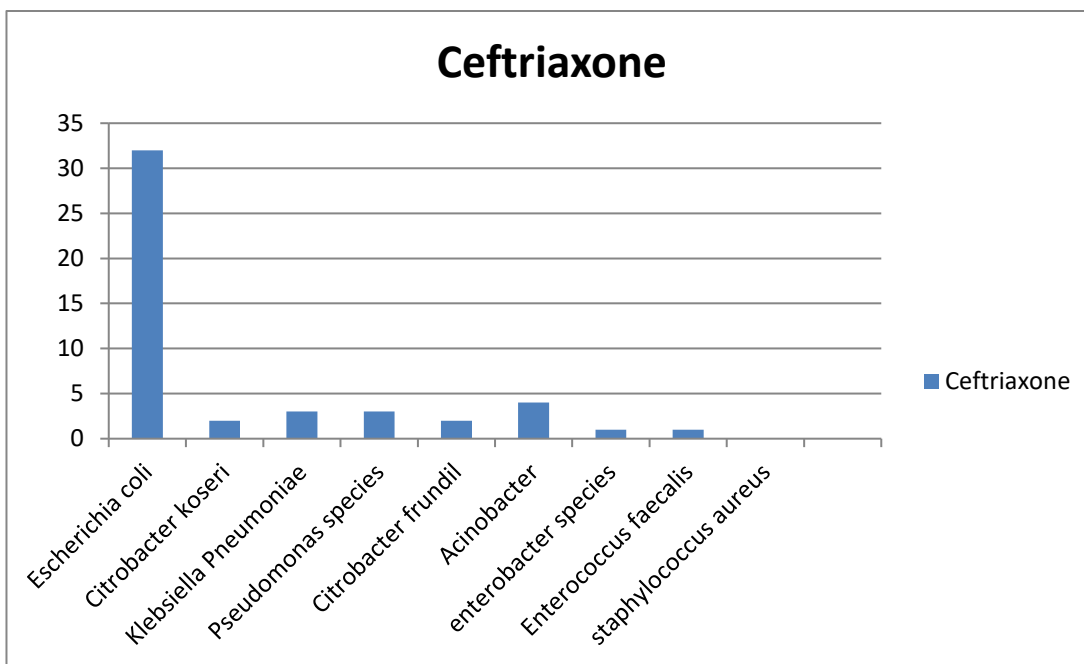


Figure12: Resistance isolated strains against ceftriaxone

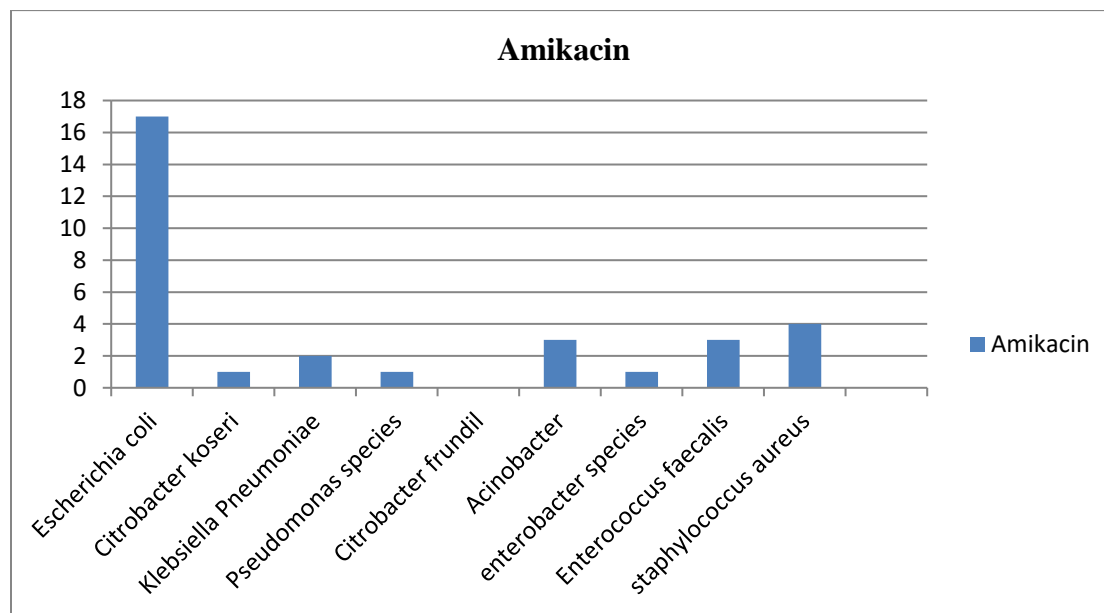


FIGURE13: Resistance isolated stains against amikacin



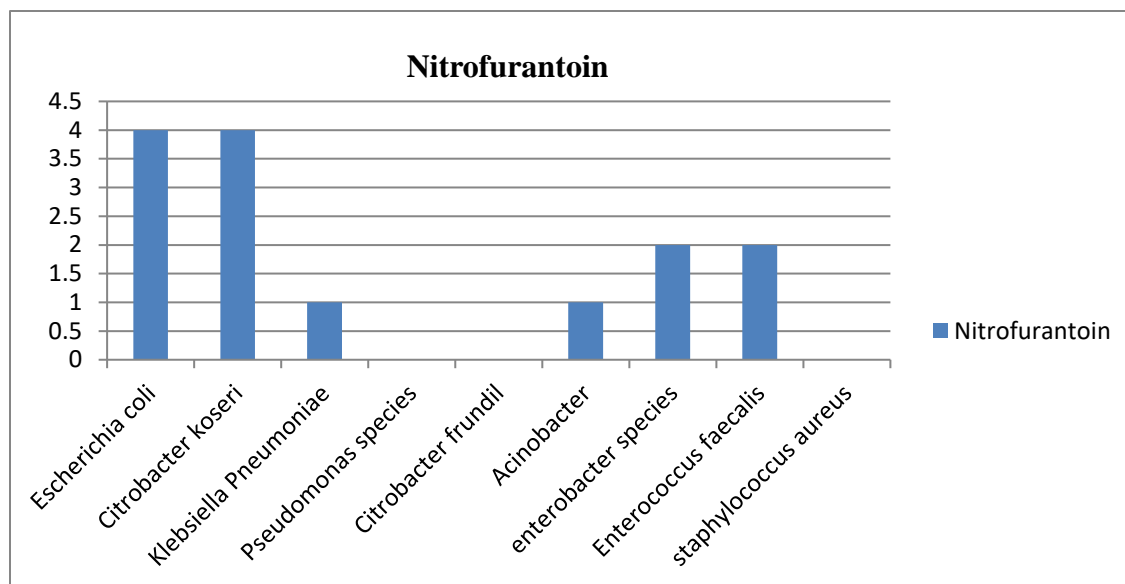


Figure14: Resistance isolated strains to nitrofurantoin

## DISCUSSION

In this study most common isolated microorganism was *Escherichia coli* in infected UTI patients. The mostly urine sample was collected by female patients. The similar study was carried out Deshmukh PM et al. (2014) (13)

The highest prevalence is occurring in the age group in 20-30 years (26.66%). The lower prevalence found in the age group of 80-90. The female are more suffering from UTI then male. In Kasi Murugan et al.(2012)(14). Study highest prevalence is also occur in 21-30 age group.

The microorganism were mostly isolated in this study is *Escherichia coli* (43.75%) gram negative bacteria in other studies like B H N Yasmeen et al.(2015) (16), this organism is also highly isolated. In this study a bacteria were show resistant against multiple drugs. The world wide estimation is 150million people diagnosed with UTI per year .In which along with the consistently increasing antibiotic resistance among the common causative agents of UTI makes the regular surveillence of the changing trends in antibiotic resistance pattern mandatory.

The mainly isolated gram positive microorganism is *Enterococcus faecalis* (16.25%), *Staphylococcus aureus* (8.75%).and Tigist Gezmu et al. (2016)(19)Study the highly isolated gram positive bacteria is *staphylococcus aureus*(20.08%).In this study maximum resistant developed against the amoxicillin and lower resistant were found against nitrofurantoin.

In Md. Tanvir Islam et al.(2013) (18)was show the similar data in the amoxicillin (90%) were highly resist against bacteria and nitrofurantoin show lower resistant against bacteria(3%). In this study nitrofurantoin were show less resistance among with other drugs the data will correlated with the study of Samidurai Nalayini et al.(2017)(20) concluded that the nitrofurantoin were show less resistance against bacteria. No significant UTI was observed in those among history of catheterization  $P=0.3246$  but Significant UTI history were observed in this study Anejo-Okopi et al(2015)(21).was observed in those with history of catheterization. In this study mostly the urban area people were develop resistance against microorganism this similar study was done Maysaloun Muhammed Abdulla et al.(2016)(22) study in this urban area people are mostly develop resistance against drug compare to rural area people.

## Conclusion

In this study UTI is mainly causes by *E. coli* gram negative bacteria. The bacteria were develop resistant against multiple drug which is typical to treat disease. Surveillence of antibiotic resistance is necessary to the physician and patients who were develop resistance against multiple drug. The drug resistance develop mostly in urban area according to this study to misuse and due to the lack of knowledge about antibiotic drugs. The female was more



suffering from UTI and also develop resistant against antimicrobial against. The antibiotic drug which may easily resistant against is Amoxicillin, levofloxacin, ciprofloxacin, ceftriaxone, amikacin, Nitrofurantoin. The physician give the sufficient knowledge about the antibiotic drug to the patient then patient were not misuse of antibiotic. The antibiotic resistance is increases in present days because some time the antibiotic drug will not required and they take by individual. The UTI mainly causes by unhygienic life style and in female UTI mostly occur because of short

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