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# AN EVALUATION OF MICROFLORA DIVERSITY AND ANTIBIOTIC RESISTANCE PROFILE OF URINARY TRACT (A PUBLIC HEALTH CONCERN)

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**ABSTRACT**

**Context:** The microbial etiology of urinary infections has for several decades been regarded as well established, reasonably consistent, and of limited interest **Aim:** To study Evaluation of Microflora diversity and antibiotic resistance profile of Urinary tract, Collection of information and data from the antibiotic consuming and non-antibiotic consuming form the different background people. Sample collection and isolation of Microflora from the Urinary tract. Identification of bacteria Preparing the antibiotic susceptibility profile of Uropathogen of antibiotic users and non-antibiotic users. **Result:** A total of 150 urine sample were collected from different location of nearby area & Laboratory of Microbiology (Central Laboratory) of Chhatrapati Shivaji Subharti Hospital, Meerut. 150 urine Sample was collected by according to their age, sex and antibiotic consumption or non-antibiotics consumption. Distribution of Urine samples according to age group, consumption and non-consumption of antibiotic. A total number of 150 urine sample out of which isolates of *Escherichia coli* were 52 (34.67%), *Klebsiella pneumoniae* 50 (33.33%), *Klebsiella oxytoca* 32 (21.33%), *Proteus spp.* 03(02%), *Citrobacterspp*03 (02%) & no organism seen in 10 (6.67%). All isolates were screened for Antibiotic screening profile. The total number of 150 urine sample out of which 140 Uropathogen were screened for antibiotic screening profile (n=150). Distribution of isolated Uropathogens shown out of 150 patient samples, in which *Escherichia coli* were 35%, followed by *Klebsiella pneumoniae* 33%, *Klebsiella oxytoca* 21%, *Proteus spp.* 2%, *Citrobacter spp.* 2% & no organism seen in 7%. All these isolates were identified by various bacteriological methods. Looking at the distribution of isolates Uropathogen in IPD & OPD, it was found that majority were isolated from IPD patient's 86/140 (61.42 %) and OPD patients54/140(38.57%). Distribution of Uropathogen in IPD & OPD. 140 maximum isolates was seen in *Escherichia coli* 52 (37.14%) followed by *Klebsiella pneumoniae*50 (35.71%), *Klebsiella oxytoca 3*2 (22.85%), *Proteus spp.* 03 (2.14%), *Citrobacter spp 03* (2.14%). distribution of isolated Uropathogen according to their sensitive and resistance pattern (n=140). distribution of total isolated Uropathogen from urine sample according to their sensitive and resistance pattern (n=140). Distribution of ESBL producing Uropathogens among clinical samples in which total positive were 56/91 (61.53%) shows *Escherichia coli* 20 (60%), followed by *Klebsiella pneumoniae* 22 (68%), *Klebsiella oxytoca* 12 (75%), *Proteus* spp. 01 (100%), and *Citrobacter spp.* 01 (100%). This study showed that TE=tetracycline was most effective antibiotics against *E.coli*With the zone of inhibition (ZOI) of 24.85± 1.23mm; however for *K.pneumoniae* TE=tetracycline showed the maximum zone

of inhibition (ZOI) of 18.79±0.60mm. *K.oxytoca* had also shown the zone of inhibition (ZOI) of 19.11±0.36mm and 19.69± 0.09mm for TE=tetracycline and CEF= cefixime respectively. For *Proteus spp.* the Maximum zone of inhibition (ZOI) of TE=tetracycline i.e. 32.62±0.61mm. However similar zone of inhibition (ZOI) of 32.44±0.71mm for NIT= nitrofurantoin. For *Citrobacter spp.*Antibiotics AMP=ampicillin and IMP= imipenem were found more effective with the zone of inhibition (ZOI) of 21.34±0.23mm and 21.41±0.28mm respectively.

**Conclusion**-UTIs remains one of the most common forms of infection both in the community and, particularly, within the healthcare setting. HAUTIs are of significant concern and cause a substantial personal and societal burden due both to their prevalence and to the ability of microbes to share resistance mechanisms.UTI caused by Gram-negative bacteria. *E. coli* was the most common cause of nosocomial UTI in our hospital and Nitrofurantoin &Tetracycline were the most effective antibiotics against this infection. Finally, to reduce the incidence of nosocomial infections, the appropriate use of antibiotics according to the standard antimicrobial susceptibility tests is proposed. Finally, to reduce the incidence of nosocomial infections, the appropriate use of antibiotics according to the standard antimicrobial susceptibility tests is proposed.

## INTRODUCTION

Urinary tract infections (UTIs) are the inflammatory disorders of the urinary tract caused by the abnormal growth of pathogens. Urinary tract infection is known to cause short-term morbidity in terms of fever, dysuria, and lower abdominal pain (LAP) and may result in permanent scarring of the kidney. Urinary tract infections can be community-acquired or nosocomial. Nosocomial or hospital-acquired infections are defined as Nosocomial infections are also important public health problems in developing countries as well as in developed countries. The most frequent types of nosocomial infections are urinary tract infection (UTI), surgical-wound infection, *pneumonia*, and bloodstream infection (BSI).(Ghadiri et al., 2012).

The present study aimed to record the common clinical presentation and risk factors for UTI. The distribution of bacterial strains isolated from complicated and uncomplicated UTIs occurring in the community and their resistance pattern against commonly used antibiotics at our setting was also studied.(Cassir et al., 2014). The increase in antibiotic resistance in the *Enterobacteriaceae* family has become a major threat to public health. Especially in recent years, *Enterobacteriaceae* Family members have been identified as important nosocomial pathogens; infection can lead to severe morbidity and mortality, particularly in intensive care units (ICU), internal medicine and surgical units, and pediatric units. Within the *Enterobacteriaceae* family

Carbapenems resistant *Klebsiella pneumoniae* strains have recently been noted in many parts of the world. Carbapenems, An enzyme belonging to the *K. pneumoniae* carbapenemase (KPC) gene family, causes resistance by breaking down carbapenems. This enzyme was first isolated From a *K. pneumoniae* strain in 1996 and is included in the Ambler classification of β-lactamases. Although KPC β-lactamases are mostly found in *K. pneumoniae*,they can also be found in *Enterobacter* and *Salmonella* species. Carbapenemases are described as chromosomally-encoded β-lactamases before the identification of plasmid-encoded IMP-1, OXA-23 (ARI-1), and KPC-2. The emergence of plasmids containing carbapenemase genes, including KPC-type (class A), as well as IMP-,VIM-, and NDM-types (class B), is considered a serious threat as the emergence of plasmids containing carbapenemase genes facilitates the dissemination of Carbapenems resistance, and the carbapenemases hydrolyze almost all β-lactams. Indeed, plasmid-borne Carbapenems have been isolated worldwide. Carbapenems resistance among Enterobacteriaceae has increased gradually over the years in different regions. The emergence of Carbapenem-resistant Enterobacteriaceae (CRE) is worrisome because treatment options are very limited. The mechanisms of Carbapenems resistance among Enterobacteriaceae include the production of ESBL and/or AmpC enzymes in combination with loss of outer membrane protein or up-regulation of efflux pump, and secretion of carbapenemases(Wang et al., 2015). Carbapenems-resistant gram-negative bacteria are now a global concern around the world. Most of these strains are also resistant to other antimicrobial agents including aminoglycosides and fluoroquinolones. Few therapeutic options without the desired efficacy are available to treat infections caused by Carbapenems-resistant Identifying patients who are

colonized with CRE and placing these patients in isolation precautions may be an important step in preventing transmission. Carbapenems resistance in Enterobacteriaceae occurs when an isolate acquires a Carbapenems or when an isolate produces an extended-spectrum cephalosporin's, such as an AmpC-type β-lactamase **(**Siegel J 2006).Carbapenems resistance in *Enterobacteriaceae* is mainly mediated by the production of Carbapenems, a form of β-lactamase that cleave the β-lactam ring, an essential component of β-lactam antibiotics such as cephalosporin and Carbapenems. The common mechanisms that are responsible for Carbapenems resistance include changes in outer membrane proteins overexpression of drug efflux pumps and Carbapenems hydrolyzing enzymes(Quinan A 2007).

Also, Carbapenems producers are usually associated with many other non–β-lactam resistance determinants, which give rise to multidrug- and pan drug-resistant Their Identification is of primary importance for the choice of appropriate therapeutic schemes and the implementation of proper infection control measures. Therefore the study is carried out to Evaluate Microflora diversity and antibiotic resistance profile of urinary tract in antibiotic consumption people.

Material and Methods: The present study was conducted in the Laboratory of Microbiology Department of Paramedical Science, Subharti Medical College and Hospital, Swami Vivekanand Subharti University, Meerut from February 2020 to July 2020.

## Study Group:

The study group comprises of samples of patients received in the Microbiology Laboratory from UTI patient of the indoor patients, outdoor patients.

## Collection of Sample and Bacterial Isolates

A total of 150 urine sample were collected from different location of nearby area &Laboratory of Microbiology (Central Laboratory) of Chhatrapati Shivaji Subharti Hospital, Meerut. 150 urine Sample was collected by according to their age, sex and antibiotic consumption or non-antibiotics consumption (Table7and figure2).

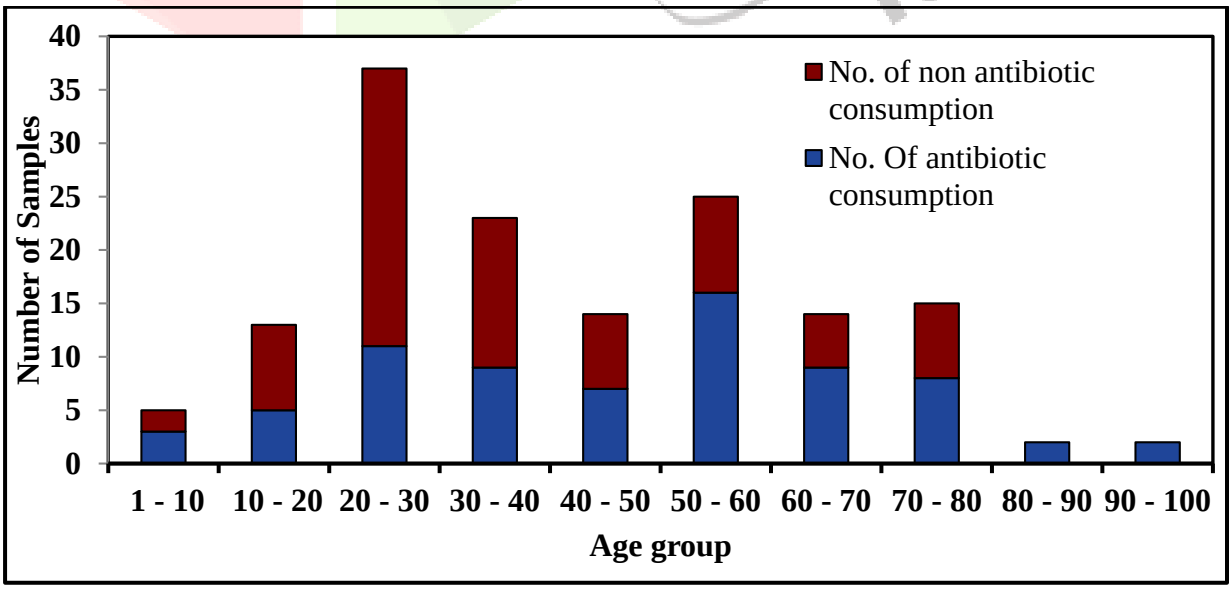



**Figure**: **2** Distribution of Urine sample according to age group, consumption and non-consumption of antibiotic

**Table:7** Distribution of Urine samples according to age group, consumption and non-consumption of antibiotic.

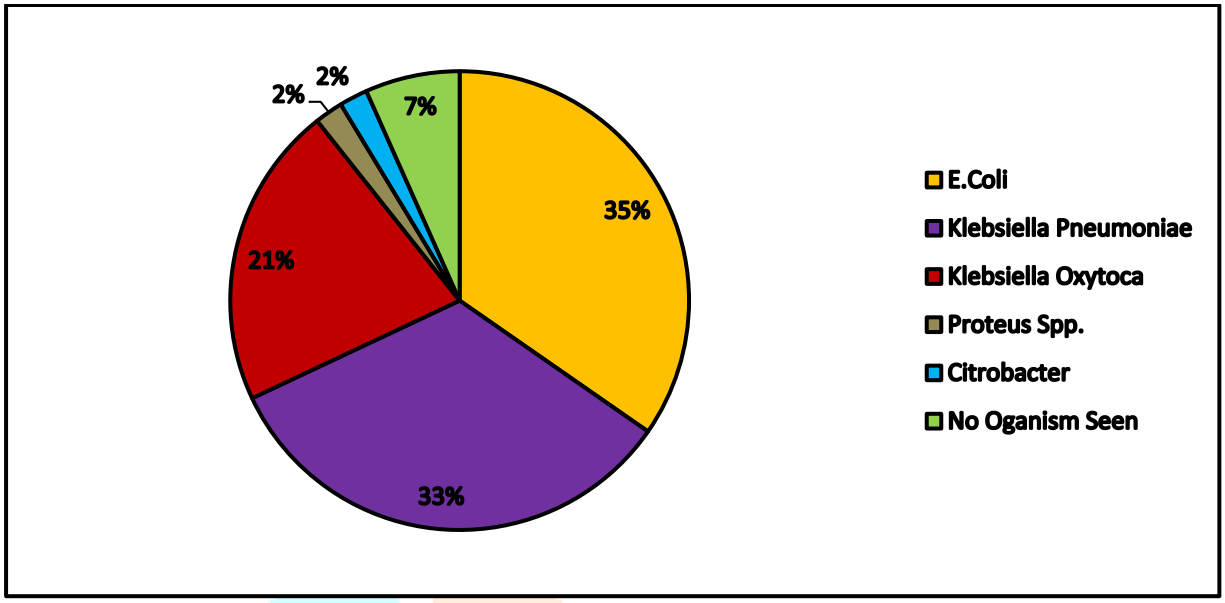
| S. No. | Age | No. of sample | No. of antibiotic consumption | No. of non-antibiotic consumption |
|---|---|---|---|---|
| 1 | 1 – 10 | 05 | 03 | 02 |
| 2 | 10 – 20 | 13 | 05 | 8 |
| 3 | 20 – 30 | 37 | 11 | 26 |
| 4 | 30 – 40 | 23 | 09 | 14 |
| 5 | 40 – 50 | 14 | 07 | 07 |
| 6 | 50 – 60 | 25 | 16 | 09 |
| 7 | 60 – 70 | 14 | 09 | 05 |
| 8 | 70 – 80 | 15 | 08 | 07 |
| 9 | 80 – 90 | 02 | 02 | 00 |
| 10 | 90 – 100 | 02 | 02 | 00 |

A total number of 150 urine sample out of which isolates of *Escherichia coli* were 52 (34.67%), *Klebsiellapneumoniae* 50 (33.33%), *Klebsiella oxytoca* 32 (21.33%), *Proteus spp.* 03(02%), *Citrobacterspp*03 (02%) & no organism seen in 10 (6.67%). All isolates were screened for Antibiotic screening profile. (Table-7).

**Table:-8**showing the total number of 150 urine sample out of which 140 Uropathogen were screened for antibiotic screening profile (n=150).

| S.No. | Organisms | No. of cases | % Percentage |
|---|---|---|---|
| 1 | *Escherichia .coli* | 52 | 34.67 |
| 2 | *Klebsiella Pneumoniae* | 50 | 33.33 |
| 3 | *Klebsiella Oxytoca* | 32 | 21.33 |
| 4 | *Proteus Spp.* | 03 | 02 |
| 5 | *Citrobacter spp.* | 03 | 02 |
| 6 | *No Organism seen* | 10 | 6.67 |
| 7 | *Total* | 150 | 100 |

**Figure: 3**Distribution of isolated organism in 150 patients (n=150).




Distribution of isolated Uropathogens shown in **figure:3** out of 150 patient samples, in which *Escherichia coli* were 35%, followed by *Klebsiella pneumoniae* 33%, *Klebsiella oxytoca* 21%, *Proteus spp.* 2%, *Citrobacter spp.* 2% & no organism seen in 7%. All these isolates were identified by various bacteriological methods.

**Table. 9 Distribution of isolates Uropathogens in IPD & OPD (n=140)**

| Sample source | *E. coli* | *K. pneumoniae* | *K. oxytoca* | *Proteus spp.* | *Citrobacter spp.* |
|---|---|---|---|---|---|
| **IPD** | 35 | 28 | 19 | 2 | 2 |
| **OPD** | 17 | 22 | 13 | 1 | 1 |

IPD=Inpatient department; OPD= Outpatient department.

Looking at the distribution of isolates Uropathogen in IPD & OPD, it was found that majority were isolated from IPD patient's86/140 (61.42 %) and OPD patients54/140(38.57%) (Table 9).

## MORPHOLOGY:

Based on colony morphology, colour and shape different isolates were selected to form the mother culture plate. Pure culture was obtained by the streak plate method. The pure colonies appeared small circular in shape,elevation flat, slightly raised or markedlyraised sometimes the colonies were pigmented and appear pink, pink mucoid,colourless colonies, pale in colour. The size of the 24 hours mature colonies was ~0.5-1 c

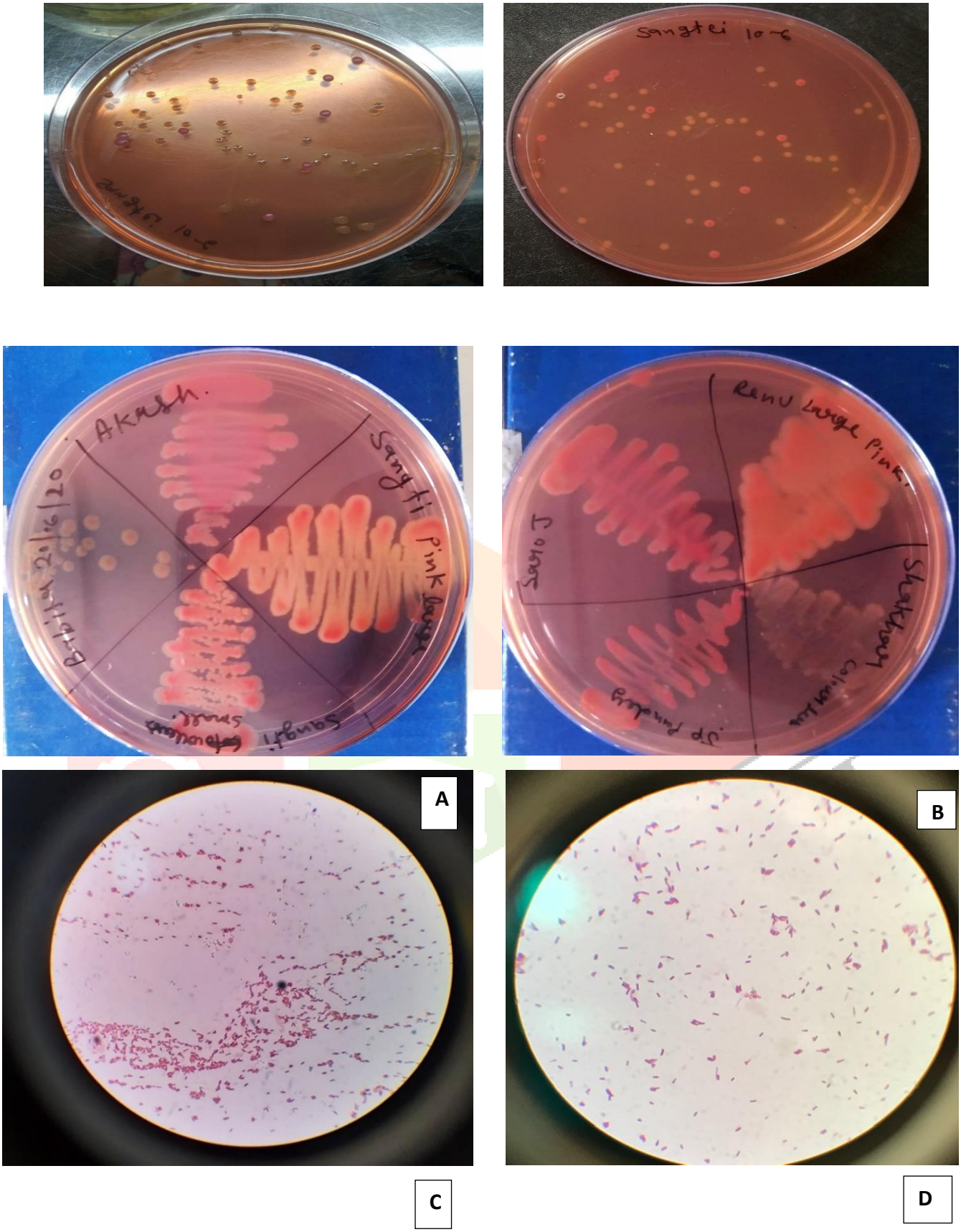



**Figure.5** Colony morphology and microscopic morphology of the bacterial isolates: A and B showing the different colour (lactose fermenting) and shape of the bacterial colonies on the Macconkey's agar plates, C and D are the gram's stain bacterial cells under the compound microscope at 100 X magnification.

## Bio-Chemical Characterization

Bacteria identification was carried out by Gram stain, morphology and biochemical reaction to specific media to obtain pure isolates. Biochemical tests were carried out using Motility test, Catalase production,Voges Proskauer**(**V.P), Indole production, Citrate utilization, and Sugar fermentation test (Table 10).

**Gram's staining:** All the isolates were found grams Negative. All the isolates showed the bacillus shape.(Figure 5 (C )and (D).

## Catalase Test:

Catalase Test is a basic test to differentiate between *E.coli, K.pneumoniae, K.oxytoca,* P*roteus spp* .and *Citrobacter spp.* All showed positive results for the Catalase tests (Figure 6).

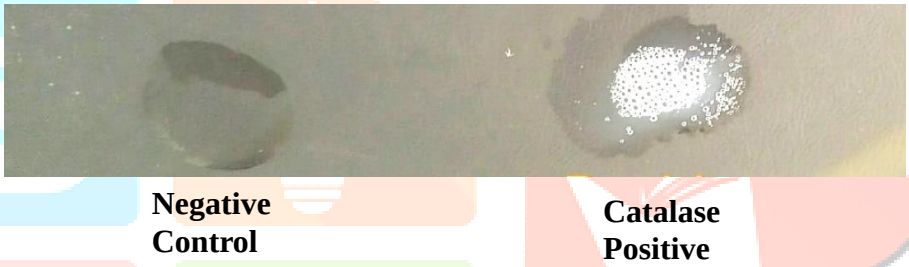



**Figure: 6**Catalase positive bacteria producing bubbles with $H_2O$

**Voges Proskauer Test**: Isolates NS42,NS45, NS78and NS65showed the positive results for the V. P. test and isolatesNS6,NS7,NS9,NS18,NS24 andNS28 were negative results for the VP test.

**Sugar Fermentation test**: All the isolates showed positive results for Maltose,Sucrose and mannitol fermentation expect Isolates of NS18 and NS24 were unable to ferment the sugar. The details of the other sugars are fermentation test is shown in table 10 (Figure9)

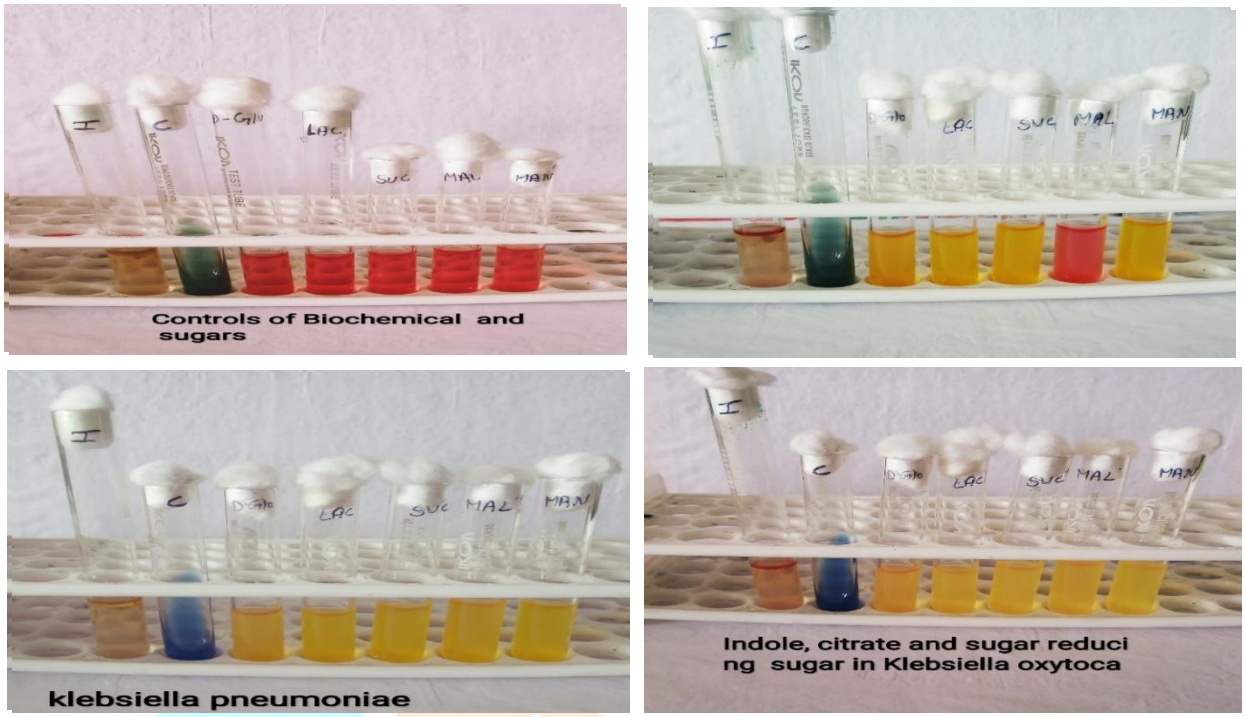
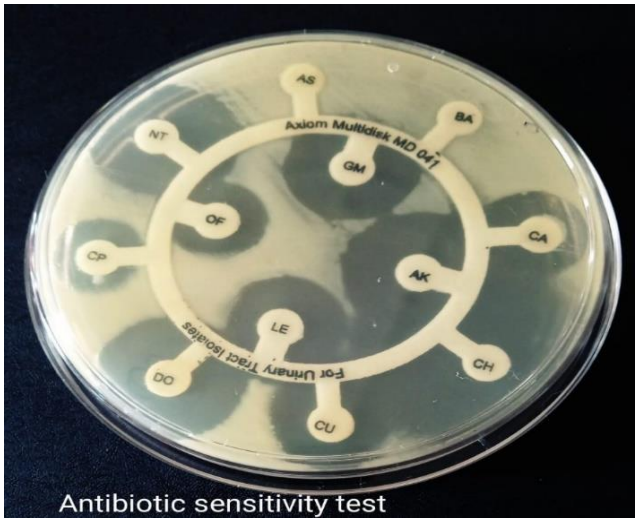



**Figure:9** Biochemicals test and Sugar fermentation by different bacterial isolates. The red colour indicates the negative control and yellow colour indicates the sugar fermentation.

## Antibiotic Susceptibility Testing:

Antibiotic susceptibility tests of the test organisms were performed by Kirby- Bauer disk diffusion method in compliance with Clinical and Laboratory Standards Institute (CLSI 2020) guidelines using Mueller-Hinton Agar Standard Media.



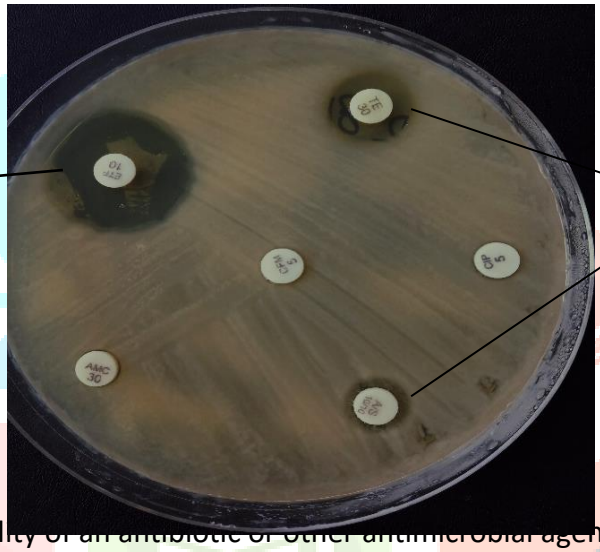
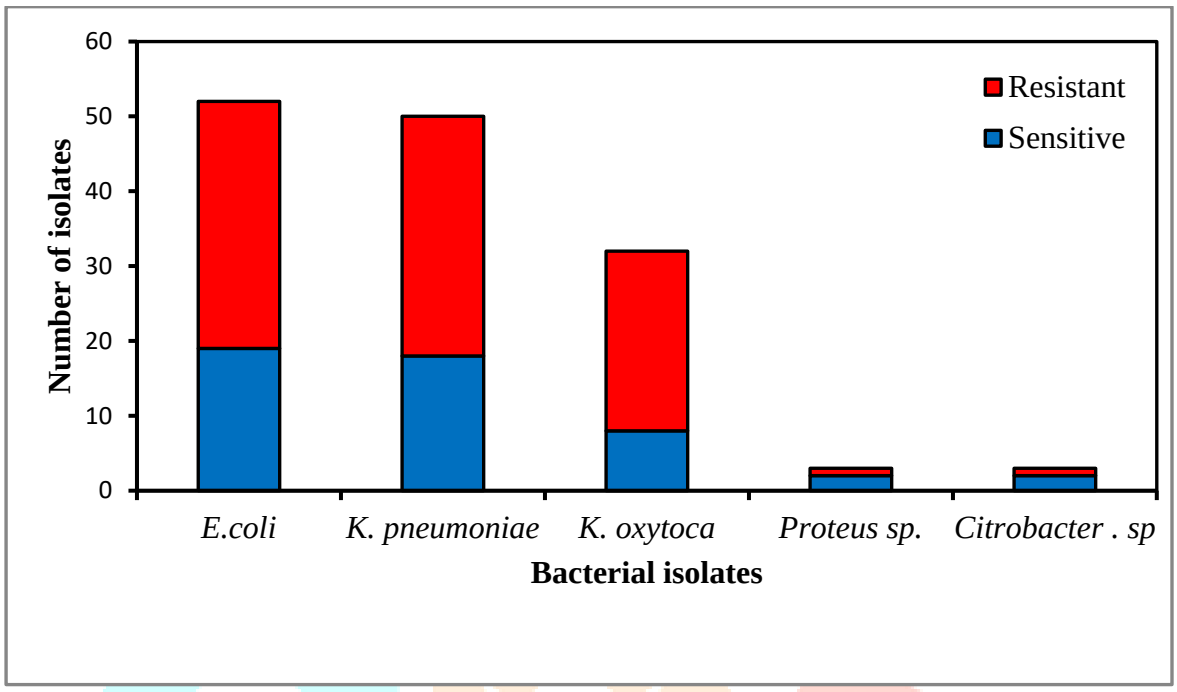




**Figure: 8**showing the ability of an antibiotic or other antimicrobial agents to inhibit bacterial growth in vitro.

| Microorganism | Total S | Total R | Total |
|---|---|---|---|
| *E.coli* | 19 | 33 | 52 |
| *K. pneumoniae* | 18 | 32 | 50 |
| *K. oxytoca* | 8 | 24 | 32 |
| *Proteus spp.* | 2 | 1 | 03 |
| *Citrobacter spp.* | 2 | 1 | 03 |

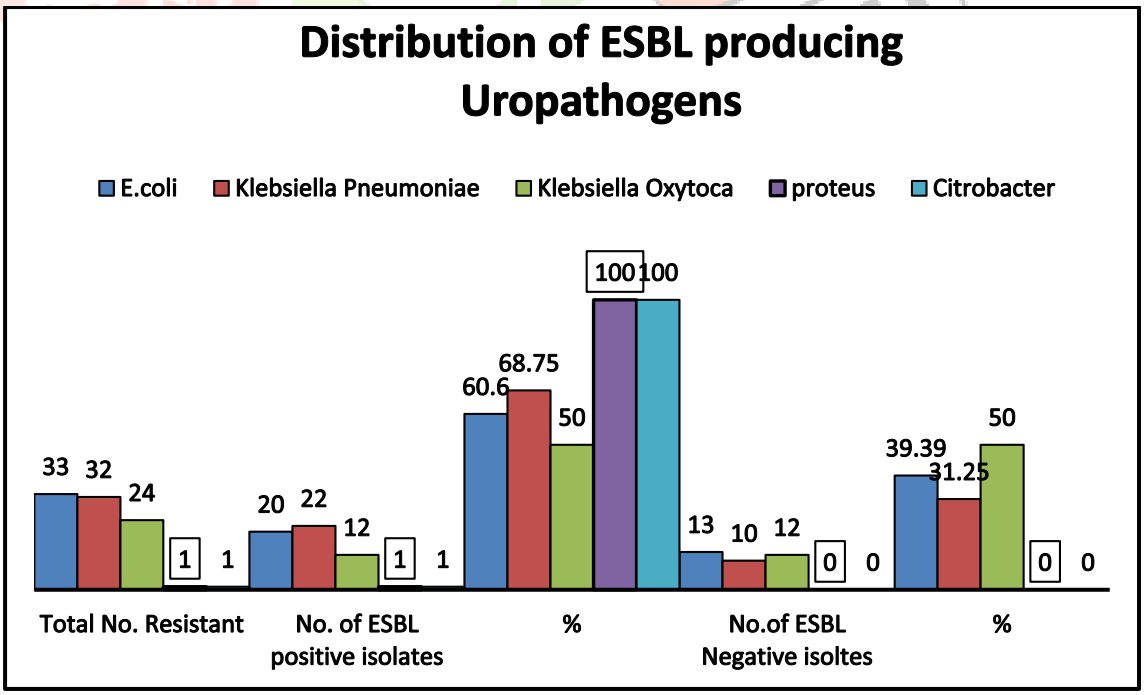
**Table: 11** distribution of isolated Uropathogen according to their sensitive and resistance pattern (n=140).

**Figure:9** distribution of total isolated Uropathogen from urine sample according to their sensitive and resistance pattern (n=140)




**Total S= Sensitive, Total R= Resistant.**

**Figure:10** Distribution of ESBL producing Uropathogen among clinical samples



Distribution of ESBL producing Uropathogens among clinical samples in which total positive were 56/91 (61.53%) shows *Escherichia coli* 20 (60%), followed by *Klebsiella pneumoniae* 22 (68%), *Klebsiella oxytoca* 12 (75%), *Proteus*spp. 01 (100%), and *Citrobacter spp.* 01 (100%).

Table No. 12 Distribution of ESBL producing Uropathogen among clinical samples

| S.No | Organism | Resistant organisms | No. of ESBL positive isolates | % | N0 of ESBL Negative isolates | % |
|---|---|---|---|---|---|---|
| 1 | *E.Coli* | 33 | 20 | 60.6 | 13 | 39.39 |
| 2 | *K. Pneumoniae* | 32 | 22 | 68.75 | 10 | 31.25 |
| 3 | *K. Oxytoca* | 24 | 12 | 50 | 12 | 50 |
| 4 | *Proteus spp.* | 1 | 1 | 100 | 0 | 0 |
| 5 | *Citrobacter spp.* | 1 | 1 | 100 | 0 | 0 |

**Figure: 11 Mean Zone of inhibition of different antibiotics.**

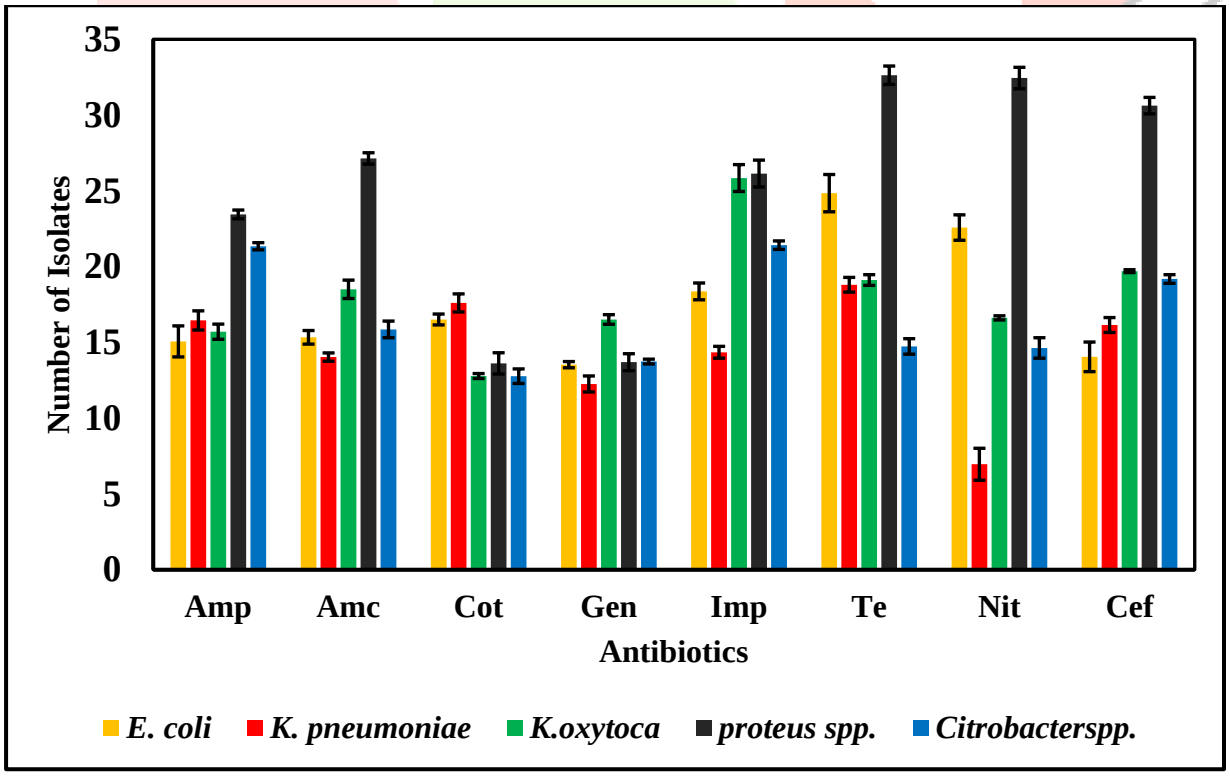


**Table: 13 MeanZone of inhibition of different antibiotic.**

| Antibiotics | *E. coli* | *K. pneumoniae* | *K.oxytoca* | *Proteus spp.* | *Citrobacter spp.* |
|---|---|---|---|---|---|
| **AMP** | 15.06 ±1.03 | 16.44±0.64 | 15.7±0.50 | 23.44±0.29 | 21.34±0.23 |
| **AMC** | 15.33±0.45 | 14.03±0.27 | 18.50±0.61 | 27.14±0.38 | 15.85±0.55 |
| **COT** | 16.51±0.36 | 17.6±0.60 | 12.77±0.16 | 13.61±0.71 | 12.77±0.48 |
| **GEN** | 13.52±0.20 | 12.25±0.53 | 16.51±0.32 | 13.69±0.56 | 13.73±0.16 |
| **IMP** | 18.36±0.56 | 14.34±0.39 | 25.84±0.88 | 26.14±0.89 | 21.41±0.28 |
| **TE** | 24.85±1.23 | 18.79±0.49 | 19.11±0.36 | 32.62±0.61 | 14.72±0.51 |
| **NIT** | 22.57±0.84 | 6.95±1.06 | 16.61±0.14 | 32.44±0.71 | 14.63±0.68 |
| **CEF** | 14.04±0.97 | 16.14±0.49 | 19.69±0.09 | 30.62±0.54 | 19.18±0.29 |

Where: AMP= Amphicillin; AMC= Amoxcicillin; COT= Co- trimoxazole; GEN= Gentamicin; IMP = Imepenem; TE = Tetracycline; NIT = Nitrofurantoin; CEF =Cefixime.

The present study showed that TE=tetracycline was most effective antibiotics against *E.coli*With the zone of inhibition (ZOI) of 24.85± 1.23mm; however for *K.pneumoniae* TE=tetracycline showed the maximum zone of inhibition (ZOI) of 18.79±0.60mm. *K.oxytoca*had also shown the zone of inhibition (ZOI) of 19.11±0.36mm and 19.69± 0.09mm for TE=tetracycline and CEF= cefixime respectively. For *Proteus spp.* the Maximum zone of inhibition (ZOI) of TE=tetracycline i.e. 32.62±0.61mm. however similarzone of inhibition (ZOI) of 32.44±0.71mm for NIT= nitrofurantoin. For *Citrobacter spp.*Antibiotics AMP=ampicillin and IMP= imipenem were found more effective with the zone of inhibition (ZOI) of 21.34±0.23mm and 21.41±0.28mm respectively.

## Discussion

Ancient and modern methodologies of scientific research bring fruitful findings after a creative and critical discussion based on the observations and analysis. Discussion is an important part of any scientific research. The present work comprises the prevalence of UTI in 150 Patients. Where the findings derived from the data analysis are subjected to discussion. The interpretation of the facts observed will throw more light into the subject and thereby helping in formulating the solutions. This emphasizes the need for detecting harbouring isolates so avoid therapeutic failure and nosocomial outbreaks.

In the present study, the incidence of UTI about age shows that age groups between 10 to 50 years give 58%, also age groups among 51 to 90 years give 37.33%. The present study shows that there was no relation between ages but the study was conducted by Martha medina et al (2019) shows that Urinary tract infections (UTIs) are the most common outpatient infections, with alifetime incidence of 50−60% in adult women. The peak rate ofuncomplicated UTIs occurs during the years of maximum sexual activity, usually between theages of 18 and 39.The mean age of the studygroup was 59 years, and 75% of UTIs were diagnosed*via* urine culture

In the present study, the organism frequently isolated in urinary tract infection include species of *Enterobacteriaceae* especially *Escherichia coli* and other gram-negative bacteria. In a study conducted by RasoulYoussefimashout, et al (2009) themost common isolates were *E. coli* (57.4%),*K. pneumoniae* (9.7%),

*Citrobacter* spp. 5.1% &*Proteus* spp. 4.5% this study also compare with the study of Hamid ghadiri (2012) that *E.coli* 29.4%, *Klebsiella pneumoniae* 11% &*Proteus* spp. 1.5%.

( Gajamer et al 2018) also reported that

454 Uropathogens were isolated with aprevalence rate of 29.94%. Among them, *Escherichia coli* (74.3%) was the predominant type followed by *Klebsiella pneumoniae* (20.1%) &*Proteus spp*. (1.98%) so The emergence of these organisms poses major difficulty in treating infections. Area-specific monitoringstudies aimed to gain knowledge about the type of pathogensand antimicrobial resistance patterns can optimize treatmentand decrease mortality rates.

ESBL producing *E.coli* has been remarkably rising in recent years, especially in the community. In our study, the overall percentage of ESBL producing pathogens is 56 (61.53%) and the most common organism were *Escherichia coli* 20 (35.71%), followed by *Klebsiella pneumoniae* 22 (39.28%), *Klebsiella oxytoca* 12 (21.42%), *Proteus* 01 (1.78%), and *Citrobacter* 01 (1.78%). This is comparable to other studiesGalia ZA Awean et al 2009 reported that the overall percentage of ESBL producing pathogens 26.8%, the most common organism were *Escherichia coli* 66.93%, *Klebsiella spp* 9.84%, another study also compare with Emmanuel Chirwa et al 2020 reported that the total number of 327 urine samples were cultured and 15 (4.6%) samples were positive ESBL producers.

This study provides valuable laboratory data onantibiotics susceptibilities of Uropathogens andallows comparison of the situation in our area with that in other countries.

## Conclusion

UTIs remains one of the most common forms ofinfection both in the community and, particularly,within the healthcare setting. HAUTIs are of significantconcern and cause a substantial personaland societal burden due both to their prevalenceand to the ability of microbes to share resistancemechanisms.UTI caused by Gram-negative bacteria. *E. coli* was the most common cause of nosocomial UTI in our hospital and Nitrofurantoin &Tetracycline were the most effective antibiotics against this infection. Finally, to reduce the incidence of nosocomial infections, the appropriate use of antibiotics according to the standard antimicrobial susceptibility tests is proposed.Finally, to reduce the incidence of nosocomial infections,the appropriate use of antibiotics according to the standardantimicrobial susceptibility tests is proposed.

## Limitations

Molecular detection of genes responsible for causing urinary tract infection could not be done due to limited resources.

**Acknowledgement** given by Neha Sharma (Student of M.Sc. MLT Microbiology & Immunology batch-2018-2020)- First of all, I Praise and thank **God** for his abundant grace and blessing throughout my study. It is an inexplicable pleasure to offer my salutations to **Professor and Head, Dr Vandana Srivastava** for her blessing, which made me complete my thesis without any hurdles.

It is a matter of great privilege for me to work under the able and highly exceptional guidance of my guide **Assistant Professor (Medical Microbiology) Miss. Pooja** the person who has nurtured my capabilities and always gave me ample freedom. I'm deeply indebted for this guidance, broadmindedness and affecting towards me.

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| Table No. 10 Representing the biochemical and physiological characteristics of the producing bacterial isolates | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bacterial isolates | Microscopy | | Biochemical test & Sugar Fermentation Test | | | | | | | Growth at/ in | | V.P | Tentative Identification |
| | Gram's reaction | Motility | Indole | Citrate | Dextrose | Sucrose | Mannitol | Mannitol | Lactose | 37° C | 7% NaCl | | |
| NS 6 | GN | + | + | - | + | + | + | + | + | + | + | - | *Escherichia coli* |
| NS 7 | GN | + | + | - | + | + | + | + | + | + | + | - | *Escherichia coli* |
| NS 9 | GN | + | + | - | + | + | + | + | + | + | + | - | *Escherichia coli* |
| NS18 | GN | + | - | + | + | - | - | - | + | + | + | - | *Proteus spp.* |
| NS24 | GN | + | - | + | + | - | - | - | + | + | + | - | *Proteus spp.* |
| NS28 | GN | + | - | + | + | + | + | + | + | + | + | - | *Citrobacter spp.* |
| NS 42 | GN | - | - | + | + | + | + | + | + | + | + | + | *Klebsiella pneumoniae* |
| NS45 | GN | - | - | + | + | + | + | + | + | + | + | + | *Klebsiella pneumoniae* |
| NS 78 | GN | - | + | + | + | + | + | + | + | + | + | + | *Klebsiella oxytoca* |
| NS 65 | GN | - | + | + | + | + | + | + | + | + | + | + | *Klebsiella oxytoca* |

## Antibiotic Susceptibility Testing:

Antibiotic susceptibility tests of the test organisms were performed by Kirby- Bauer disk diffusion method in compliance with Clinical and Laboratory Standards Institute (CLSI 2020) guidelines using Mueller-Hinton Agar Standard Media.

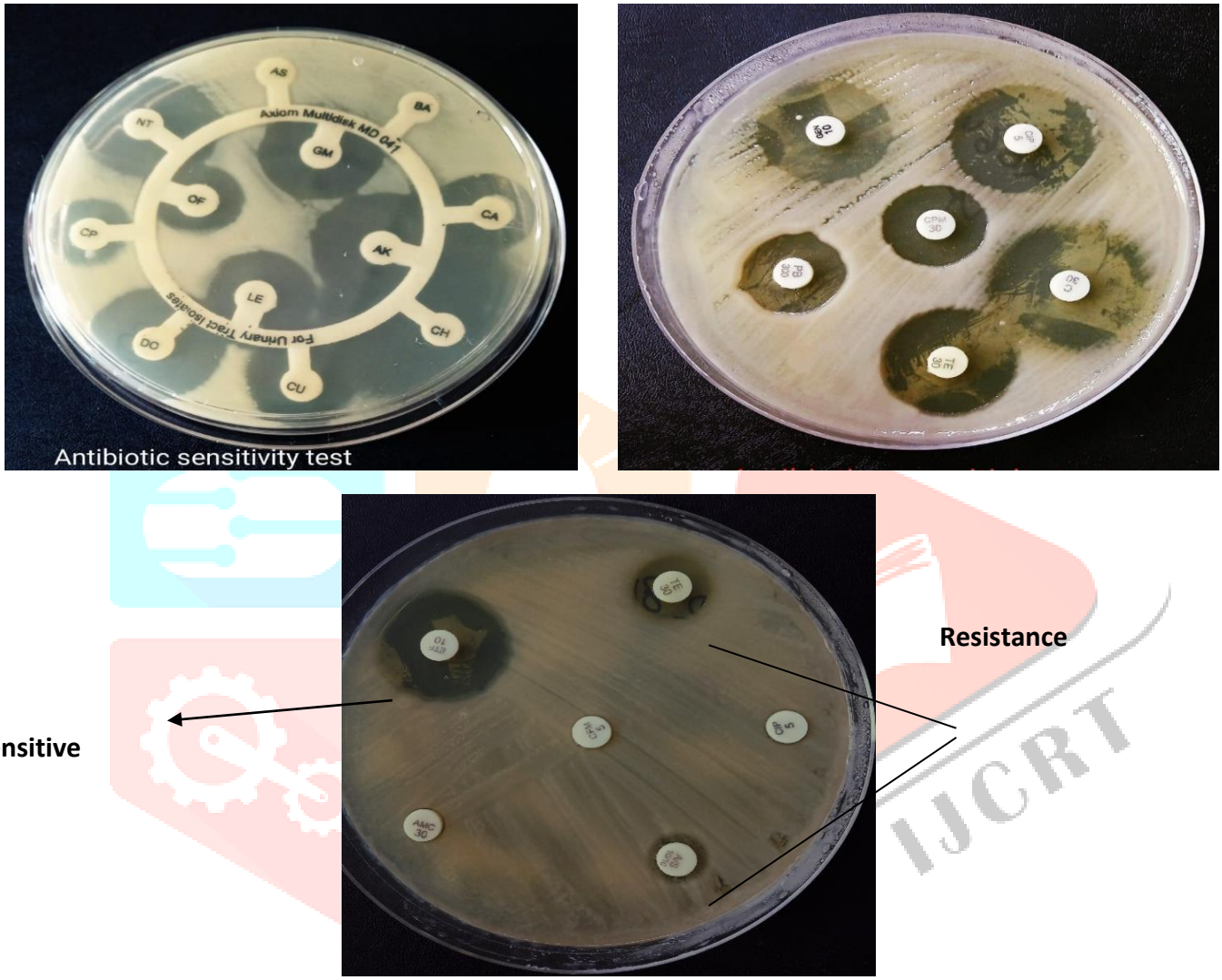
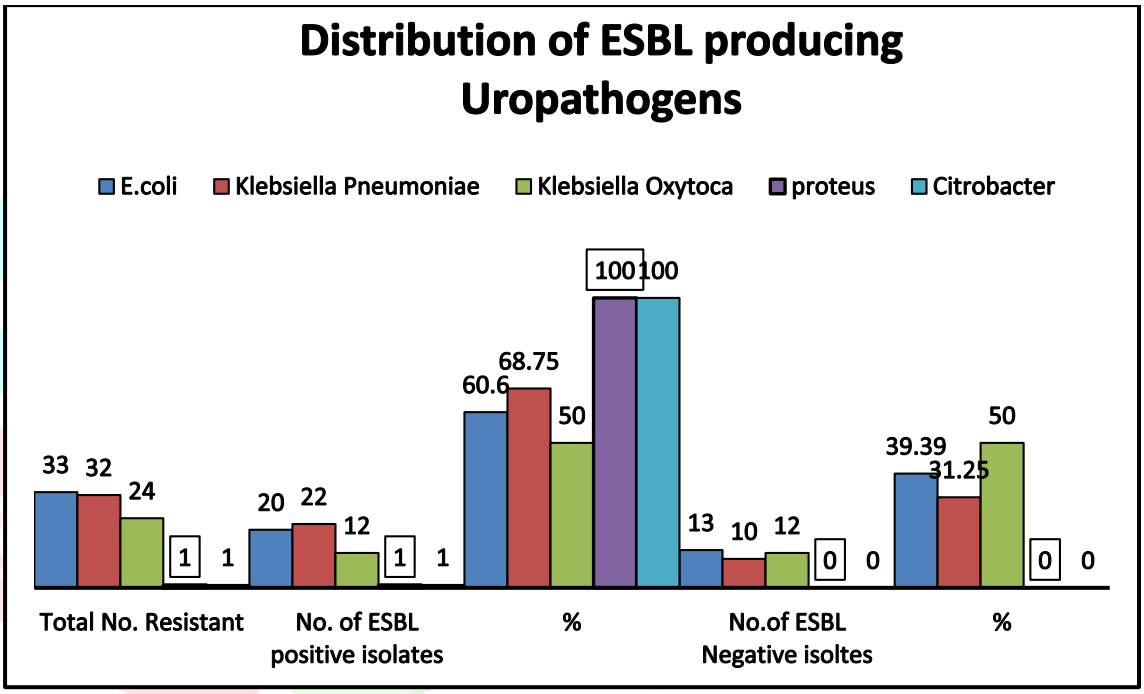



**Figure: 8**showing the ability of an antibiotic or other antimicrobial agents to inhibit bacterial growth in vitro.

| Microorganism | Total S | Total R | Total |
|---|---|---|---|
| *E.coli* | 19 | 33 | 52 |
| *K. pneumoniae* | 18 | 32 | 50 |
| *K. oxytoca* | 8 | 24 | 32 |
| *Proteus spp.* | 2 | 1 | 03 |
| *Citrobacter spp.* | 2 | 1 | 03 |

**Table: 11** distribution of isolated Uropathogen according to their sensitive and resistance pattern (n=140).

**Figure:10** Distribution of ESBL producing Uropathogen among clinical samples




Distribution of ESBL producing Uropathogens among clinical samples in which total positive were 56/91 (61.53%) shows *Escherichia coli* 20 (60%), followed by *Klebsiella pneumoniae* 22 (68%), *Klebsiella oxytoca* 12 (75%), *Proteus*spp. 01 (100%), and *Citrobacter spp.* 01 (100%).

Table No. 12 Distribution of ESBL producing Uropathogen among clinical samples

| S.No | Organism | Resistant organisms | No. of ESBL positive isolates | % | N0 of ESBL Negative isolates | % |
|---|---|---|---|---|---|---|
| 1 | *E.Coli* | 33 | 20 | 60.6 | 13 | 39.39 |
| 2 | *K. Pneumoniae* | 32 | 22 | 68.75 | 10 | 31.25 |
| 3 | *K. Oxytoca* | 24 | 12 | 50 | 12 | 50 |
| 4 | *Proteus spp.* | 1 | 1 | 100 | 0 | 0 |
| 5 | *Citrobacter spp.* | 1 | 1 | 100 | 0 | 0 |

**Figure: 11 Mean Zone of inhibition of different antibiotics.**

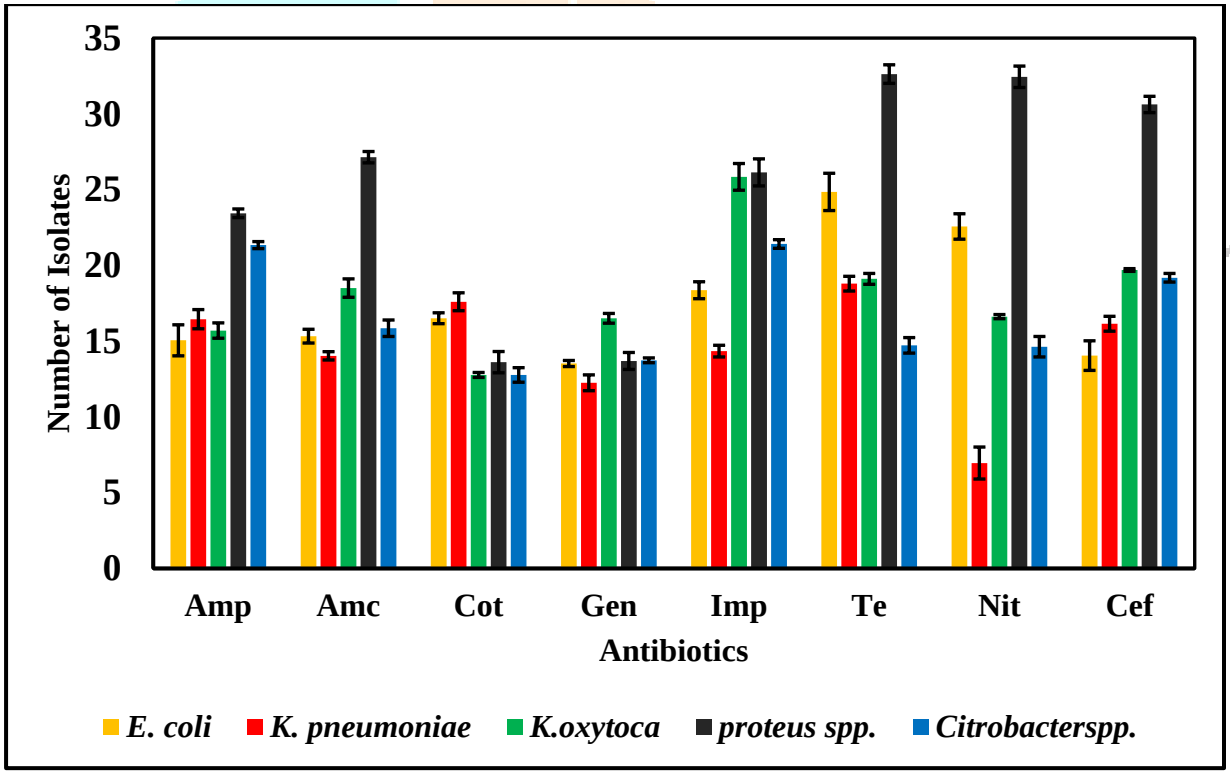


**Table: 13 MeanZone of inhibition of different antibiotic.**

| Antibiotics | *E. coli* | *K. pneumoniae* | *K.oxytoca* | *Proteus spp.* | *Citrobacter spp.* |
|---|---|---|---|---|---|
| **AMP** | 15.06 ±1.03 | 16.44±0.64 | 15.7±0.50 | 23.44±0.29 | 21.34±0.23 |
| **AMC** | 15.33±0.45 | 14.03±0.27 | 18.50±0.61 | 27.14±0.38 | 15.85±0.55 |
| **COT** | 16.51±0.36 | 17.6±0.60 | 12.77±0.16 | 13.61±0.71 | 12.77±0.48 |
| **GEN** | 13.52±0.20 | 12.25±0.53 | 16.51±0.32 | 13.69±0.56 | 13.73±0.16 |
| **IMP** | 18.36±0.56 | 14.34±0.39 | 25.84±0.88 | 26.14±0.89 | 21.41±0.28 |
| **TE** | 24.85±1.23 | 18.79±0.49 | 19.11±0.36 | 32.62±0.61 | 14.72±0.51 |
| **NIT** | 22.57±0.84 | 6.95±1.06 | 16.61±0.14 | 32.44±0.71 | 14.63±0.68 |
| **CEF** | 14.04±0.97 | 16.14±0.49 | 19.69±0.09 | 30.62±0.54 | 19.18±0.29 |

Where: AMP= Amphicillin; AMC= Amoxcicillin; COT= Co- trimoxazole; GEN= Gentamicin; IMP = Imepenem; TE = Tetracycline; NIT = Nitrofurantoin; CEF =Cefixime.

The present study showed that TE=tetracycline was most effective antibiotics against *E.coli*With the zone of inhibition (ZOI) of 24.85± 1.23mm; however for *K.pneumoniae* TE=tetracycline showed the maximum zone of inhibition (ZOI) of 18.79±0.60mm. *K.oxytoca*had also shown the zone of inhibition (ZOI) of 19.11±0.36mm and 19.69± 0.09mm for TE=tetracycline and CEF= cefixime respectively. For *Proteus spp.* the Maximum zone of inhibition (ZOI) of TE=tetracycline i.e. 32.62±0.61mm. however similarzone of inhibition (ZOI) of 32.44±0.71mm for NIT= nitrofurantoin. For *Citrobacter spp.*Antibiotics AMP=ampicillin and IMP= imipenem were found more effective with the zone of inhibition (ZOI) of 21.34±0.23mm and 21.41±0.28mm respectively.

# Discussion

Ancient and modern methodologies of scientific research bring fruitful findings after a creative and critical discussion based on the observations and analysis. Discussion is an important part of any scientific research. The present work comprises the prevalence of UTI in 150 Patients. Where the findings derived from the data analysis are subjected to discussion. The interpretation of the facts observed will throw more light into the subject and thereby helping in formulating the solutions. This emphasizes the need for detecting harbouring isolates so avoid therapeutic failure and nosocomial outbreaks.

In the present study, the incidence of UTI about age shows that age groups between 10 to 50 years give 58%, also age groups among 51 to 90 years give 37.33%. The present study shows that there was no relation between ages but the study was conducted by Martha medina et al (2019) shows that Urinary tract infections (UTIs) are the most common outpatient infections, with alifetime incidence of 50−60% in adult women. The peak rate ofuncomplicated UTIs occurs during the years of maximum sexual activity, usually between theages of 18 and 39.The mean age of the studygroup was 59 years, and 75% of UTIs were diagnosed*via* urine culture

In the present study, the organism frequently isolated in urinary tract infection include species of *Enterobacteriaceae* especially *Escherichia coli* and other gram-negative bacteria. In a study conducted by RasoulYoussefimashout, et al (2009) themost common isolates were *E. coli* (57.4%),*K. pneumoniae* (9.7%),

*Citrobacter* spp. 5.1% &*Proteus* spp. 4.5% this study also compare with the study of Hamid ghadiri (2012) that *E.coli* 29.4%, *Klebsiella pneumoniae* 11% &*Proteus* spp. 1.5%.

( Gajamer et al 2018) also reported that

454 Uropathogens were isolated with aprevalence rate of 29.94%. Among them, *Escherichia coli* (74.3%) was the predominant type followed by *Klebsiella pneumoniae* (20.1%) &*Proteus spp*. (1.98%) so The emergence of these organisms poses major difficulty in treating infections. Area-specific monitoringstudies aimed to gain knowledge about the type of pathogensand antimicrobial resistance patterns can optimize treatmentand decrease mortality rates.

ESBL producing *E.coli* has been remarkably rising in recent years, especially in the community. In our study, the overall percentage of ESBL producing pathogens is 56 (61.53%) and the most common organism were *Escherichia coli* 20 (35.71%), followed by *Klebsiella pneumoniae* 22 (39.28%), *Klebsiella oxytoca* 12 (21.42%), *Proteus* 01 (1.78%), and *Citrobacter* 01 (1.78%). This is comparable to other studiesGalia ZA Awean et al 2009 reported that the overall percentage of ESBL producing pathogens 26.8%, the most common organism

were *Escherichia coli* 66.93%, *Klebsiella spp* 9.84%, another study also compare with Emmanuel Chirwa et al 2020 reported that the total number of 327 urine samples were cultured and 15 (4.6%) samples were positive ESBL producers.

This study provides valuable laboratory data onantibiotics susceptibilities of Uropathogens andallows comparison of the situation in our area withthat in other countries.

## Conclusion

UTIs remains one of the most common forms ofinfection both in the community and, particularly,within the healthcare setting. HAUTIs are of significantconcern and cause a substantial personaland societal burden due both to their prevalenceand to the ability of microbes to share resistancemechanisms.UTI caused by Gram-negative bacteria. *E. coli* was the most common cause of nosocomial UTI in our hospital and Nitrofurantoin &Tetracycline were the most effective antibiotics against this infection. Finally, to reduce the incidence of nosocomial infections, the appropriate use of antibiotics according to the standard antimicrobial susceptibility tests is proposed.Finally, to reduce the incidence of nosocomial infections,the appropriate use of antibiotics according to the standardantimicrobial susceptibility tests is proposed.

LIMITATIONS-Molecular detection of genes responsible for causing urinary tract infection could not be done due to limited resources.