

PREVALENCE OF ESBL AND MDR ORGANISMS, ANTIBIOTIC SENSITIVITY ITS RISK FACTORS, AND MANAGEMENT OF URINARY TRACT INFECTIONS IN A TERTIARY CARE HOSPITAL

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Article Received on 30/05/2021

Article Revised on 21/06/2021

Article Accepted on 11/07/2021

ABSTRACT

Aim and Objective: The main aim of the study is to focus on the prevalence of ESBL and MDR organisms, the sensitivity of antibiotics, its risk factors, and the management of urinary tract infections in a tertiary care hospital.

Results of the Study: The study was conducted on 100 UTI patients with positive urine culture and sensitivity reports. It was identified that males and females account for (61%) and (39%) respectively. The most common and least common organisms detected are Escherichia coli with (35%) and Klebsiella species with (1%) respectively. The study among the 100 UTI patient urine cultures reports ESBL and MDRO organisms are identified as (15%) and (11%) respectively. Among the 100 urine culture samples, 15/100(15%) of samples are ESBL producers in which males 11/15(73.3%) and females 4/15(26.6%) the most common age group are 60-80 years 5/15(33.3%). Out of 100 urine culture samples, 11/100(11%) of the samples are identified as the MDR organisms out of which males 8/11(72.7%) and females 3/11(27.7%), and the most common age group are 50-60 3/11(27.7%). The most common organisms of the ESBL and MDRO are Escherichia coli (66.6%) and pseudomonas aeruginosa. (81.8%) respectively. The least common organisms of the ESBL and MDRO are Klebsiella species (6.6%) and (9%) respectively. The sensitivity of antibiotics among the ESBL and MDRO organisms of which most sensitive is colistin accounts (100%) and tobramycin and ceftazidime+ tazobactam which accounts for (1%) and (6.6%) respectively. The most common risk factors for ESBL and MDRO organisms are antibiotic prior use (20%) and recurrent UTI (45.4%) respectively. **Conclusion:** This study concludes that E. coli and pseudomonas aeruginosa. are the most frequent ESBL producers and MDR organisms respectively. Also identified that only antibiotics sensitive to MDR organisms are colistin and polymyxin-B. Hence health care providers should review the current guidelines used for empirical and effective treatment of ESBL and MDR organisms and prescribe antibiotics only if needed and also should recommend completing the antibiotic course completely.

KEYWORDS: Extended Spectrum Beta lactamases (ESBL), antibiotic sensitivity, Multi-drug resistant organisms (MDR), Recurrent UTI.

INTRODUCTION

The urinary tract is a very common disease. UTI more frequently occurs in developing countries due to poor hygiene, lifestyle, environmental conditions.

Multi-drug resistant (MDR) organisms are defined as the insensitivity of the organisms to two (or) more classes of antibiotics.

Extended Spectrum Beta Lactamases (ESBL) are the enzymes produced by the micro-organisms to protect against antibiotics.

It is known that Extended Spectrum Beta Lactamases (ESBL) producing organisms are increasing rapidly worldwide. Along with that Multi-Drug Resistant Organisms are developing resistance towards antibiotics

like Fluoroquinolones, fourth-generation cephalosporins, Carbapenem antibiotics. Worldwide data has shown that increasing resistance of UTI pathogenic organisms to several newer and more potent antibiotics too therefore certain antimicrobial guidelines are necessary for the empirical treatment and selection of the best antibiotics for the treatment of the infections. In addition to this one should examine the past medical history, history of catheterization, any history of urological treatments, and assessing the emergence of ESBL producing bacteria and MDR organisms. ESBL producing organisms and MDR organisms are creating a distressing threat to the treatment of UTI infections.

OBJECTIVES

The main aim and important objective of the study are to achieve the following.

- The main objective of the study is to identify the prevalence of ESBL and MDR organisms.
 - To identify the major risk factors and to build awareness among the high-risk patients.
 - To access the antibiotic sensitivity pattern of antibiotics.
 - To identify the most sensitive and resistant antibiotics.
 - To analyze the better antibiotic treatment for ESBL and MDR organisms.
- Patients with recurrent UTI infection.
 - Patients with bladder catheterization.
 - Patients on immunosuppression therapy.
 - Patients on recent antibiotic use.
 - Patients with renal calculi and structural urological disease.

Exclusion criteria

- Patients who are not willing to give data.
- Pregnant women.
- Pediatric patients.

METHODOLOGY

This study was done for six months, from September 2020 to April 2021,

Study design: This is a prospective observational study conducted over a period of six months the individuals who met the inclusion criteria are taken into consideration according to their willingness and interest to carry out the study.

Participants: out-patients and in-patients.

Sample size: 100.

Collection of Data

- ❖ Patient demographics.
- ❖ Patient case file
- ❖ Prescription chart.
- ❖ Nursing notes.
- ❖ Medical records.
- ❖ Doctor notes.

Inclusion criteria

- Both the sex.
- All age groups.
- Patients with comorbid illnesses.

Methods and collection of Data

The individuals are examined including their-

- ❖ Patient demographics
- ❖ Chief complaints
- ❖ History of present illness
- ❖ Past disease history
- ❖ Past medications
- ❖ Urine culture and sensitivity reports
- ❖ Risk factors

Primary outcome measures

- 1) Prevalence of ESBL and MDR.
- 2) Antibiotic sensitivity pattern.
- 3) Risk factors.

Source of data: Case sheets of the in-patients and case files of the out-patients.

Place of Study

This was done in all in-patient and out-patient departments of Multispecialty Hospital, Hyderabad, which is 300 bedded multispecialty hospital.

RESULTS

Table 1: Percentage of organisms isolated in urine culture reports (n=100).

S.NO	ORGANISMS	PRESENT	PERCENTAGE
1	Escherichia coli	35	35%
2	Pseudomonas aeruginosa	27	27%
3	Klebsiella pneumonia	12	12%
4	Enterococcus faecalis	8	8%
5	Klebsiella oxytoca	5	5%
6	Proteus mirabilis	4	4%
7	Candida albicans	4	4%
8	Klebsiella species	2	2%
9	Klebsiella aerogens	1	1%
10	Candida krusei	1	1%
11	Morganella morganii	1	1%

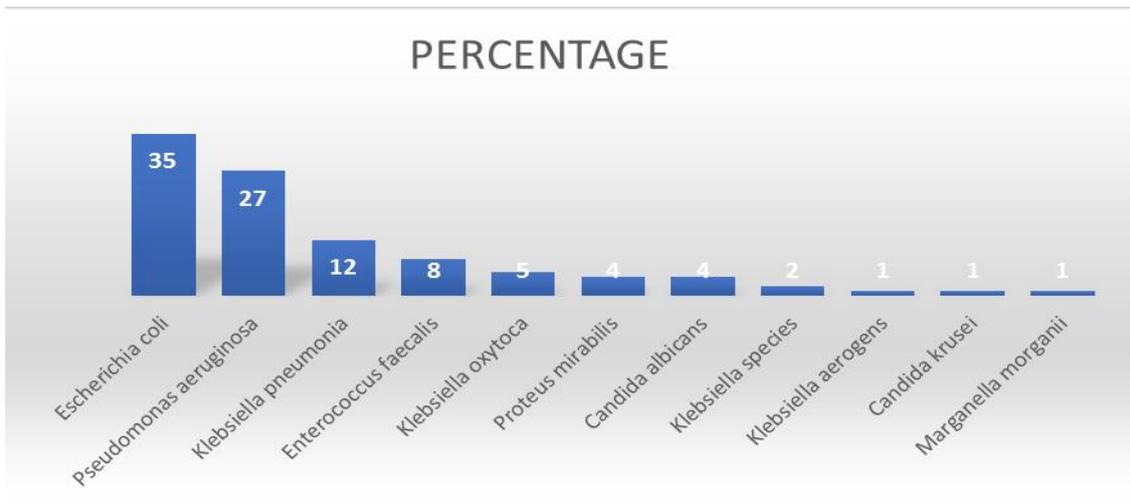


Table 2: Percentage of comorbid illness and risk factors in UTI patients (n=100).

S.NO	COMORBIDITIES AND RISK FACTORS	PERCENTAGE
1	Hypertension (Htn)	54%
2	Type 2 Diabetes Mellitus (Type 2 D.M.)	48%
3	Coronary Artery Disease(Cad)	18%
4	Cerebrovascular Accident(Cva)	9%
5	Chronic Kidney Disease(Ckd)	33%
6	Recurrent Urinary Tract Infection(R-Uti)	21%
7	Renal Stones Or Kidney Stones	24%
8	Bladder Catheterisation	25%
9	Prior Antibiotic Use	10%
10	Structural Urological Disease	2%
11	Significant Post-Void Residue	1%

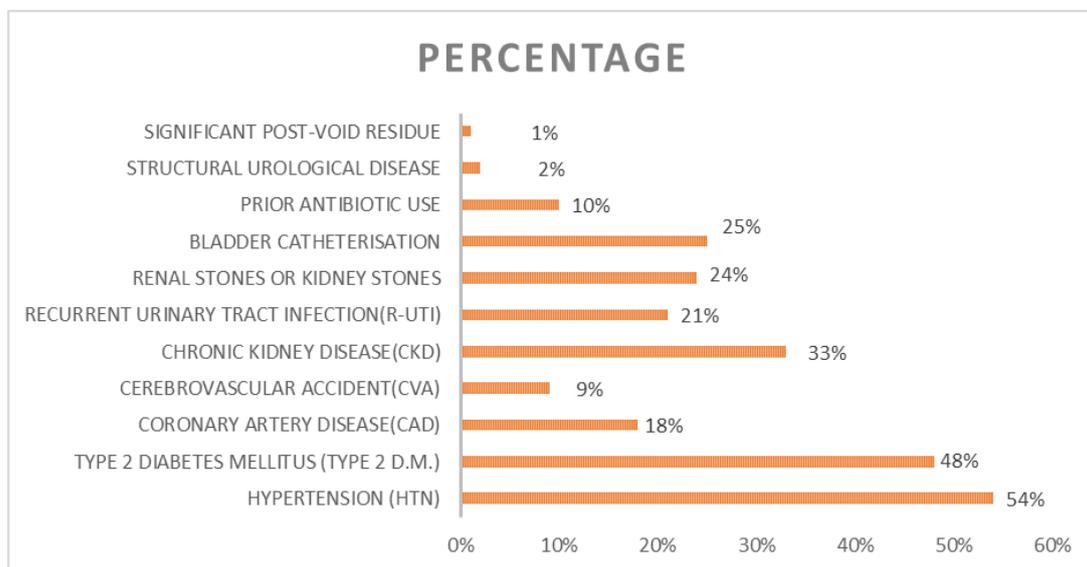


Table 3: Prevalence of ESBL organisms in UTI patients (n=100).

ESBL organisms	Present	Percentage
Escherichia coli	10	66.6%
Klebsiella oxytoca	4	26.6%
Klebsiella species	1	6.6%

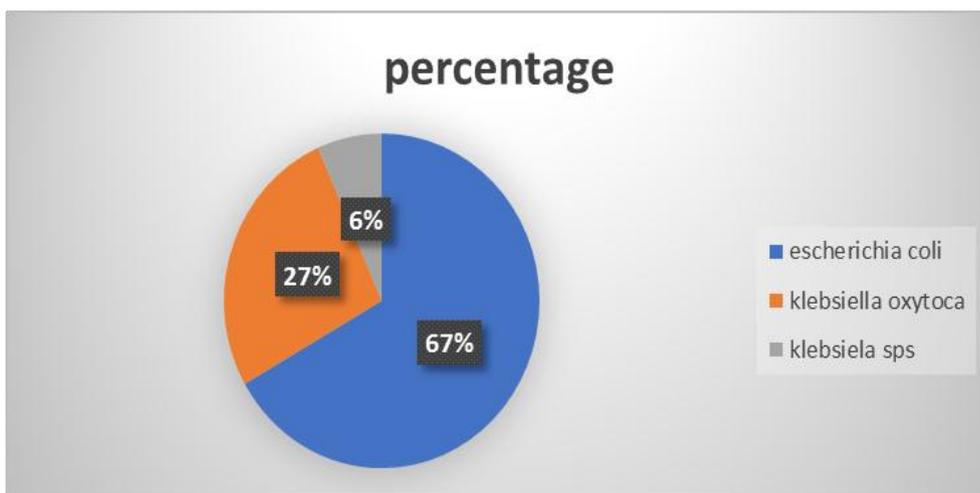


Table 4. Prevalence of MDR organisms in UTI patients (n=100).

Organisms	Present	Percentage
Pseudomonas aeruginosa	9	81%
Klebsiella oxytoca	1	9%
Klebsiella pneumonia	1	9%

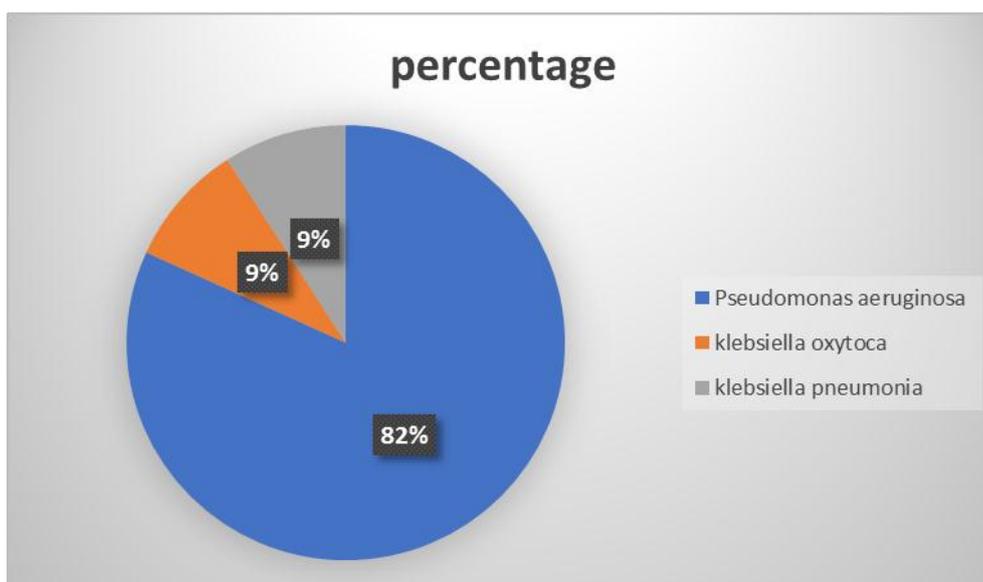


Table 5: Risk factors for ESBL positive patients in UTI patients (n=100).

Risk factors	Present	Percentage
Antibiotic prior use	3	20%
Recurrent UTI infection	2	13%
Bladder catheterization	2	13%
Renal stones	2	13%
Structural urological disease	2	13%
Significant post-void residue	1	6.6%

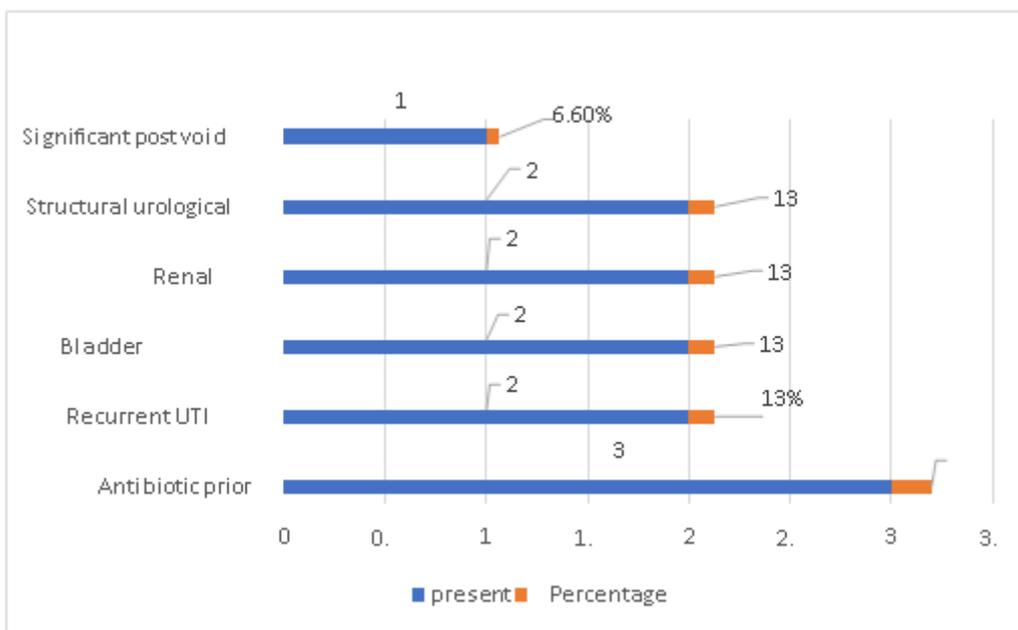


Table 6: Risk factors for MDR organism in UTI patients (n=100).

Risk factors	Present	Percentage
Prior antibiotic use	4	36.3%
Recurrent UTI infection	5	45.4%
Bladder catheterization	3	27.2%
Renal calculi	3	27.2%

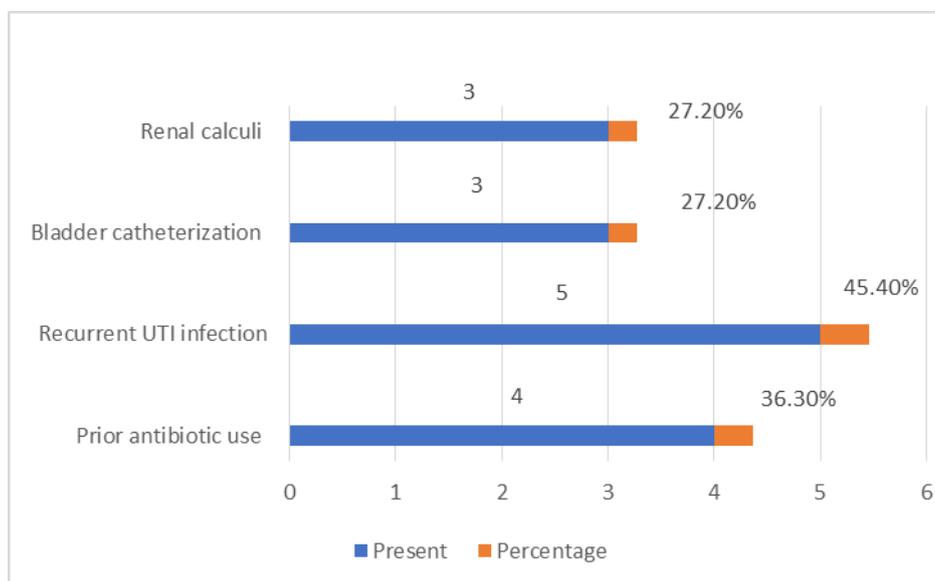


Table 7: Antibiotic sensitivity of MDR organisms in UTI infections (n=100).

DRUGS	PRESENT	PERCENTAGE
Colistin	11	100%
Tigecycline	1	9%
Polymyxin-B	10	91%
Piperacillin+ Tazobactam	1	9%
Netilmicin	1	9%
Tobramycin	1	1%

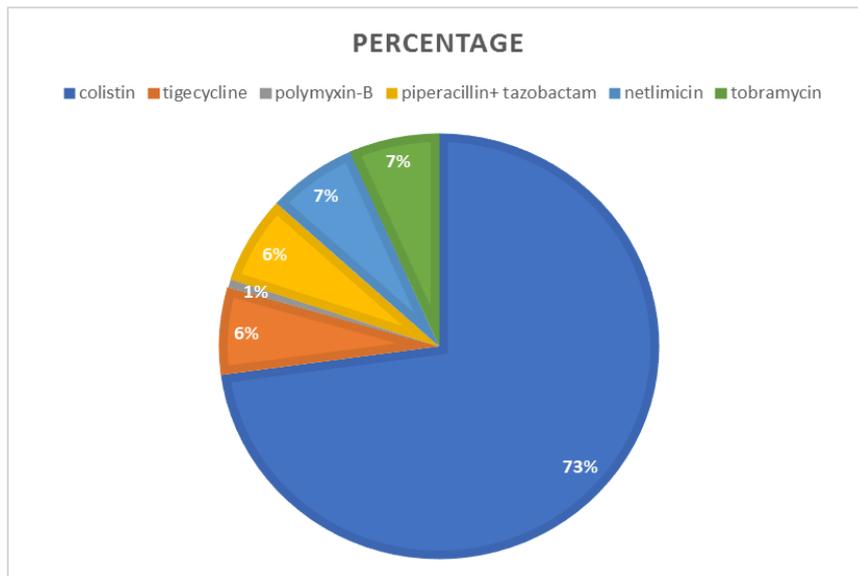


Table 8: Antibiotic sensitivity of ESBL positive patients in UTI infection (n=100).

Drugs	Present	Percentage
Colistin	15	100%
Tigecycline	14	93.3%
Imipenem	12	80%
Doripenem	12	80%
Netilmicin	7	46.6%
Tobramycin	6	40%
Meropenem	5	33.3%
Nitrofurantoin	5	33.3%
Ertapenem	4	26.6%
Piperacillin+ tazobactam	4	26.6%
Ceftazidime + clavulanic acid	3	20%
Cefoperazone+ sulbactam	2	13.3%
Cefepime + tazobactam		13.3%
Cefoperazone+ tazobactam	2	13.3%
Amoxiclav	2	13.3%
Aztreonam	2	13.3%
Doxy	1	6.6%
Ceftazidime + tazobactam	1	6.6%

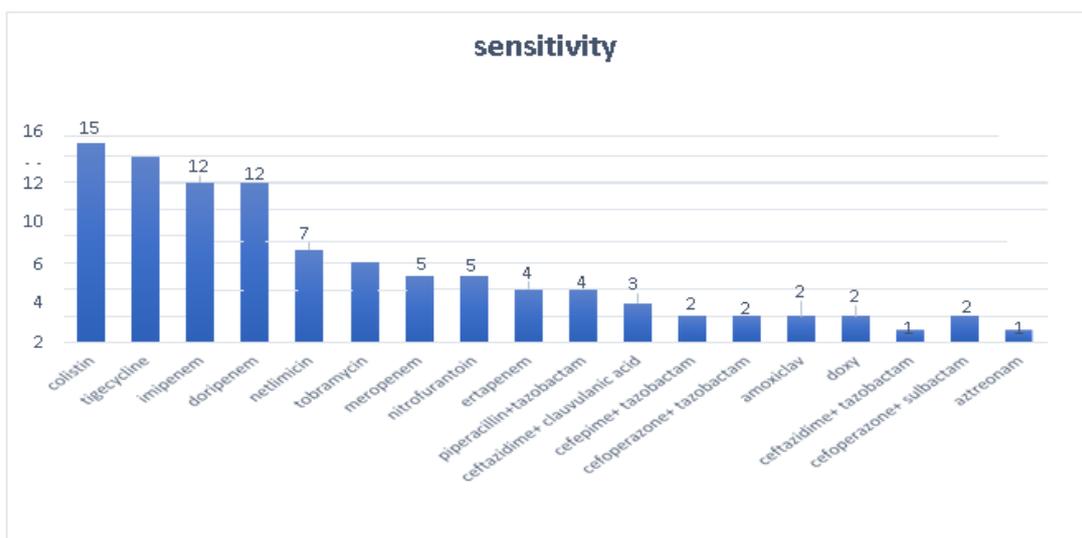
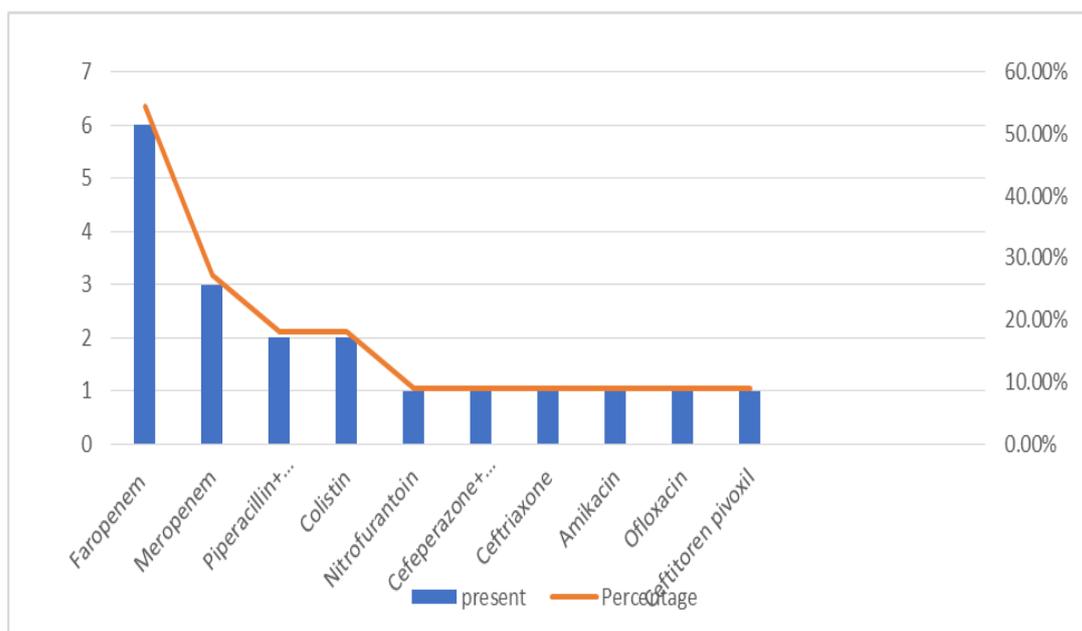
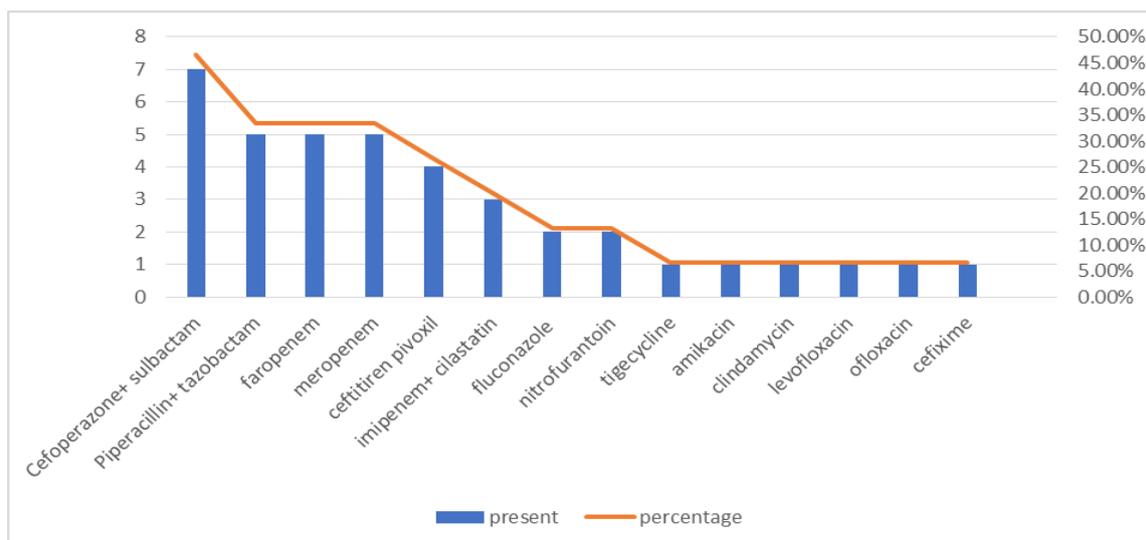


Table 9: Most commonly used antibiotics for MDR organisms in UTI patients.

Antibiotics	Present	Percentage
Faropenem	6	54.5%
Meropenem	3	27.2%
Piperacillin+ tazobactam	2	18%
Colistin	2	18%
Nitrofurantoin	1	9%
Cefeperazone+ sulbactam	1	9%
Ceftriaxone	1	9%
Amikacin	1	9%
Ofloxacin	1	9%
Cefditoren pivoxil	1	9%

**Table 10: Most commonly used antibiotics for ESBL positive UTI patients.**

Antibiotics	Present	Percentage
Cefoperazone+ sulbactam	7	46.60%
Piperacillin+ tazobactam	5	33.30%
Faropenem	5	33.30%
Meropenem	5	33.30%
Cefditoren pivoxil	4	26.60%
Imipenem+ cilastatin	3	20.00%
Fluconazole	2	13.30%
Nitrofurantoin	2	13.30%
Tigecycline	1	6.60%
Amikacin	1	6.60%
Clindamycin	1	6.60%
Levofloxacin	1	6.60%
Ofloxacin	1	6.60%
Cefixime	1	6.60%



SUMMARY AND CONCLUSION

We have conducted this study in Hyderabad, Telangana, India. For six months from September 2020 to April 2021. The main aim of the study to identify the prevalence of ESBL and MDR organisms, antibiotic sensitivity pattern its risk factors, and management of UTI infections in tertiary care hospitals are as follows.

- Total number of urine culture reports collected: 100
- Total number ESBL positive patients in reports: 15/100(15%)
- Total number of MDR patients in reports: 11/100(11%)
- Gender-wise distribution of ESBL positive patients: males 11/15(73.3%), females 4/15(26.6%).
- Gender-wise distribution of MDR patients: males 8/11(72.7%), females 3/11(27.7%).
- Age-wise severity of ESBL positive patients: 60-80 years 5/15(33.3%).
- Age-wise severity of MDR patients: 50-60 years 3/11(27.7%).
- The Most and least sensitive antibiotic of ESBL positive patients: colistin (100%), Doxy (6.6%) respectively.
- The Most and least sensitive antibiotic of MDR patients: colistin (100%), Tobramycin (1%) respectively.
- Major risk factor of ESBL positive patients: antibiotic prior use 3/15(20%).
- Major risk factor of MDR patients: recurrent UTI infection 4/11(36.3%).
- The most and least sensitive antibiotics in the carbapenems: Imipenem 73/100(73%), Ertapenem 45/100(45%) respectively.
- The most and the least resistant antibiotic in carbapenems: Meropenem 18/100(18%), Imipenem 7/100(7%) respectively.
- The most and least sensitive antibiotics in Aminoglycosides: Netilmicin 45/100 (45%), Gentamicin 9/100 (9%) respectively.
- The most and least resistant antibiotics in

Aminoglycosides: Gentamicin 36/100(36%), Netilmicin 2/100 (2%) respectively.

- The most and least sensitive antibiotics in Fluoroquinolones: levofloxacin and moxifloxacin 10/100 (10%) each, Nalidixic acid 4/100(4%) respectively.
- The most and least resistant antibiotics in Fluoroquinolones: Nalidixic acid and ciprofloxacin 64/100(64%) each, sparfloxacin 45/100(45%) respectively.
- The most and the least sensitive antibiotics in Miscellaneous: Colistin (100%), Nitrofurantoin 28/100(28%) respectively.
- The most and least resistant antibiotics in Miscellaneous: Tigecycline 7/100(7%), colistin and polymyxin B (NIL) respectively.
- The most and the least sensitive antibiotics in Cephalosporins: ceftazidime 11/100(11%), [cefoxitin, cefazolin, cefpodoxime, cefuroxime, cefixime] respectively.
- The most and the least resistant antibiotics in Cephalosporins: Cefoperazone 50/100(50%), cefixime 24/100(24%) respectively.

The present study was conducted in a multispecialty hospital to find out the prevalence and antibiotic sensitivity pattern of ESBL and MDR patients. This study will be helpful for healthcare professionals to find out a better antibiotic treatment for the treatment of UTI infections.

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