

Prospective Observational Study On Antibiotic Usage In Patient With Urinary Tract-Infection In Tertiary Care Hospital

I.M.S Deepthi¹, Jakkula Prashanth², Kasapuram Adharsh Reddy³, Mandha Sairam⁴, Dr. Sabahat Sakina⁵

^{1,2,3,4}Student, Dept. of Nephrology, Holy Mary college of pharmacy, Telangana, India.

⁵Assistant Professor, Dept. of Nephrology, Holy Mary college of pharmacy, Telangana, India.

ABSTRACT

To analyse the prospective observational study on antibiotic usage in patient with Urinary tract-infection in tertiary care hospital. To assess the of antibiotic usage in patient with UTI. To examine how antibiotics are used to treat UTI. They check the effectiveness and safety of antibiotics in the UTI. To evaluate the drug usage pattern based on age, gender, and class of drugs, To evaluate the complication and most used drugs in UTI. A total 120 cases were gathered for the study, which was supported out over six months at the KIMS Hospital in Secunderabad. Data was obtained from patient case sheets from urology departments and general medicine department. A total of 120 subjects were recruited for research, for the study, among the 120 patient 42 men and 78 women were presumably recruited. When considering gender as a variable, we can state that men (35%) and women (65%), are prone to UTI. This is because women have shorter urethra which help bacteria to travel easily from vaginal area to bladder to cause infection. The age range with the highest percentage (46%) was between 21 and 40 it is because of hormonal changes, sexual activity and pregnancy in female, while the lowest percentage (3%) was between 81 and 90. The majority of UTI are caused due to the escherichia coli with 68%, klebsiella pneumonia with 15%, staphylococcus aureus with 5%, enterococcus with 10%. In the patients we found that diabetes mellitus, chronic kidney-disease (CKD), benign prostatic hyperplasia (BPH) are the most common comorbidities. In UTI the common drugs are nitrofurantoin, ciprofloxacin, levofloxacin, ceftriaxone, and amoxicillin clavulanate were used. The Current study shows that antibiotic used in patient with UTI are very effective. The antibiotics are very beneficial and also improving the individual response by reducing the symptom and also bacteria in urinary tract. According to the finding the most often prescribed medication in the study was nitrofurantoin (29%), ciprofloxacin (21%), ceftriaxone (18%), levofloxacin (15% and amoxicillin clavulanate (10%). The most observed comorbidities are diabetes mellitus, chronic-kidney disease, benign prostatic hyperplasia. The data collected may be utilized by the practitioner and health care professionals to make clinical decision in order to get the best treatment outcome in patient with UTI. Among the studied cases the E.coli (60%) was the most common pathogen. The appropriateness of antibiotics selection was done based on the culture sensitivity report and treatment guidelines.

Keywords: Urinary tract infection, E.coli, chronic kidney-disease, BPH

I. INTRODUCTION

The kidneys are two essential organs situated in the lower back, on either side of the vertebrae. By filtering waste, excess fluid, and contaminants from the circulation, they are responsible for the production of urine. The kidneys also produce hormones such as erythropoietin, which are instrumental in the regulation of blood pressure, electrolyte balance, and red blood cell production. Each kidney is composed of nephrons, which are functional units that execute these functions.

External Structure:

1. **Renal Capsule:** A thin, fibrous layer covering the kidney.
2. **Perirenal Fat:** A layer of fatty tissue surrounding the kidney.
3. **Fascia of Gerota:** A layer of connective tissue surrounding the kidney & perirenal fat.

Internal Structure:

1. **Cortex:** The outer layer of kidney, containing:
 1. Glomeruli: Tiny blood vessels filtering waste and excess fluids.
 2. Proximal Convolved Tubules (PCTs): Coiled tubes reabsorbing nutrients and water.
 3. Distal Convolved Tubules (DCTs): Coiled tubes regulating electrolyte balance.
2. **Medulla:** The inner layer of the kidney, containing:
 1. Renal Pyramids: Triangular structures collecting urine from the nephrons.
 2. Renal Columns: Extensions of the cortex between the renal pyramids.
3. **Nephrons:** The functional units of kidney, consisting of:
 1. Glomerulus: The blood-filtration unit.
 2. Proximal Convolved Tubule (PCT): The nutrient-reabsorbing unit.
 3. Loop of Henle: The electrolyte-regulating unit.
 4. Distal Convolved Tubule (DCT): The electrolyte-regulating unit.
 5. Collecting Duct: The urine-collecting unit.

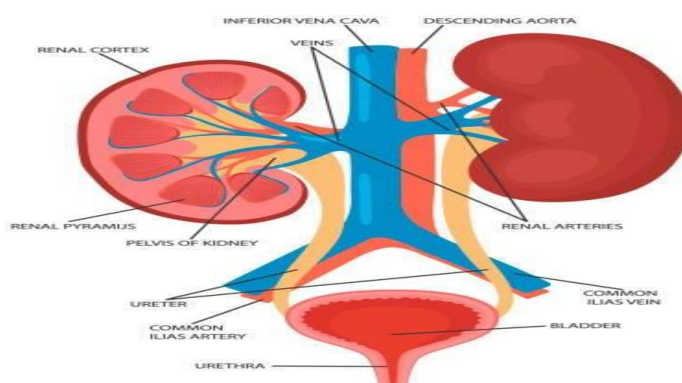
Blood Supply:

1. Renal Artery: Branching off the aorta, supplying oxygenated blood to the kidney.
2. Renal Vein: Returning deoxygenated blood from the kidney to the inferior vena cava.

Nerve Supply:

1. Renal Plexus: A network of nerves surrounding the kidney, regulating function.
2. Sympathetic Nerves: Regulating blood pressure and electrolyte balance.
3. Parasympathetic Nerves: Regulating urine production and bladder function.

ANATOMY OF THE URINARY SYSTEM



II. LITERATURE REVIEW

1. Giovanni Muzzonigro, Alessandro Conti, Daniele Minardi, Gianluca d'Anzeo, and Daniele Cantoro.

Symptomatic cystitis has been encountered by approximately one-third of adult women, and these episodes frequently recur. Urinary tract-infections (UTIs) are prevalent among women. If risk factors are not identified and eliminated, UTIs may result in more severe consequences, including renal failure and kidney injury. This review aimed to examine the variables that are most frequently associated with UTI in women in order to identify potential cures that are currently being employed in general practice and specialised domains, as well as those that are still being explored.

2. Klaus Gebhardt, Eberhardt Kniehl, Martha M. Matejczyk, Guido Schmiemann, and Eva Hummers

Given the prevalence and importance of UTIs in clinical practice, it is imperative to maintain a high level of diagnostic accuracy. UTIs are among the most frequently treated conditions in adult primary care medicine and account for a substantial proportion of antibiotic prescriptions. It is not advisable to overuse antibiotics, especially in view of the increasing prevalence of antibiotic resistance.

3. Justin Tenney, Nicholas Hudson, Hazar Alnifaidy, Justin Ting Cheung Li, and Kathy Harriet Fung.

For the first time, this review investigates the risk factors associated with a multidrug-resistant urinary tract-infection (MDR UTI). Urinary tract-infections are not addressed in other evaluations that have examined risk factors for various diseases that involve multidrug-resistant organisms. The objective of this investigation is to compile data that has been recently published in order to identify the risk factors for uTI that are reported most frequently and consistently.

4. Anja Maria Braend, Ildiko Gagyor, Karen Farrell, Marius Skow, Ingvild Vik, Gail Hayward, Gail Tandan, Virginia Hernandez Santiago, and Akke Vellinga

Approximately 20% of men will experience urinary tract-infections (UTIs) at some point in their lives. The incidence of UTIs in the community is 7.7 cases per 1000 men over the age of 85 and 0.9 to 2.4 cases per 1000 men under the age of 55.

5. Andrew J. Lowes, Andrew St. John, James C. Boyd, and Christopher P. Price

The utility of dipstick tests to detect or rule out urinary tract-infections (UTIs) has been the subject of numerous systematic studies. The evidence in favour of the use of urine leukocyte esterase and nitrite tests to exclude or eradicate UTI in adults was analysed. A meta-analysis was conducted using a threshold of 108 colony-forming units per litre, and 23 of the 30 studies that contained relevant and acceptable information were compiled after a literature search from 1966 to 2003. In 14 trials, the combination of the nitrite and leukocyte esterase assays, which were positive in one or both cases, exhibited the highest sensitivity and the lowest negative probability ratio. Despite the widespread nature of the investigations, seven of the fourteen studies demonstrated substantial decreases in pretest scores. Despite the extreme heterogeneity of the studies, seven out of fourteen investigations exhibited a significant decrease in the pretest to posttest likelihood, with a pooled posttest probability of 5% for the negative result. There is evidence that urinalysis can be employed as a rule-out test for UTI in certain situations.

NEED OF THE STUDY :

- UTI is presently most Common disease in many individual particularly in women.
- This Study helps to develop better treatment advices for the patient
- If provide a better understanding of disease and their symptoms
- This study help to determine the accurate antibiotics need for specific organism in UTI patient

- This help to also categorise the types of UTI accordingly to the symptoms
- Accurate diagnosis and evidence based treatment of UTI will results in better clinical care for many patients and reduction in needles antibiotic use
- To prevent the multi-drug resistance

III. AIMS AND OBJECTIVES

AIM:

To identify prescribing patterns & rational drug use of antibiotics in UTI patients in tertiary care hospital,

OBJECTIVES:

PRIMARY OBJECTIVES:

- To measure outcomes of antibiotics in UTI patient.
- To estimate impact of antibiotic in UTI patient.

SECONDARY OBJECTIVES:

- To observe management of several conditions with using antibiotics.
- To assess negative impacts of using antibiotics.
- To evaluate the safety & efficacy of antibiotics in UTI.

IV. METHODOLOGY

Study design and study period:

- It is prospective, observational study to be conducted in KIMS, Secunderabad.
- Study is proposed to be conducted for 6 months.

Source of data:

Data would be collected from treatment charts, case-sheets, and laboratory data of subjects included in study.

Sample size:

Estimated sample-size is about 120 patients.

Inclusion criteria:

The study includes if subject satisfies the following criteria.

- Inpatients & Outpatients.

- Patients with other-comorbidities.
- Age (about 18 years).
- Gender (male & female).

Exclusion criteria:

- Pediatrics.
- Patients who are situated not willing to give consent.
- Emergency-cases.
- Pregnant-women.
- Lactating-women.

V. RESULTS

Over six months 120 cases were gathered in KIMS hospital the gathered information used to make the following assessment.

TABLE 1: DISTRIBUTION BASED ON GENDER

GENDER	NO OF PATIENTS	PERCNTAGE (%)
MALE	42	35%
FEMALE	78	65%
TOTAL	120	100%

FIGURE 2 GENDER WISE DISTRIBUTION

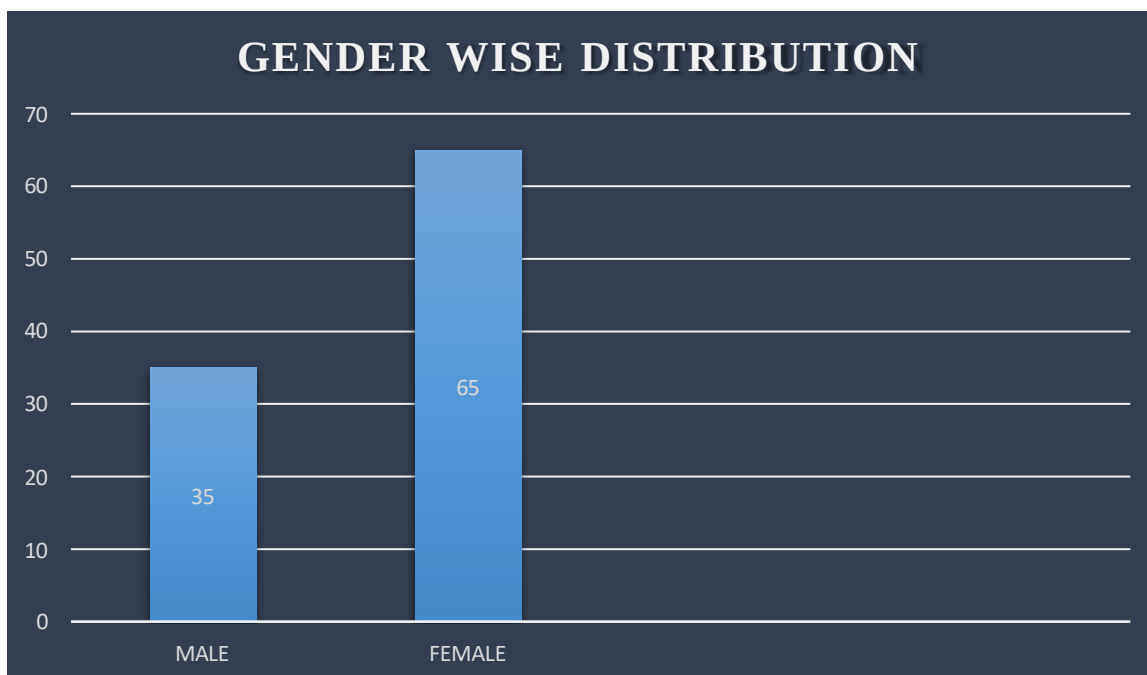


TABLE 2 : AGE WISE DISTRIBUTION OF UTI:

AGE	NO. OF PATIENTS	PERCENTAGE (%)
21-30	32	26%
31-40	25	20%
41-50	22	18%
51-60	15	12%
61-70	12	10%
71-80	10	8%
81-90	4	3%

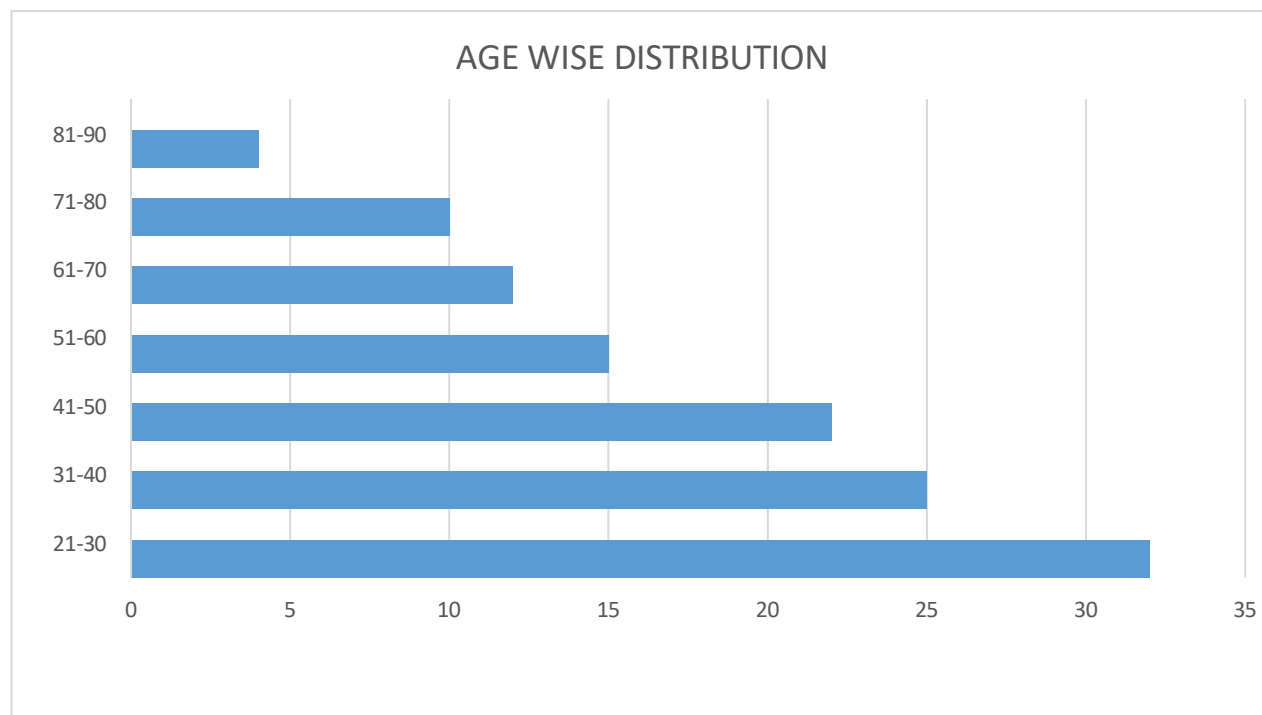


FIGURE 3 : AGE-WISE DISTRIBUTION

TABLE 3 :COMORBIDITES IN UTI DIAEASE:

COMORBIDITIES	NO.OF PATIENTS	PERCENTAGES%
DIABETES MELLITUS (DM)	35	30%
CHRONIC KIDNEY DISEASE(CKD)	15	12%
BENIGN PROSTASTIC HYPERPLASIA (BPH)	10	8%
CATHETERIZATION AND URINARY RETENTION	10	8%
HYPERTENSION	30	26%
NO COMORBIDITIES	20	16%
TOTAL	120	100%

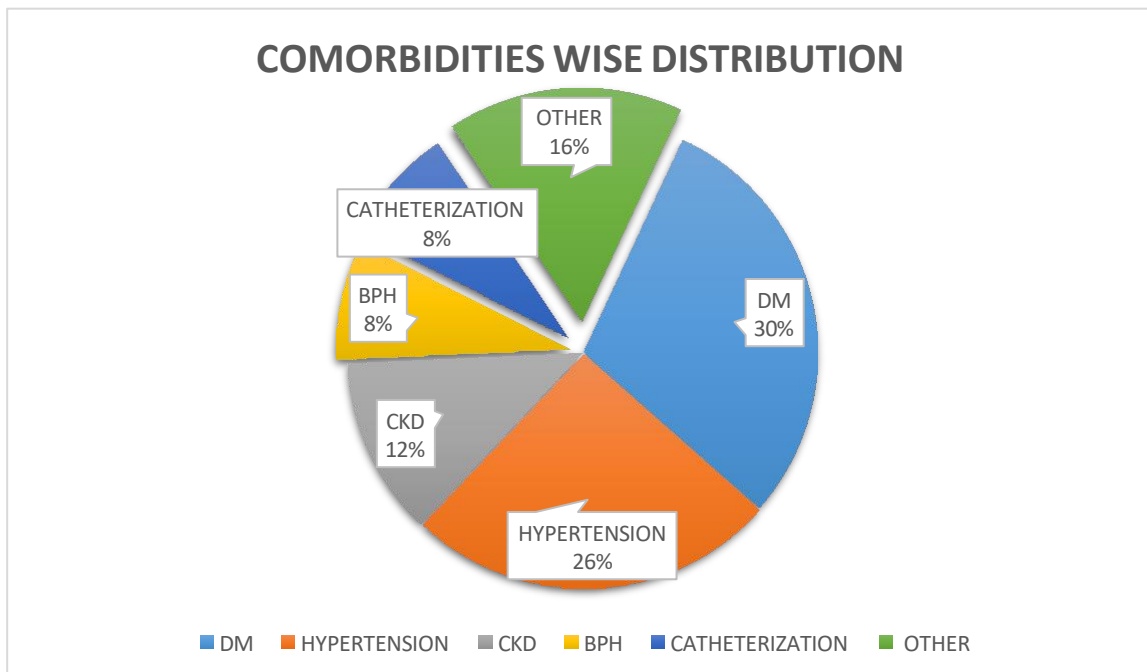


FIGURE 4 : COMORBIDITIES WISE DISTRIBUTION

TABLE 4 :MAJOR DRUGS USED IN UTI

Major drugs used	Number of patients	Percentage %
Nitrofurantoin	35	29%
ciprofloxacin	25	21%
levofloxacin	18	15%
ceftriaxone	22	18%
Amoxicillin-clavulanate	12	10%
meropenem	8	7%

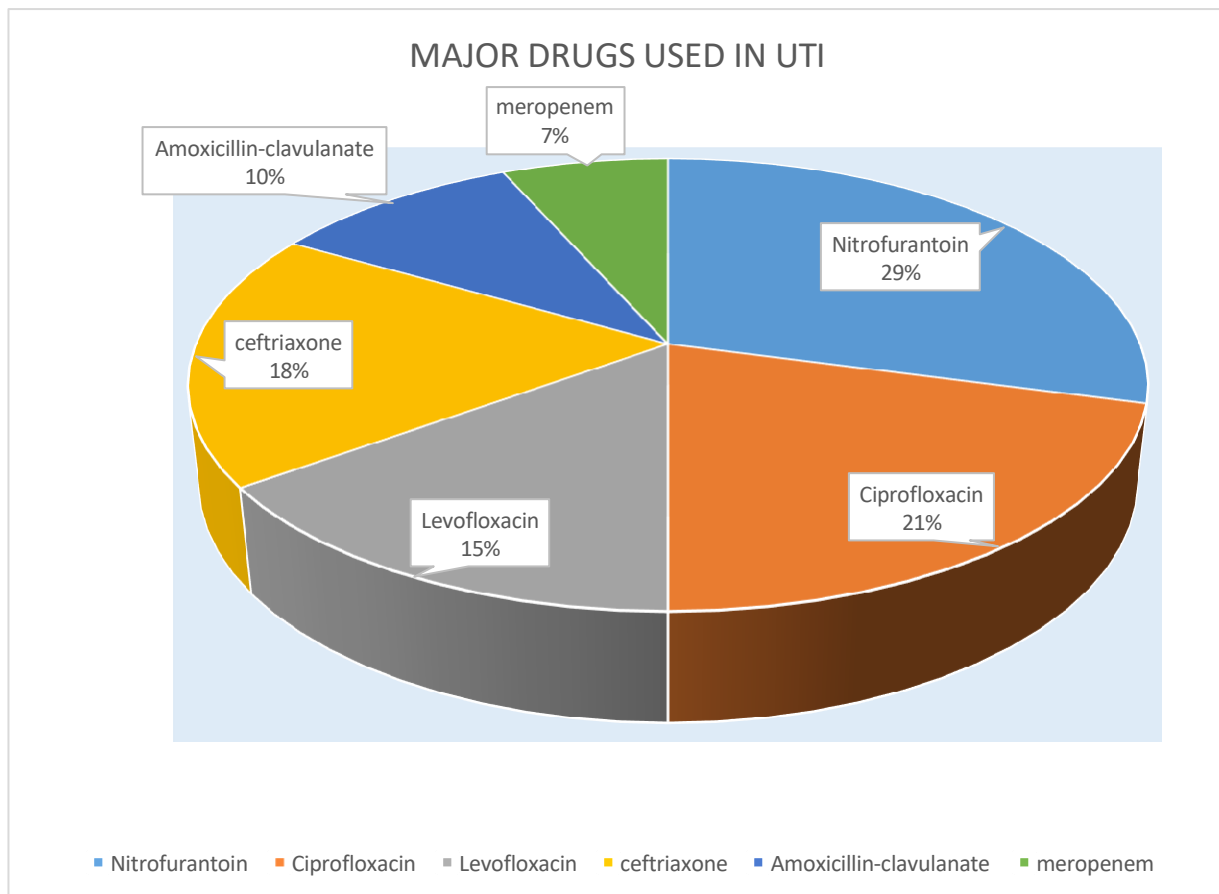


FIGURE 5 : MAJOR DRUGS USED IN UTI

TABLE 5 :PRESENCES OF COMORBIDITIES

COMORBIDITIES	NO OF SUBJECTS	PERCENTAGES %
YES	85	86%
NO	35	29%

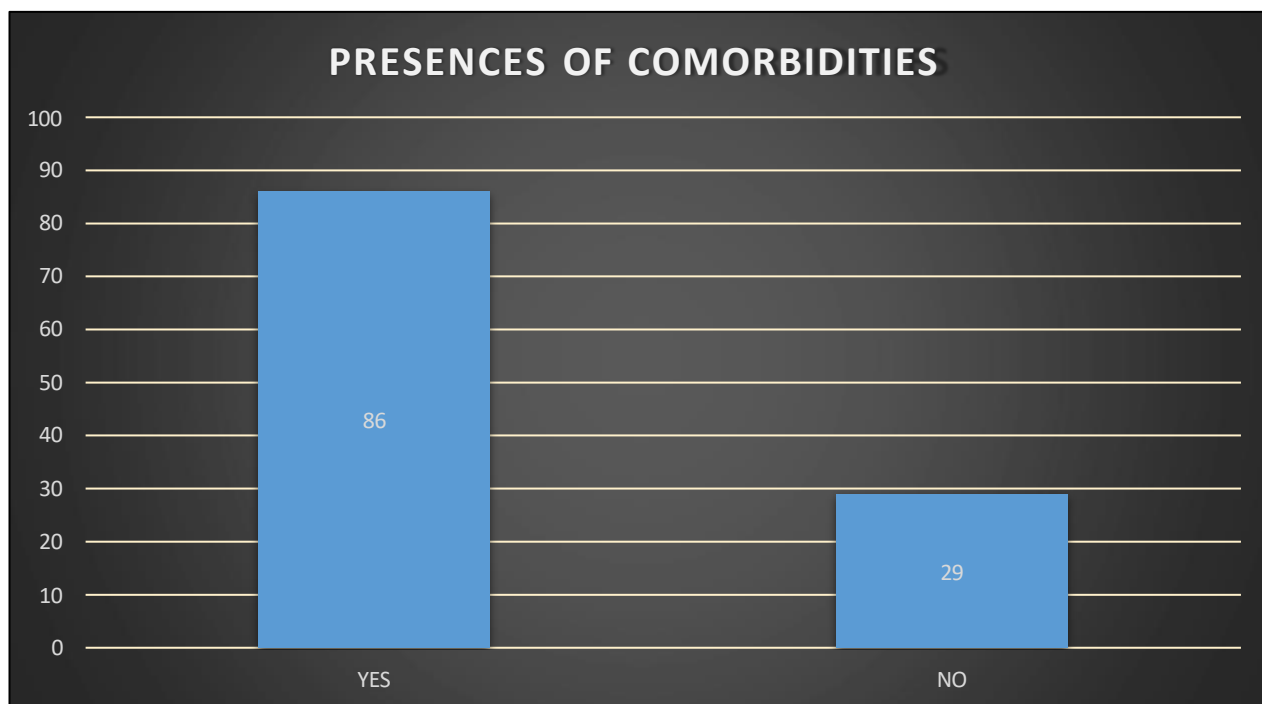


FIGURE 6: PRESENCES OF COMORBIDITIES

TABLE 6 :PATHOGEN WISE DISTRIBUTION

CAUSATIVE ORGANISM	NO. OF PATIENTS	PERCENTAGE %
E.coli	50	60%
Klebsiella pneumonia	30	15%
Pseudomonas spp.	20	10%
Staphylococci aureus	12	10%
OTHER	8	6%

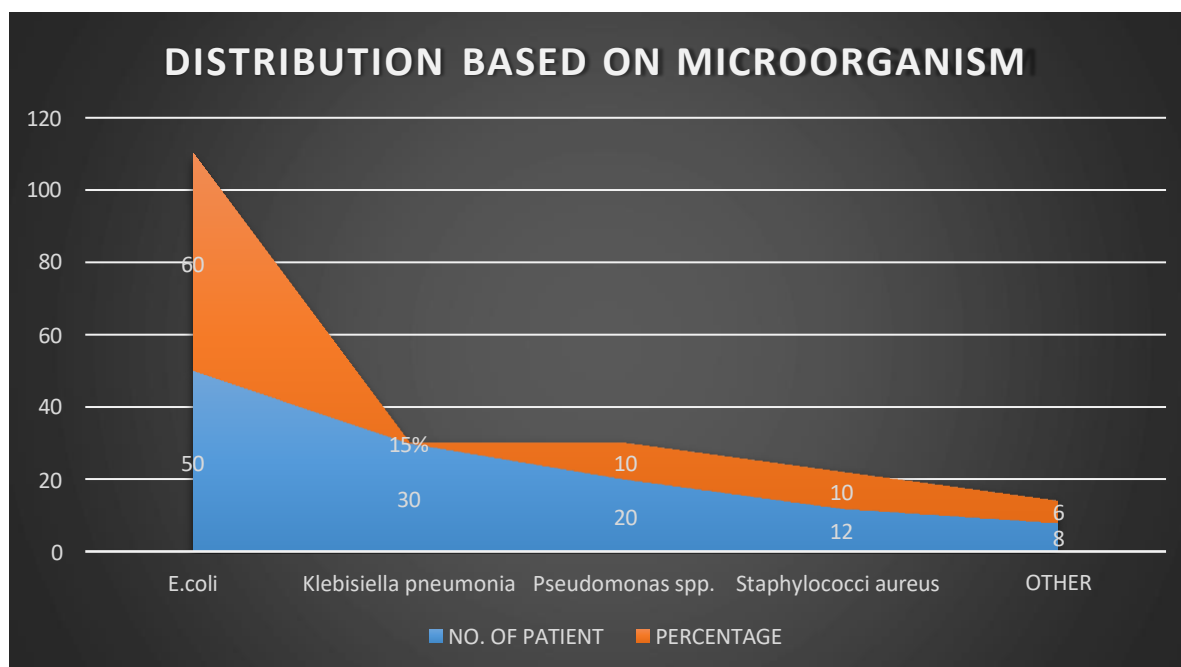


FIGURE 7 : DISTRIBUTION BASED ON MICROORGANISM

TABLE 7 : DISTRIBUTION BASED ON THE SYMPTOMS IN UTI

SYMPTOMS	NO. OF PATIENTS	PERCENTAGE (%)
DYSURIA	80	80%
FREQUENT URINATION	75	75%
URGENCY	70	70%
SUPRAPUBIC PAIN	60	60%
HEMATURIA	30	30%
FEVER	35	35%

TABLE 8 :Distribution based on duration

DURATION (IN DAYS)	NO.OF PATIENTS	PERCENTAGE (%)
1-3 DAYS	40	33.3%
3-5DAYS	30	25%
5-7DAYS	25	20.8%

7-10 DAYS	15	12.5%
>10 DAYS	10	8.3%
TOTAL	120	100

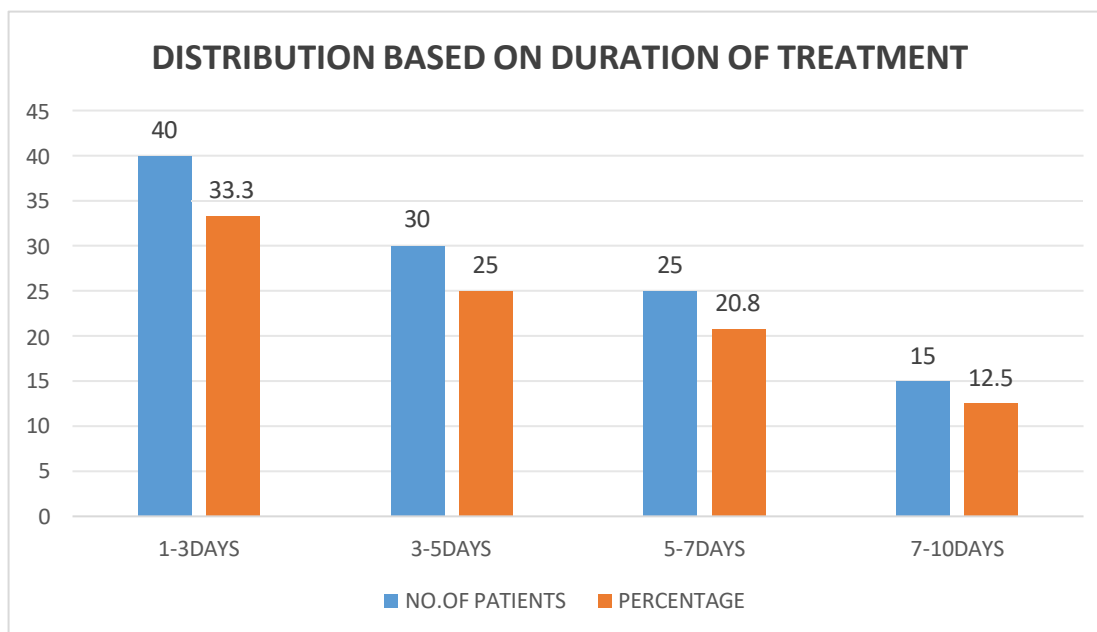


FIGURE 8 : DISTRIBUTION BASED ON DURATION OF TREATMENT

DISCUSSION:

- ✓ The focal point for the research is to study the prospective, observational usage of antibiotic in UTI.
- ✓ This study current research was directed at General Medicine and urology departments in KIMS.
- ✓ A total of 120 patients were included from KIMS for this study
- ✓ This study express that female are more prone to disease than male, this is because of the female have shorter urethra which helps bacteria to easily travel to urinary tract.
- ✓ UTI are most common bacterial-infection caused by both gram-negative and positive.
- ✓ But the most common microorganism E.coli with (60%) which is a gram positive species.
- ✓ The majority of patient affecting with UTI have symptoms like dysuria (80%), frequent urination 75%.
- ✓ Patients with Comorbid condition are more likely affected with UTI.
- ✓ patient with DM are 30% high.
- ✓ Early diagnosis of disease helps to treat disease faster than late diagnosis.
- ✓ Investigation of Culture and sensitivity test Provide information of the microorganism and the bacteria which is sensitive against that microorganism.

- ✓ Different antibiotic are administered to the patient in which Major drug administered to the patient was Nitrofurantoin (29 %)
- ✓ This study help in reducing multi-drug resistance in patient
- ✓ Complicated UTI are more common than uncomplicated UTI
- ✓ Mostly a 5 to 10 days period of treatment is required to treat the disease.

VI. CONCLUSION

Conclusion drawn from this study is that UTI is the common and often recurring disease.

The most important conclusion from this study is UTI are more common in female with (65%) than male with (35%).

This is due to women have a shorter urethra than men which help bacteria to travel bladder easily.

Most of cases when consider age as a variable Mostly age group from 21 to 31 are affected with UTI because of hormonal changes, sexual activity and pregnancy in female, while the lowest percentage (7%) was between 81and 90.

Another most important conclusion is that the pathogen causing UTI is E coli with (60%).

The majority of patients affecting with UTI have symptoms like increase in urinary frequency (75%), dysuria (80%), supra pubic pain (60%), urinary urgency(65%).

Timely diagnosis and appropriate management are crucial in preventing complications like kidney infection or sepsis.

Patients with comorbidities are most likely to affect with UTI. Patients with Diabetes mellitus and Chronic kidney disease are having high chances of UTI infection .

The appropriateness of antibiotics selection was done by culture and sensitivity test report . The most important conclusion is Antibiotics are the beneficial treatment for the UTI.

Antibiotics are the medication that treat bacterial infection by inhibiting the growth of microorganisms and killing them.

Prescription pattern monitoring studies were considered as a valuable goal for the drug therapy monitoring .

From the PPMS studies we can conclude that Nitrofurantoin was most prescribed antibiotics for treatment of UTI with 29% as bacterial nitroreductases convert nitrofurantoin into electrophilic intermediates that both the citric acid cycle and DNA, RNA, and protein production.

Then followed by ciprofloxacin is 20% as Ciprofloxacin is a bactericidal antibiotic that works by inhibiting DNA replication in bacteria. It accomplishes this by inhibiting the enzymes DNA gyrase & topoisomerase IV, which essential for DNA replication.

Then followed by levofloxacin is 15%, Ceftriaxone 18%, Amoxicillin -calvulanate10%. Mostly a 1 week to 2 week period of treatment time was required to treat the symptoms.

Recurrent UTIs are handled by decreasing risk factors and utilizing intermittent or daily antibiotic prophylaxis.

The study help in reducing multi drug resistance in patient.

The data collected may be utilised by the physician and health care professional to make clinical decision so as to ensure best treatment outcomes in patients with UTI.

SUMMARY:

The rational use of antibiotics over 6 month with different ages and gender at a tertiary care hospital were studied

The study consists of 120 different patients health analysis and disease Conditions were observed It consists of 42male and 78 female patients which gives the percentile as female 65%, 35% male.

The Gender wise analytical description was shown in the form of graphical representation of patients, with highest percentage of 26% from age-group of 21 to 30 years, 20% for age group of 31 to 40 years and lowest percentage of 3% from age-group of 81 to 90 years.

Prescription pattern monitoring-studies (ppms) is considered as valuable for the drug therapy monitoring

These antibiotics are the drugs which reduces the toxins released by the Bacteria and other Microbes, later it kill the deadly Microorganism

The comorbidities data was Collected from ppms it was displayed in tabular form, the percentage of patient with DM (29%) CKD (25%) BPH (16%) catheterization and urinary retention (8%) HTN (26%), other Comorbidities (16%).

The most often used/prescribed antibiotics in the study are Nitrofurantoin (29%) Ciprofloxacin (20%), Levofloxacin (15%), Ceftriaxone (18%), Amoxicillin Clavulanate (10%) Meropenem (7%)

The above Mentioned percentages includes patients from 100 percentage

The comorbidities data in chart patients with comorbidities are 85 and patients with no comorbidities are 35.

These summary was based on patients, gender, age, Comorbidities, rational use of antibiotics prescription and duration of use.

Prescription Pattern for rational use of antibiotics has wide range of changes in patient with no comorbidities.

By Looking prescription patterns, we can determine the appropriate usage of antibiotic in patient with Bacterial UTI

The Majority of uti are Caused due to Escherichia coli with (60%)and pseudomonas species with 10% Klebsiella with 15% and staphylococcus aureus (10%)and others with 6% respectively ,with the above mentioned data we provide proper treatment for the Patients

Regular assessment of drug therapy monitoring enables a symptomatic relief, decreases over dosing of drug and multidrug resistances.

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