MS.ID-IJPBS-2561
International Journal of Pharmacy and Biological Sciences-IJPBS™ (2022) 12 (3): 01-16
Online ISSN: 2230-7605, Print ISSN: 2321-3272
Research Article | Pharmaceutical Sciences | OA Journal | MCI Approved | Index Copernicus

A Study on Prevalence, Etiology and Antibiotic Sensitivity Pattern of Urinary Tract Infection in A Tertiary Care Teaching Hospital

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Received: 28 Mar 2022 / Accepted: 26 Apr 2022 / Published online: 1 Jul 2022
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Abstract

The most prevalent infectious disease in the community or in the healthcare setting is urinary tract infection. It is one of the leading causes of morbidity and mortality. Regardless of age or gender, UTI is an issue. This study is designed as a retrospective observational study. The aim of the study is to determine the prevalence of the disease among different age groups and sex, causative agents, associated comorbidities and antibiotic sensitivity pattern of urinary tract infection. The research was carried out at the Rajah Muthiah Medical College and Hospital (RMMCH), affiliated with Annamalai University in Chidambaram, Cuddalore District, Tamil Nadu. The information was gathered from a sample size of 110 people. The study's data was gathered from inpatient case sheets in the Medical Records Department (MRD) as well as a cultural sensitivity report. The present study deduce that prevalence of UTI was higher among females than males. It has been observed that occurrence of UTI was preponderant in the age group of 21-30 and 51-60 years. Gram negative organisms was the most common organism causing UTI. Among them, *E. coli* was the predominant causative agent. Gram negative organisms were mostly sensitive to Piperacillin-Tazobactam, and Gram-positive organisms were highly sensitive to Linezolid. This study also inferred that Cefuroxime, Ceftazidime and Co-Trimoxazole were resistant predominantly to isolated uropathogens. Type II Diabetes Mellitus was the most common comorbid condition in UTI patients. Also, most commonly prescribed antibiotics for UTI was Nitrofurantoin. Antimicrobial resistance is a serious problem that affects people all around the world. Within a population, the sensitivity profile of commonly isolated viruses has been shifting. The goal of this research is to find the best way to use antibiotics in order to combat antibiotic resistance in the long run. Prior to a patient's urine culture result, the resistance pattern to antibiotics is critical in determining the best empirical treatment.

Keywords
Antibiotic Sensitivity Pattern, Antimicrobial Resistance, Urinary Tract Infection.

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I. INTRODUCTION:

Urinary Tract Infection (UTI) is one of the most prevalent infectious disorders, with microorganisms invading any region of the urinary tract. [1] It affects people of all ages and genders. Because of the structure of the female urinary system, it is more common. Bacteria and fungi are the most common causes of urinary tract infections. Infections in the urinary tract can be classified as either complicated or uncomplicated. The most frequent type of infection is uncomplicated urinary tract infection. Complicated Urinary Tract Infection develops as a result of factors that obstruct the normal flow of urine, such as functional or structural abnormalities, such as renal instrumentation, or the existence of an underlying condition that raises the risk and severity of infection. With no prior instrumentation, uncomplicated urinary tract infection arises in the normal genitourinary system. Asymptomatic or symptomatic infection is possible. [2] The site of infection, such as the upper or lower urinary tract system, can be used to classify urinary tract infections. The kidneys and ureters are involved in upper tract infections. The bladder and urethra are two areas of the lower tract that might be infected. [3] The third most frequent bacterial illness in humans is urinary tract infection (UTI). [4] It is one of the leading causes of morbidity and the second most prevalent reason for hospitalization. UTI affects people of all ages and genders around the world. The prevalence of urinary tract infections (UTIs) rises with age. The global prevalence rate is 0.7 percent, with women being more susceptible to infection than men. The global incidence of UTI in underdeveloped nations is estimated to be 250 million persons per year. [5] UTI affects over 40% of women and 12% of males at some point in their lives. The illness will affect women between the ages of 15 and 44. [6]

II. MATERIALS AND METHODS:

Selection of title in collaboration with guides, acquisition of study-related literature, data collecting form design, Institutional Ethics Committee approval, and patient selection based on inclusion and exclusion criteria, Data collection and documentation pertinent to the study, data analysis utilizing statistical methods, interpretation of results, conclusion, and report submission are all part of the work plan.

Population and Sample:

The study was conducted for five months (January 2021 – May 2021) in the Department of General Medicine. By using the sample size formula for finite population $\frac{z^2 \times p(1-p)/e^2}{1+[z^2 \times p(1-p)/\, e^2 N]}$ where z=z score, p = population proportion, e=margin of error, N=population size. 415 population size of urinary tract infected patients with a 95 % Confidence Interval (Z=1.96), 50% population proportion, 8% margin of error, sample size(n) = 110. Hence the result of the study will be based on the data obtained from the sample size of 110.

Data and Sources of Data:

This is retrospective observational research. The research was carried out at the Rajah Muthiah Medical College and Hospital (RMMCH), a 1200-bed multi-specialty tertiary care teaching hospital affiliated with Annamalai University in Chidambaram, Cuddalore District, Tamil Nadu. The information was gathered from a sample size of 110 people. The study's data was gathered from inpatient case sheets in the Medical Records Department (MRD) as well as a cultural sensitivity report. The study subject recruitment procedure are all patients admitted in the medicine ward of RMMCH with Urinary Tract Infection. Subjects will be selected based on inclusion and exclusion criteria.

Inclusion Criteria: Patients admitted in the medicine ward with clinical manifestations, laboratory investigations (Total count, Urine routine examination, Urine culture test) suggestive of UTI. Patients with and without comorbid conditions.

Exclusion Criteria: Patients who are less than 18 years of age, Patients on any recent or current history of antibiotic intake, Pregnant/lactating women.

Statistical Tools:

Descriptive Statistics has been used to find the maximum, minimum, mean and normally distribution of the data of all the variables of the study.

III. RESULTS:

A total of 414 patients attended inpatient departments of Rajah Muthiah Medical College and Hospital during the period January 2019 – January 2020. Out of the total 110 samples of patients admitted in the Department of General Medicine were included based on inclusion and exclusion criteria. Identification of bacterial isolates and Antibiotic Susceptibility Pattern was observed in the Department of Microbiology. The results was statistically analyzed as follows:

Table and Figure 3.1 shows the Prevalence of UTI among male and female. Among them 77(70%) were females and 33(30%) were males. It has been observed that UTI was predominant among female than males. Table and Figure 3.2 shows the Prevalence of UTI among different age groups. Among them, it has been observed that high

prevalence of UTI were in the age group of 21-30 and 51-60 (20.90%) followed by 41-50 (18%) and 61-70 (12.72%). Females was predominant among both age groups. Table and Figure 3.3 shows the distribution of organisms causing UTI. It has been observed that *E. coli* (57%) was the dominant organism causing UTI followed by *Klebsiella sp.* (25%), *Staphylococcus aureus* (10%) and *Pseudomonas sp.* (6%). Table and Figure 3.4 shows the distribution of comorbidities in UTI Patients. In this study 40 patients had UTI along with other diseases. Among them, it was observed that Type II Diabetes Mellitus (65%) was the most common comorbidity associated with UTI. Table and Figure 3.5 shows the antibiotic susceptibility pattern of *E.coli.* It has been observed that antibiotics which showed higher sensitivity to *E. coli* was Piperacillin-Tazobactam (75%) followed by Nitrofurantoin (64%) and Amikacin (59%). Figure 3.6 shows the Growth of *E.coli* on MacConkey Agar. Figure 3.7 shows the Antibiotic Susceptibility Test of *E.coli* by Kirby-Bauer Disk Diffusion Method. Table 3.6 and Figure 3.8 shows the antibiotic susceptibility pattern of *Klebsiella sp.* It has been observed that antibiotics which showed higher sensitivity to *Klebsiella sp.* was Piperacillin-Tazobactam (64%) and Amikacin (64%) followed by Gentamicin (61%) and Norfloxacin (54%). Figure 3.9 shows the Growth of *Klebsiella sp.* on MacConkey agar. Figure 3.10 shows the Antibiotic Susceptibility Test of *Klebsiella sp.* by Kirby-Bauer Disk Diffusion Method. Table 3.7 and Figure 3.11 shows the antibiotic susceptibility pattern of *Pseudomonas sp.* It has been observed that antibiotics which showed higher sensitivity to *Pseudomonas sp.* was Piperacillin-Tazobactam (100%) followed by Gentamicin (71%), Amikacin (57%) and Cefotaxime (43%). Figure 3.12 shows the Growth of *Pseudomonas sp.* on Blood agar. Figure 3.13 shows the Antibiotic Susceptibility Test of *Pseudomonas sp.* by Kirby-Bauer Disk Diffusion Method. Table 3.8 and Figure 3.14 shows the antibiotic susceptibility pattern of *Staphylococcus aureus*. It has been observed that antibiotics which showed higher sensitivity to *Staphylococcus aureus* was Linezolid (73%) followed by Amikacin (64%) and Nitrofurantoin (55%). Figure 3.15 shows the Growth of *Staphylococcus aureus* on Blood agar. Figure 3.16 shows Antibiotic Susceptibility Test of *Staphylococcus aureus* by Kirby-Bauer Disk Diffusion Method. Table 3.9 and Figure 3.17 shows the prescribed antibiotics under each class. It was observed that most commonly prescribed antibiotic class was Aminoglycosides (26%) followed by Penicillin (21.16%) and Urinary Antiseptics (21.16%).

Table 3.1: Prevalence of UTI According to Gender

Gender	Number of Patients	Percentage
Female	77	70
Male	33	30
Total	110	100

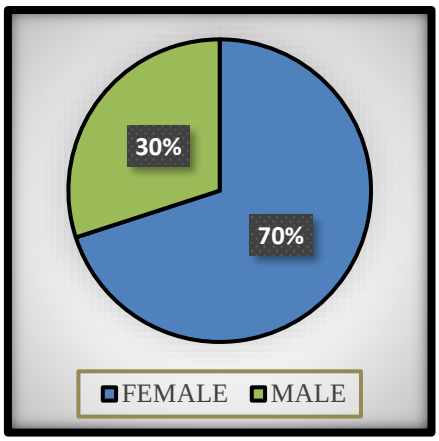


Fig.3.1 PREVALENCE OF UTI ACCORDING TO GENDER

Table 3.2: Prevalence of UTI According to Age-Groups

Age Groups	Sex	Frequency	Total Percentage
18-20	Female	2	1.81%
	Male	0	
21-30	Female	19	20.90%
	Male	4	
31-40	Female	9	12.72%
	Male	5	
41-50	Female	16	18%
	Male	4	
51-60	Female	17	20.90%
	Male	6	
61-70	Female	8	14.54%
	Male	8	
71-80	Female	4	9.09%
	Male	6	
81-90	Female	2	1.81%
	Male	0	

Fig.3.2 PREVALENCE OF UTI ACCORDING TO AGE-GROUPS

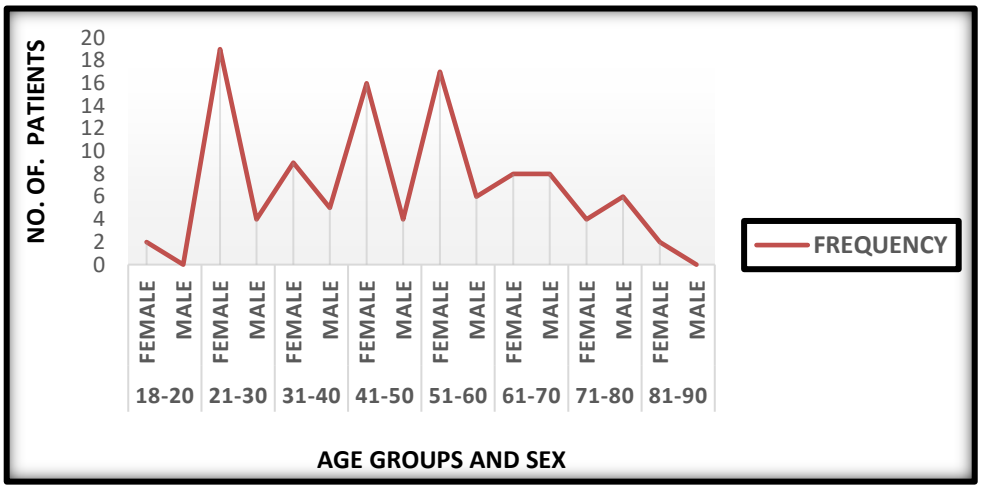


Table 3.3: Distribution of Uropathogens:

Organisms	Number of Organisms	Percentage
GRAM NEGATIVE		
Escherichia coli	63	57.27%
Klebsiella sp.	28	25.45%
Pseudomonas sp.	7	6.36%
GRAM POSITIVE		
Staphylococcus aureus	11	10%
Streptococcus sp.	1	0.9%
Total	110	100%

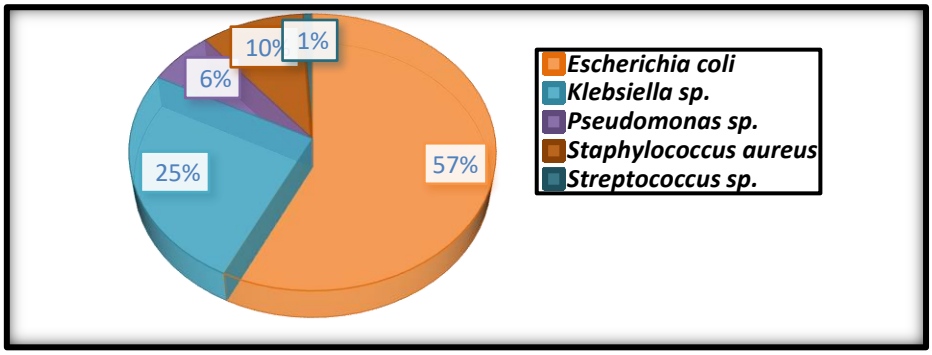


Fig.3.3 DISTRIBUTION OF UROPATHOGENS

Table 3.4: Comorbidities Associated with UTI Patients

Comorbidities	Number of Patients	Percentage
Type II Diabetes Mellitus	26	65%
Chronic Kidney Disease	5	12.5%
Coronary Artery Disease	4	10%
Renal Calculi	3	7.5%
Stroke	2	5%
Total	40	100%

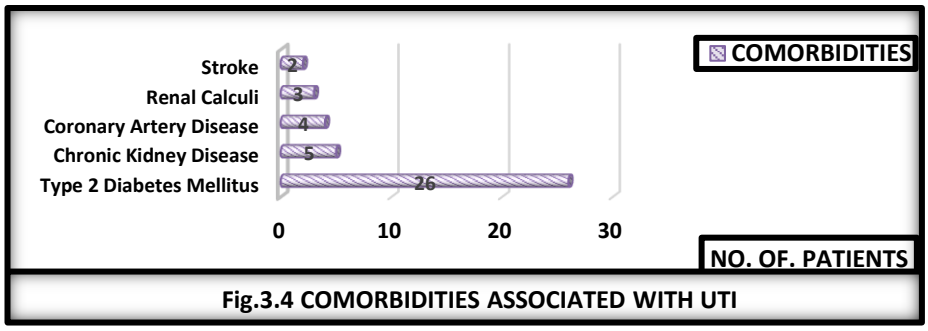


Fig.3.4 COMORBIDITIES ASSOCIATED WITH UTI

Table 3.5: Antibiotic Sensitivity Pattern of *E.coli:*

Antibiotics	Number of Patients	Sensitive Percentage
Amikacin	37	58.73
Linezolid	3	4.76
Gentamicin	17	26.98
Imipenem	8	12.69
Cefuroxime	4	6.34
Piperacillin -Tazobactam	47	74.60
Nitrofurantoin	40	63.49
Norfloxacin	29	46.03
Ciprofloxacin	6	9.52
Ofloxacin	2	3.17
Cefotaxime	6	9.52
Ceftazidime	2	3.17
Ceftriaxone	11	17.46
Tobramycin	3	4.76
Co-Trimoxazole	17	26.98
Cefazolin	3	4.76
Amoxycillin and Potassium clavulanate	3	4.76
Meropenem	6	9.52
Cefixime	4	6.34

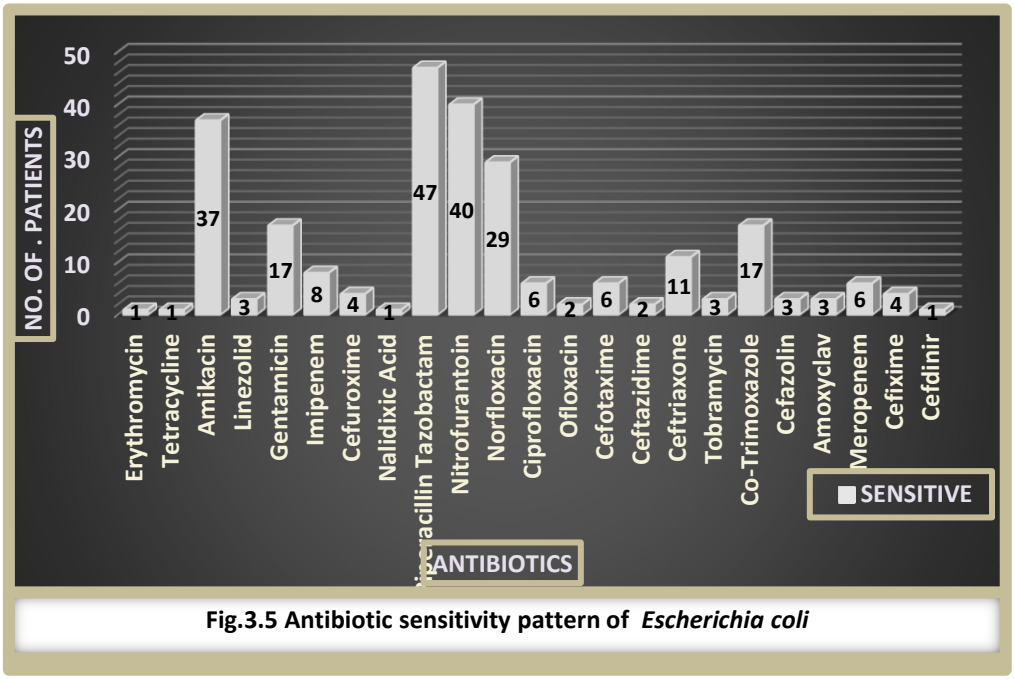


Fig.3.5 Antibiotic sensitivity pattern of *Escherichia coli*

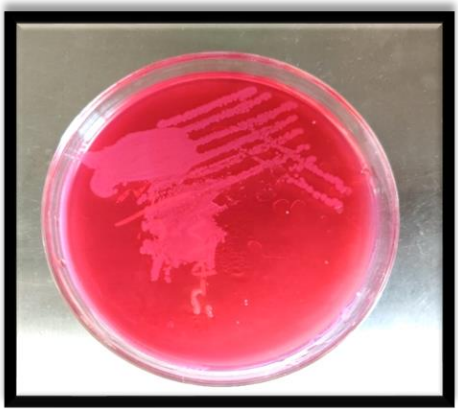


Fig.3.6 Growth of *E.coli* on MacConkey Agar

Fig.3.7 Antibiotic Susceptibility Test of *E.coli* by Kirby-Bauer Disk Diffusion Method

Table 3.6: Antibiotic Sensitivity Pattern of *klebsiella sp.*

Antibiotics	Number of Patients	Sensitive Percentage
Amikacin	18	64.28
Gentamicin	17	60.71
Imipenem	5	17.85
Cefuroxime	6	21.42
Nalidixic Acid	3	10.71
Piperacillin -Tazobactam	18	64.28
Nitrofurantoin	9	32.14
Norfloxacin	15	53.57
Ciprofloxacin	9	32.14
Cefotaxime	3	10.71
Ceftriaxone	10	35.71
Co-Trimoxazole	6	21.42
Cefazolin	7	25
Meropenem	1	3.57
Cefixime	1	3.57

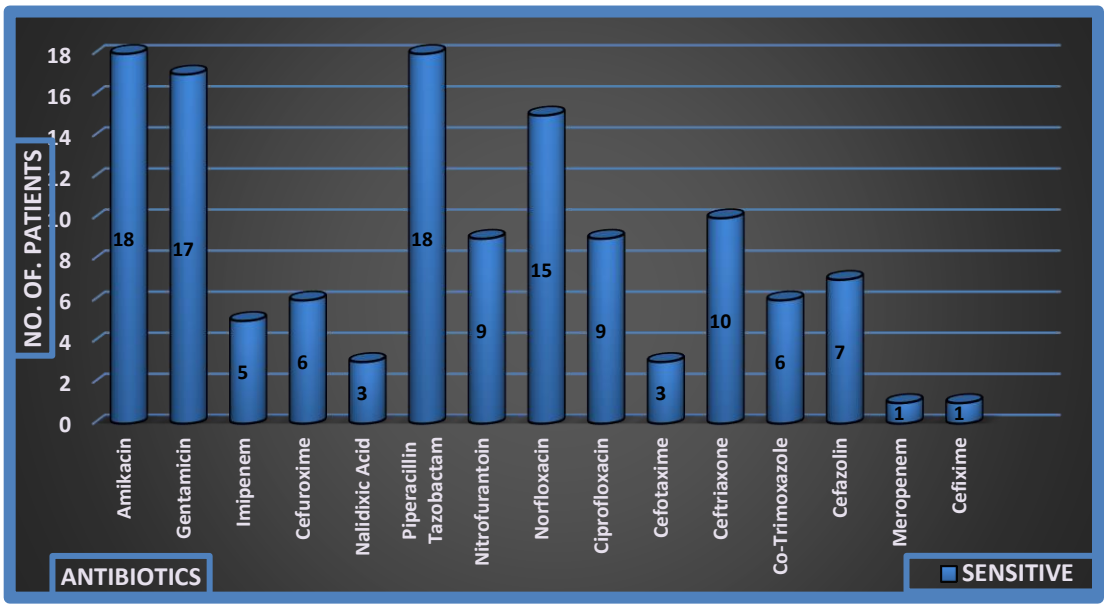


Fig.3.8 Antibiotic Sensitivity Pattern of *Klebsiella sp.*

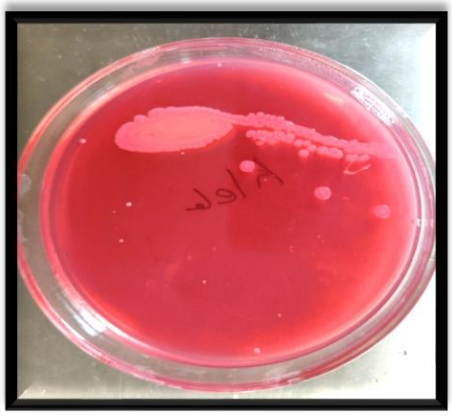


Fig.3.9 Growth of *Klebsiella sp.* on MacConkey agar

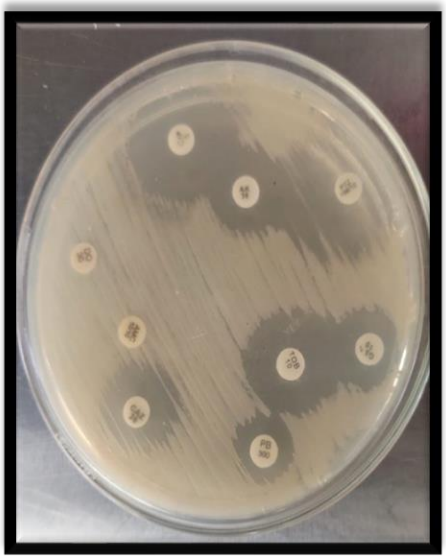


Fig.3.10 Antibiotic Susceptibility Test of *Klebsiella sp.* by Kirby-Bauer Disk Diffusion Method

Table 3.7: Antibiotic Sensitivity Pattern of *Pseudomonas sp.*

Antibiotics	Number of Patients	Sensitive Percentage
Amikacin	4	57.14
Gentamicin	5	71.42
Piperacillin -Tazobactam	7	100
Nitrofurantoin	4	57.14
Norfloxacin	4	57.14
Cefotaxime	3	42.85
Ceftazidime	2	28.57
Tobramycin	4	57.14

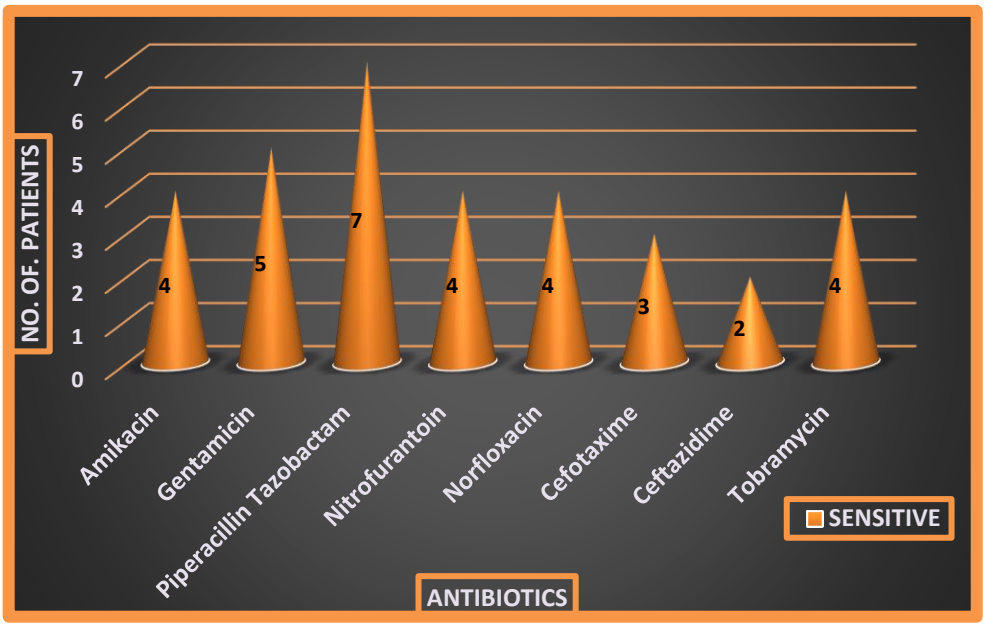


Fig.3.11 Antibiotic Sensitivity Pattern of *Pseudomonas*

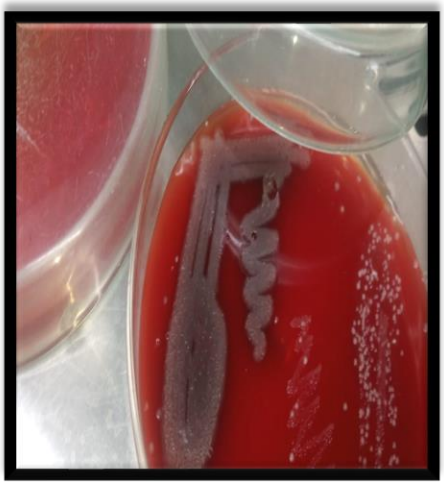


Fig.3.12 Growth of *Pseudomonas sp.* on Blood agar

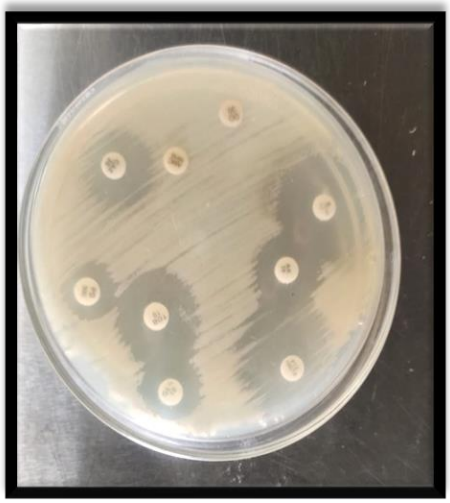


Fig:3.13 Antibiotic Susceptibility Test of *Pseudomonas sp.* by Kirby-Bauer Disk Diffusion Method

Table 3.8: Antibiotic Sensitivity Pattern of Staphylococcus *sp.*

Antibiotics	Number of Patients	Sensitive Percentage
Erythromycin	2	18
Tetracycline	4	36
Amikacin	7	64
Linezolid	8	73
Gentamicin	4	36
Nitrofurantoin	6	55
Norfloxacin	2	18
Ciprofloxacin	1	9.09
Ceftriaxone	2	18
Clindamycin	5	45
Tobramycin	1	9.09
Chloramphenicol	3	27
Co-Trimoxazole	2	18

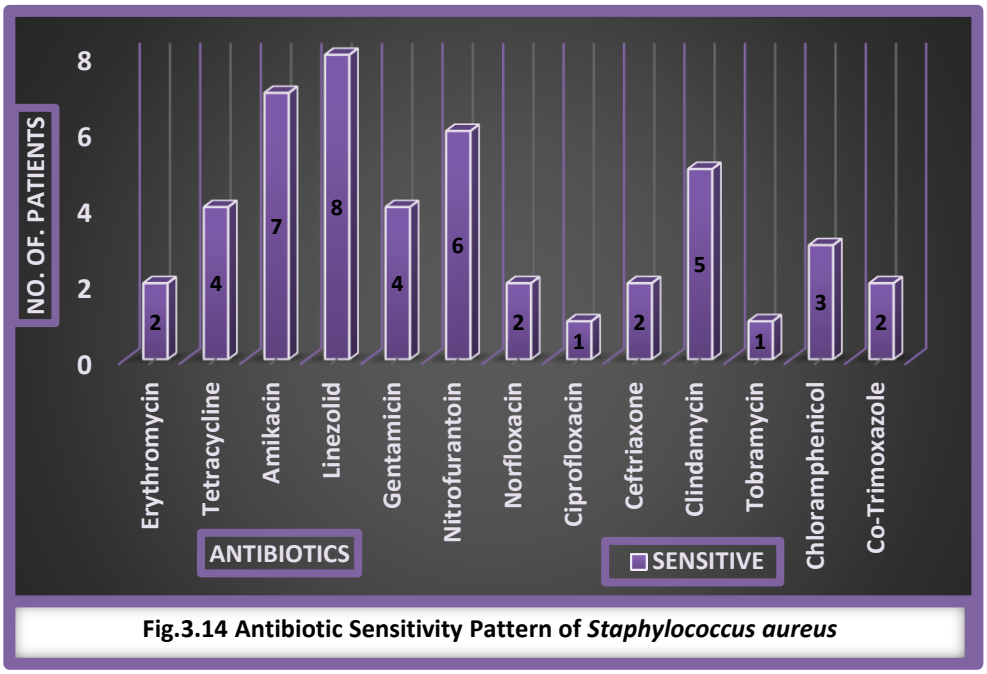


Fig.3.14 Antibiotic Sensitivity Pattern of *Staphylococcus aureus*

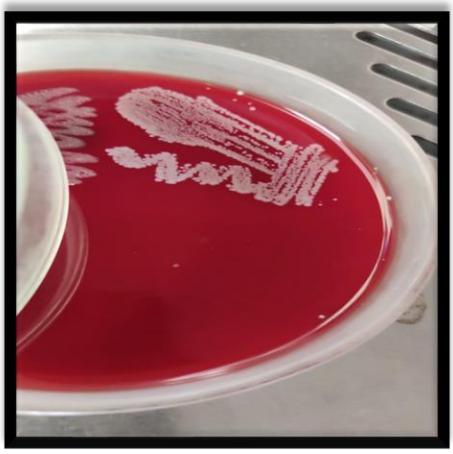


Fig.3.15 Growth of *Staphylococcus aureus* on Blood agar

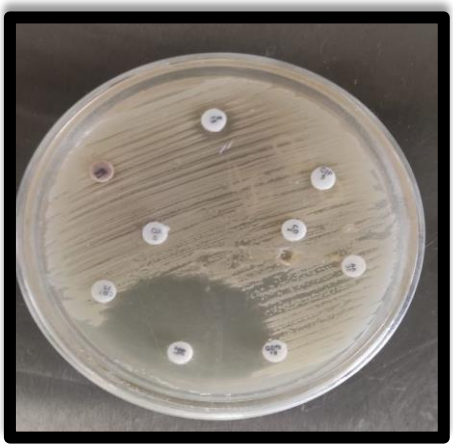


Fig.3.16 Antibiotic Susceptibility Test of *Staphylococcus aureus* by Kirby-Bauer Disk Diffusion Method

Table 3.9: Distribution of Different Antibiotics

Antibiotic Class	Prescribed Antibiotics	Number of Patients	Total Percentage
Aminoglycosides	Amikacin	25	25.54
	Gentamicin	10	
Penicillin	Amoxycillin and Potassium clavulanate	2	21.16
	Piperacillin and Tazobactam	26	
	Ampicillin	1	
Cephalosporin	Cefotaxime	8	14.59
	Ceftriaxone	10	
	Cefixime	2	
Quinolones	Nalidixic Acid	1	0.72
Fluoroquinolones	Norfloxacin	14	15.32
	Ciprofloxacin	6	
	Ofloxacin	1	
Carbapenem	Imipenem	2	1.45
Urinary Antiseptics	Nitrofurantoin	29	21.16
Total		137	100

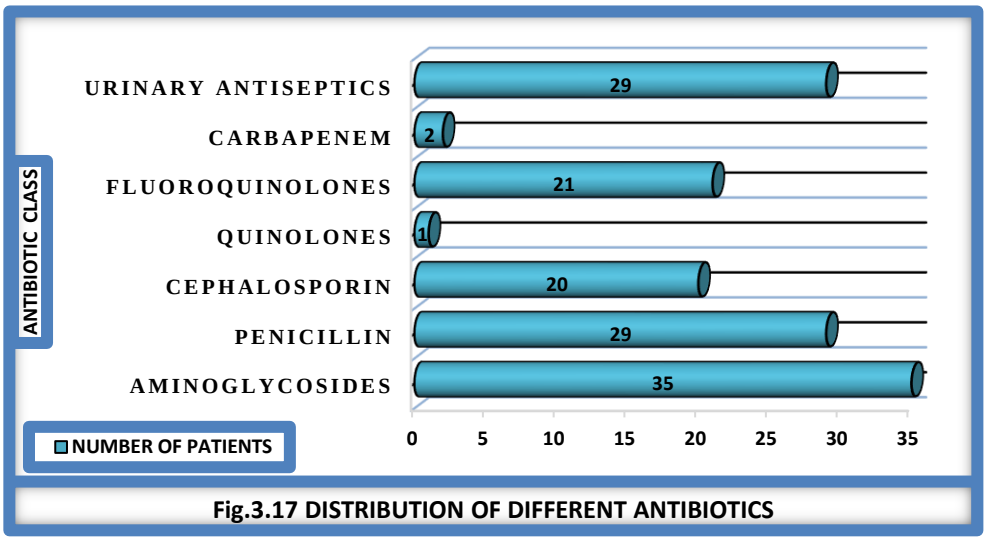


Fig.3.17 DISTRIBUTION OF DIFFERENT ANTIBIOTICS

Table 4: Comparison of Prevalence of UTI Among Sex with Other Studies

Authors	Year	% Prevalence	
		Female	Male
Rezina Parveen et al.[21]	2015	66%	35%
Nazreen Khan et al.[22]	2016	68.67%	31.33%
Jubina Bency A.T et al.[23]	2017	63.3%	36.7%
Pritam Pardeshi [24]	2018	66.78%	33.22%

Table 5: Comparison of Distribution of Uropathogens with Other Studies

Authors	Year	% Prevalence			
		E.coli	*Klebsiella sp.*	*Staphylococcus aureus*	*Pseudomonas sp.*
Niranjan V et al.[8]	2013	56.8%	14.4%	4.02%	8.4%
Saman Mashkoor et al.[25]	2017	45.59%	16.27%	6.97%	4.19%
Patel P.K et al.[26]	2017	53.8%	32.3%	1.43%	5.71%
Pritam Pardeshi[24]	2018	53.7%	27.4%	1.54%	8.56%
Sanjo Saijan et al.[5]	2020	59.1%	34.4%	0.40%	4.9%

Sowjanya et al.[27]	2020	47.05%	15.68%	10.78%	10.78%

Table 6: Comparison of Antibiotic Sensitivity Pattern of *E. coli* With Other Studies Across India

Authors	Year	% Sensitive		
		Piperacillin-Tazobactam	Nitrofurantoin	Amikacin
Harshkumar B. Patel et al.[28]	2019	51.77%	72.33%	61.46%
Sumedha Swamy et al.[10]	2019	81.57%	71.05%	76.31%
Santhosh John Thattil et al.[29]	2018	75.2%	82.3%	81.1%
Niranjan V et al.[8]	2014	78.2%	82.1%	82.6%
Syed Mustaq Ahmed et al.[30]	2012	91.5%	98.1%	98.1%

Table 7: Comparison of Antibiotic Sensitivity Pattern of *Klebsiella sp.* With Other Studies Across India

Authors	Year	% Sensitive			
		Piperacillin-Tazobactam	Amikacin	Gentamicin	Norfloxacin
Harshkumar B. Patel et al.[28]	2019	35.17%	44.66%	38.34%	-
Santhosh John Thattil et al.[29]	2018	78.3%	96.2%	78.0%	74.2%

Table 8: Comparison of Antibiotic Sensitivity Pattern of *Pseudomonas sp.* With Other Studies Across India

Authors	Year	% Sensitive			
		Piperacillin-Tazobactam	Gentamicin	Amikacin	Cefotaxime
Sanjo Saijan et al.[5]	2020	100%	-	>80%	-
Harshkumar B. Patel et al.[28]	2019	54.14%	46.83%	55.12%	-
Santhosh John Thattil et al.[29]	2018	87.6%	89.1%	88.3%	56.6%

Table 9: Comparison of Antibiotic Sensitivity Pattern of *Staphylococcus aureus* With Other Studies Across India

Authors	Year	% Sensitive	
		Linezolid	Amikacin
Harshkumar B. Patel et al.[28]	2019	100%	54.54%
Santhosh John Thattil et al.[29]	2018	99.1%	90.5%
Saman Mashkoor et al.[25]	2017	86.67%	66.67%
Shirishkumar Patel et al.[31]	2012	98%	-

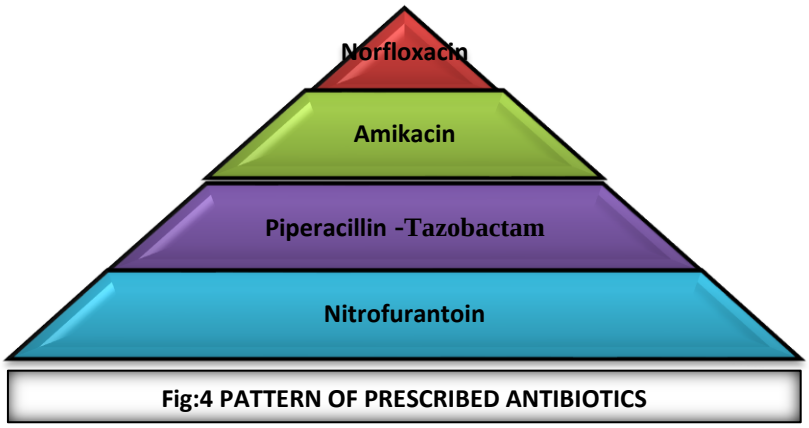
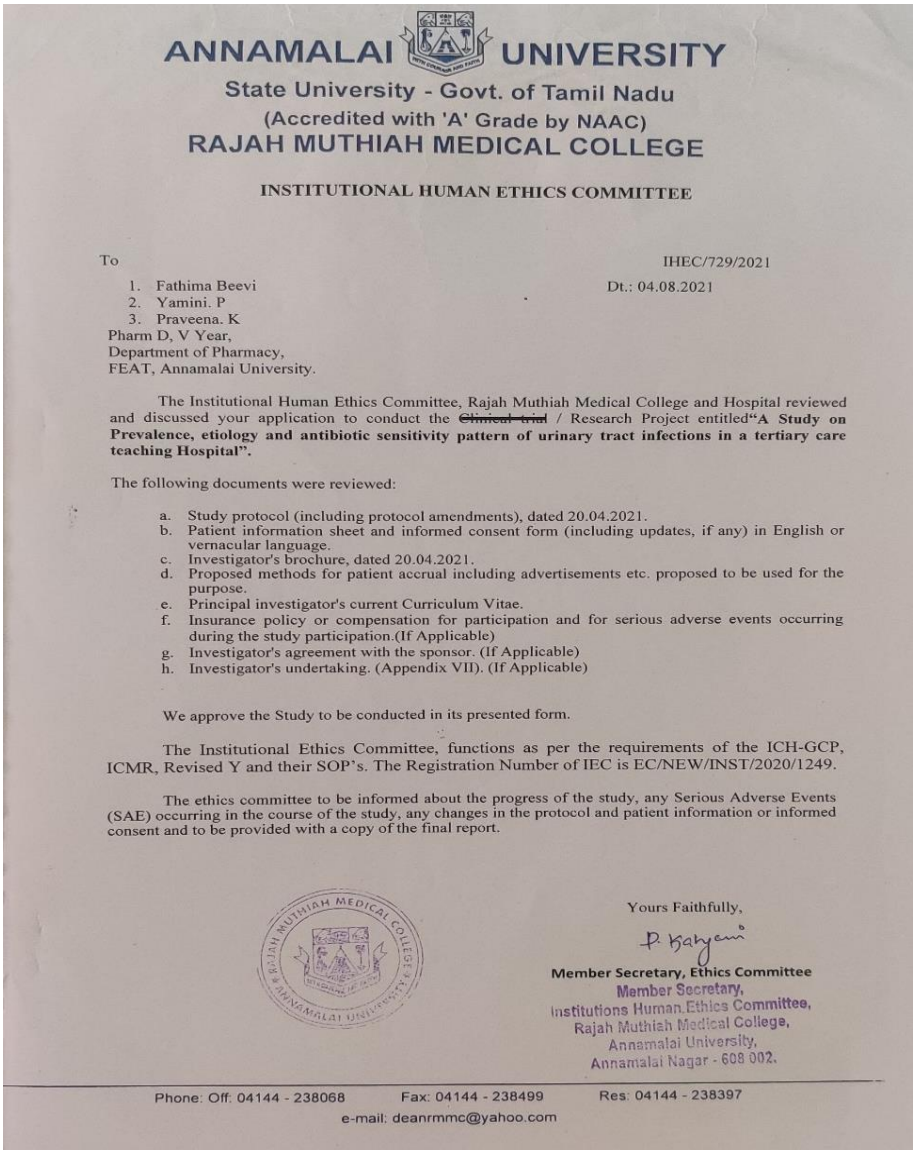


Fig:4 PATTERN OF PRESCRIBED ANTIBIOTICS

ETHICAL APPROVAL:



ANNAMALAI UNIVERSITY
State University - Govt. of Tamil Nadu
(Accredited with 'A' Grade by NAAC)
RAJAH MUTHIAH MEDICAL COLLEGE

INSTITUTIONAL HUMAN ETHICS COMMITTEE

To

1. Fathima Beevi
2. Yamini. P
3. Praveena. K

Pharm D, V Year,
Department of Pharmacy,
FEAT, Annamalai University.

IHEC/729/2021
Dt.: 04.08.2021

The Institutional Human Ethics Committee, Rajah Muthiah Medical College and Hospital reviewed and discussed your application to conduct the ~~Clinical trial~~ / Research Project entitled**"A Study on Prevalence, etiology and antibiotic sensitivity pattern of urinary tract infections in a tertiary care teaching Hospital".**

The following documents were reviewed:

a. Study protocol (including protocol amendments), dated 20.04.2021.
b. Patient information sheet and informed consent form (including updates, if any) in English or vernacular language.
c. Investigator's brochure, dated 20.04.2021.
d. Proposed methods for patient accrual including advertisements etc. proposed to be used for the purpose.
e. Principal investigator's current Curriculum Vitae.
f. Insurance policy or compensation for participation and for serious adverse events occurring during the study participation.(If Applicable)
g. Investigator's agreement with the sponsor. (If Applicable)
h. Investigator's undertaking. (Appendix VII). (If Applicable)

We approve the Study to be conducted in its presented form.

The Institutional Ethics Committee, functions as per the requirements of the ICH-GCP, ICMR, Revised Y and their SOP's. The Registration Number of IEC is EC/NEW/INST/2020/1249.

The ethics committee to be informed about the progress of the study, any Serious Adverse Events (SAE) occurring in the course of the study, any changes in the protocol and patient information or informed consent and to be provided with a copy of the final report.

Yours Faithfully,

Member Secretary, Ethics Committee
Member Secretary,
Institutions Human Ethics Committee,
Rajah Muthiah Medical College,
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IV. DISCUSSION:

UTI is considered to be the most common bacterial infection. Effective management of patients suffering from bacterial UTIs commonly relays on the identification of the type of organisms that caused the disease and the selection of an effective antibiotic agent to the organism. The emerging antimicrobial resistance is a worldwide concern and has jeopardized the management of UTI. This study was conducted to illustrate the prevalence, distribution and antibiotic sensitivity pattern of uropathogens in UTI patients admitted to a tertiary care hospital in Chidambaram, Cuddalore district. Our study shows that prevalence of UTI was higher in females (70%) than males (30%). Generally, low prevalence of UTI is observed among men. This finding is consistent with reports of the following studies:

Table 4 shows the comparison of prevalence of UTI among sex with other studies.

Among UTI patients, females were predominant across all the age groups compared to the males due to the urethra's shortness and proximity to the anus, which makes it possible for bacteria to ascend across the urinary tract. In this study, it has been observed that high prevalence of UTI were in the age group of 21-30(20.90%) and 51-60 (20.90%) followed by 41-50 (18%) and 61-70 (12.72%). Among females, age groups of 21-30 followed by 51-60 and 41-50 were more prevalent to UTI and males in the age group of 61-70. This finding was consistent with the study conducted by Vigila et al. (2020) [6] who concluded

that UTI is common in women in the reproductive age and post-menopausal stage and males in the age group of 61-70 years were more vulnerable to UTI than other age groups.

In this study, Gram negative bacteria constituted (89.09%) while Gram positive bacteria (10.90%). Among them, the predominant organism causing UTI was *E.coli (57%)* followed by *Klebsiella sp.(25%), Staphylococcus aureus (10%)* and *Pseudomonas sp.(6%). E.coli* is most common organism causing UTI which accounts for up to 90% of cases.[7] These results are correlated with following studies :

Table 5 shows the comparison of distribution of uropathogens with other studies.

E.coli and *Klebsiella sp.* were the prominent uropathogens causing UTI. The major isolate in most of Indian studies of UTI was *E.coli.* In majority of other Indian studies showed that *Klebsiella sp*. is the second major uropathogen which is in accordance to our study.[8]

Out of 110 cases, 40 patients were with comorbid conditions. The most common comorbid condition was Type II Diabetes Mellitus (65%) followed by chronic kidney disease (12.5%), Coronary Artery Disease (10%), Renal Calculi (7.5%) and Stroke (5%). Similar results has been observed in the study conducted by Kumar et al(2019)[9], Sumedha et al(2018)[10] ,Mallikarjun et al(2016)[11], Sunil et al.(2015)[12] in which 64.1%, 63.3%, 40% and 32.65% cases had Type II Diabetes Mellitus. Patients with diabetes have an increased risk of infections with the urinary tract being the most prevalent infection site. In this study, the predominant uropathogen associated with Type II Diabetes Mellitus was *E.coli*.

In our study, it was observed that antibiotics which showed higher sensitivity to *E. coli* was Piperacillin-Tazobactam (75%) followed by Nitrofurantoin (64%), Amikacin (59%) and Norfloxacin (46%). This findings are correlated with following studies:

Table 6 shows the comparison of antibiotic sensitivity pattern of *E. coli* with other studies across India.

Klebsiella sp. showed higher sensitivity to Piperacillin-Tazobactam (64%) and Amikacin (64%) followed by Gentamicin (61%) and Norfloxacin (54%). These findings are correlated with following studies:

Table 7 shows the comparison of antibiotic sensitivity pattern of *Klebsiella sp.* with other studies across India.

Pseudomonas sp. showed higher sensitivity to Piperacillin-Tazobactam (100%) followed by Gentamicin (71%), Amikacin (57%) and Cefotaxime (43%).

These findings are correlated with following studies:

Table 8 shows the comparison of antibiotic sensitivity pattern of *Pseudomonas sp.* with other studies across India.

Staphylococcus aureus showed higher sensitivity to Linezolid (73%) followed by Amikacin (64%) and Nitrofurantoin (55%). This findings are correlated with following studies:

Table 9 shows the comparison of antibiotic sensitivity pattern of *Staphylococcus aureus* with other studies across India.

Antimicrobial resistance among uropathogens is a barrier that hinder the effective treatment and it varies between regions and countries.

In this study, *E.coli* showed higher resistance against Cefuroxime (67%) followed by Gentamicin (60.31%) and Co-Trimoxazole (56%). *Klebsiella sp.* showed higher resistance against Cefuroxime (50%), Nitrofurantoin (50%) and Co-Trimoxazole (50%). *Pseudomonas sp.* showed higher resistance against Ceftazidime (71.42%). Out of the total *Staphylococcus aureus* isolated, 2 was found to be Methicillin Resistant *Staphylococcus aureus* (MRSA) and it showed higher resistance against Co-Trimoxazole (54%).

A study by Mohammed Akram et al. (2007) has showed that *E.coli* is more resistant to Co-Trimoxazole than *Klebsiella sp.* which corroborate with finding of our study.[13] Rampant usage has led to the emergence of resistant strains and latest drugs like cephalosporins, fluoroquinolones are also being affected day by day.

Based on the Indian Council of Medical Research (ICMR 2019) and National Institute for Health and Care Excellence (NICE 2018), Co-Trimoxazole and Cefuroxime are alternative drug of choice for empirical treatment of UTI which is found to be resistant in our study hence it is not recommended. [14,15] Thus, it is observed that empirical treatment of UTI should be based on local antibiotic sensitivity pattern of uropathogens and not on guidelines. To ensure appropriate treatment, periodic surveillance of antibiotic sensitivity pattern of uropathogens is essential as it varies with time and serve as a guide for clinicians in selection of antimicrobial agents thus promoting prudent use of antibiotics and combat antibiotic resistance.

Based on this study, empirical antibiotics recommended before the urine culture report of a patient are Piperacillin-Tazobactam 4.5 g IV q6hr for 7-14 days, Nitrofurantoin 100 mg PO BD for 5 days, Amikacin 15 mg/kg/day IV/IM divided q8-12hr for 7-14 days and Gentamicin 3 mg/kg/day IV/IM in equally divided doses q8hr for 7-10 days. [16,17,18,19,20]

In this study, 137 antibiotics have been prescribed for UTI treatment. Antibiotic class which was

prescribed in more number of patients was Aminoglycosides (25.54%) followed by Penicillin (21.16%) and Urinary Antiseptics (21.16%). Among them, Amikacin (25 patients,18.24%) under the category of Aminoglycosides, Piperacillin-Tazobactam (26 patients,18.97%) under the category of Penicillin, Nitrofurantoin (29 patients, 21.16%) under the category of Urinary Antiseptics was prescribed more compared to other antibiotics.
Figure 4 shows the pattern of prescribed antibiotics.
Antibiotic resistance among bacteria causing common infections is increasing in all regions of the world. By taking into consideration this study was conducted to keep a track of antibiotic susceptibility pattern in a tertiary care hospital in Chidambaram.

V. CONCLUSION:

This study shows the prevalence of urinary tract infection in both genders and all age categories, as well as the causes of UTI, uropathogen sensitivity to antimicrobials, comorbidities, and prescribed antibiotics. The present study deduce that prevalence of UTI was higher among females than males. It has been observed that occurrence of UTI was preponderant in the age group of 21-30 and 51-60 years. Gram negative organisms was the most common organism causing UTI. Among them, *E.coli* was the predominant causative agent. Gram negative organisms were mostly sensitive to Piperacillin-Tazobactam, Gentamicin, Amikacin, Nitrofurantoin, Norfloxacin and Gram positive organisms were highly sensitive to Linezolid. This study also inferred that Cefuroxime, Ceftazidime and Co-Trimoxazole were resistant predominantly to isolated uropathogens. Type II Diabetes Mellitus was the most common comorbid condition in UTI patients. Also, most commonly prescribed antibiotics for UTI was Nitrofurantoin followed by Piperacillin-Tazobactam and Amikacin. Antibiotic resistance has public health implications, and isolated uropathogens have been found to be resistant to three or more antibiotics, which is concerning, and empirical therapy should be based on knowledge of local sensitivity patterns. Antibiotics should be chosen for individual patients based on culture reports, minimising morbidity, hospital stay, healthcare costs, and improving patient outcomes.

VI. ACKNOWLEDGEMENT:

The authors thank the Professor and Medical Superintendent of RMMCH, Department of Pharmacy, General Medicine and Microbiology to carry out the study and support throughout the duration of our project work.

VII. FUNDING:

No funding sources

VIII. REFERENCES:

1. Roger Walker, Cate Whittlesea. Clinical Pharmacy And Therapeutics. Fifth Edition. Edinburgh: Churchill Livingstone;2012:561-569.
2. Kumud Bala, Lovely Gupta and Mohini Agarwal. Identification and antibiotic susceptibility testing of urinary isolates in a tertiary care hospital. Der Pharmacia Lettre.2015;7(9):270-279.
3. Joseph T. Diprio. Pharmacotherapy A Pathophysiologic Approach. Sixth Edition. McGraw Hill;2005:2081-2089.
4. Najar MS, Saldanha CL, Banday KA. Approach to urinary tract infections. Indian Journal of Nephrology .2009; 19(4):129-139.
5. Saijan S, Reji S, Johny NM, George S. A Study on the Bacteriological Profile of Urinary Tract Infection and their Antibiotic Sensitivity Pattern in a Secondary Care Hospital in Kerala, India. Pharmacy Practice and Research.2020;1(1):40-45.
6. Vigila CR, Athinarayanan G, Mariselvam R, Dhasarathan P and Ranjitsingh AJA. Epidemiology of urinary tract infection in South India. World Journal of Biology Pharmacy and Health Sciences.2020;1(1):25-32.
7. Pardeshi P. Prevalence of urinary tract infections and current scenario of antibiotic susceptibility pattern of bacteria causing UTI. Indian J Microbiol Res.2018;5(3) :334-338.
8. Niranjan V, Malini A. Antimicrobial resistance pattern in Escherichia coli causing urinary tract infection among inpatients. Indian J Med Res.2014; 139:945-948.
9. Kumar Gaurav, Tripathi Shailendra Mohan, Mishra Neeti, Siddique M.E. Prevalence of urinary tract infections in elderly patients attending a tertiary care hospital. International Journal of Contemporary Medical Research.2019;6(2):B13-B16.
10. Swamy S, Ramaswamy M, Pakale AM. Urinary tract infection in elderly: clinical profile and outcome study done at Kempegowda Institute of Medical Science and Hospital, Bengaluru. Int J Res Med Sci 2019;7:226-30.
11. Karishetti MS, Shaik HB. Clinicomicrobial assessment of urinary tract infections in a tertiary care hospital. Indian J Health Sci Biomed Res.2019;12:69-74.
12. Gidamudi SS, Jadhav SA, Khanwelkar CC, Thorat VM, Desai RR, Naik HG. Antimicrobial Utilization Pattern of Urinary Tract Infection In Tertiary Care Hospital. Asian J Pharm Clin Res.2015;8(6):161-164.
13. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community acquired urinary tract infections in JNMC hospital Aligarh, India. Ann Clin Microbiol Antimicrob.2007;6 : 4.
14. Indian Council of Medical Research, Department of Health Research. Treatment Guidelines for Antimicrobial Use in Common Syndromes. New Delhi, India: Indian Council of Medical Research; 2019.
15. NICE Pathways Urinary Tract Infections in people aged 16 years and over; 2018.Available from: Urinary tract

infections overview - NICE Pathways.[Last accessed on 2021 June 22].
16. Padmaja Udaykumar. Medical Pharmacology. Fifth Edition. New Delhi: CBS Publishers & Distributors; 2015.438,450,461,479.
17. FDA PIPERACILLIN AND TAZOBACTAM FOR INJECTION. Available from: https://www.accessdata.fda.gov.[Last accessed on 2021 June 23].
18. Gentamicin Sulfate. In IBM Micromedex Drug Reference (v2565_2105151433).
19. Amikacin Sulfate. In IBM Micromedex Drug Reference (v2565_2105151433).
20. Nitrofurantoin. In Medscape Drug Reference (v1088.0).
21. Parveen R, Yusuf MA, Sharmin I, Islam MS, Rahim I. Antibiotic Sensitivity of bacteria Causing Urinary Tract Infection. Bangladesh J Infect Dis.2015;2(1):13-18.
22. Khan N, Khan MS. Prevalence of Antimicrobial Resistance in Bacterial Isolates Causing Urinary Tract Infection in Patients attending at IIMS&R Hospital, Lucknow. Int. J. Life Sci. Scienti. Res. 2016;2(1):1-8.
23. Bency JAT, Priyanka R, Jose P. A study on the bacteriological profile of urinary tract infection in adults and their antibiotic sensitivity pattern in a tertiary care hospital in central Kerala, India. Int J Res Med Sci.2017;5:666-9.
24. Pardeshi P. Prevalence of urinary tract infections and current scenario of antibiotic susceptibility pattern of bacteria causing UTI. Indian J Microbiol Res.2018;5(3): 334-338.
25. Mashkoor S, Goel S, Farooq U, Dayal N, Sridhar D, Bhadauria B. Prevalence of Urinary Tract Infection in Patients attending Teer thanker Mahaveer Medical College & Research Centre and Hospital Moradabad. Int Arch BioMed Clin Res.2017;3(2):81-85.
26. Patel P.K., Pattani M.H. A study on prevalence of bacterial isolates causing urinary tract infection at tertiary care hospital, Rajkot, Gujarat, India. Trop J Path Micro.2019;5(7):454-460.
27. Mendem S, Vinyas M, Faraz MAA, Swamy MV, Shubham P. A retrospective study on the prevalence of urinary tract infections in a tertiary care hospital in Sangareddy district of South India. Int J Reprod Contracept Obstet Gynecol.2020; 9:3422-7.
28. Patel HB, Soni ST, Bhagyalaxmi A, Patel NM. Causative agents of urinary tract infections and their antimicrobial susceptibility patterns at a referral center in Western India: An audit to help clinicians prevent antibiotic misuse. J Family Med Prim Care.2019; 8:154-9.
29. Santhosh John Thattil, Sumitha Santhosh. Prevalence of UTI in different age groups in a tertiary care hospital and their antibiogram. International Journal of Contemporary Medical Research.2018;5(1):3-6.
30. Ahmed SM, Jakribettu RP, Koyakutty S, Arya B, Shakir VPA. Urinary Tract Infections-An overview on the Prevalence and the Anti-biogram of Gram Negative Uropathogens in A Tertiary Care Centre in North Kerala, India. Journal of Clinical and Diagnostic Research.2012;6(7):1192-1195.
31. Patel S, Taviad PP, Sinha M, Javadekar TB, Chaudhari VP. Urinary Tract Infections (UTI) Among patients at G.G.Hospital & Medical College, Jamnagar. National Journal of Community Medicine. 2012;3(1):138-141.
32. WHO Antimicrobial resistance in the South-East Asia. Available from: https://www.who.int/southeastasia/health-topics. [Last accessed on 2021 June 17].