International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

Clinical Pharmacist Intervention on Antibiotic Resistance in Patients with Urinary Tract Infection

[1]Shahana Sherin, [1]Sanitha mol p m
[1] Pharm d interns, Al-Shifa college of pharmacy, Perinthalmanna
Corresponding authors: Aleema p p, Dr. Shinu c

Submitted: 01-10-2023 Accepted: 10-10-2023

ABSTRACT

OBJECTIVE : The aim of this study is to monitor the use of antibiotics in urinary tract infections (UTI) and evaluate the prevalence of antibiotic resistance among UTI patients across various departments.

MATERIALS AND METHODS:A prospective observational study was conducted over a period of six months to examine patients presenting with signs and symptoms of urinary tract infections (UTI) in both inpatient (IP) and outpatient (OP) settings. The study involved the direct examination of culture sensitivity reports and prescribed medications. The primary focus was to analyze the major resistant drugs and common isolates found in the samples.

RESULT: The study included a total of 92 patients, with male subjects accounting for 56.6% (n=52), while female patients represented 43.4% (n=40) of the sample. Among the age groups, the highest number of patients (21.7%, n=20) fell within the 70-79 age range, followed by 19.6% (n=18) in the 60-69 age group.

Regarding the isolates, bacteria accounted for the majority at approximately 50% (n=46) of the samples, with E. coli being isolated from 32% (n=35) of the cases. Ampicillin was found to have the highest resistance rate at 17.4% (n=16), while ciprofloxacin, levofloxacin, and nalidixic acid had a combined resistance rate of only 7.6% (n=7).

The primary intervention in this study involved patient counseling, which was provided to 95.7% (n=88) of the population.

CONCLUSION: Our findings bring attention to a significant issue observed in our study, whereby a substantial number of outpatients received treatment solely based on their symptoms and the clinical judgment of the doctors. This practice raises concerns as patients may exhibit varying antimicrobial susceptibility patterns. In order to tackle this issue effectively and combat antibiotic resistance, it is imperative for all physicians to adhere to recognized National Guidelines or Hospital Guidelines for antibiotic prescriptions. By adhering to these established guidelines, we can not only mitigate the problem of antibiotic resistance but also enhance treatment adherence among patients.

KEYWORDS: Antibiotic resistance, UTI, empirical therapy, uropathogens, culture and sensitivity.

I. INTRODUCTION

A urinary tract infection (UTI) is characterized by the presence of microorganisms in the urine that cannot be attributed to contamination. These organisms possess the capability to invade the tissues of the urinary tract and nearby structures. Lower tract infections encompass cystitis (bladder), urethritis (urethra), prostatitis (prostate gland), and epididymitis. Conversely, upper tract infections affect the kidneys and are known as pyelonephritis [1]

Antibiotics are medications utilized to prevent and treat bacterial infections. Antibiotic resistance emerges when bacteria undergo changes as a result of antibiotic usage. It is the bacteria themselves, not humans or animals, that become resistant to antibiotics. As a consequence, infections caused by antibiotic-resistant bacteria pose greater challenges for treatment compared to those caused by non-resistant bacteria [2].

Presently, antibiotic resistance has become a widespread phenomenon due to inappropriate antibiotic usage. Urgent action is required to transform the prescription and utilization of antibiotics worldwide. Even with the development of new medications, unless there is a shift in behavior, antibiotic resistance will continue to pose a significant threat [3].

Antibiotic resistance is escalating to alarmingly high levels worldwide. There is a emergence of new resistance mechanisms that are rapidly spreading, jeopardizing our capacity to effectively treat common infectious diseases. A growing range of infections, including pneumonia, tuberculosis, sepsis, gonorrhea, and foodborne illnesses, are becoming increasingly challenging to treat as

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

the effectiveness of antibiotics diminishes, and in some cases, renders treatment impossible.

Where antibiotics can be purchased for human or animal use without a prescription, the emergence and spread of resistance are exacerbated. Similarly, in countries lacking standardized treatment guidelines, health workers, veterinarians, and the general public often engage in excessive antibiotic prescription and usage.

Without immediate intervention, we are approaching a post-antibiotic era, in which common infections and minor injuries can once again result in fatal outcomes. The objective of this study is to reduce antibiotic resistance through clinical pharmacist intervention in UTI. Given that UTI has become a prevalent disorder in contemporary times, and antibiotic usage is widespread, this study holds significant importance in the present era.

II. MATERIAL AND METHODS

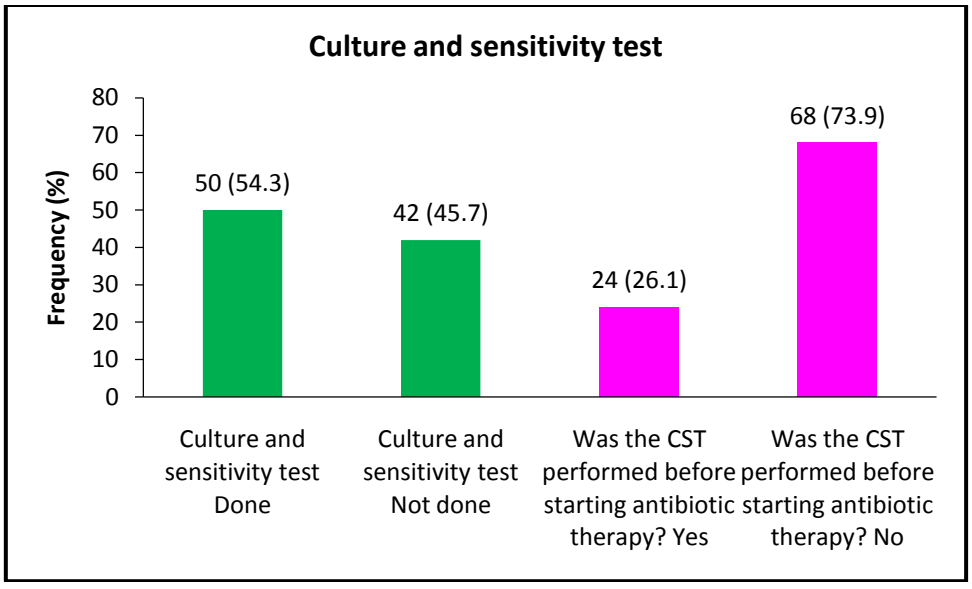
This study followed a prospective observational design. Setting: The study was conducted in a single centertertiary care referal hospital. A total of 92 patients with UTI were included in the study. Confidence Interval and Margin of Error: The study employed a 95% confidence interval with a margin of error of ±10%. Ethical Approval: Ethical approval for the study was obtained from the Ethical Committee of AL SHIFA HOSPITAL. An official consent was obtained from the Institutional Ethics Committee, as per letter no KAS:ADM:IEC:057:22 on April 11, 2022.

Patients presenting with signs and symptoms of UTI in both IP and OP settings who willingly completed the data collection and consent forms. Exclusion Criteria: None specified.

A comprehensive data collection form was designed to capture patient medication details, including age, sex, reason for admission, past medication and medical history, co-morbidities, medication chart, sensitivity and resistance patterns of organisms, and the most commonly isolated organisms. Approval: The informed consent form and data collection form were approved by the hospital's ethical committee, consisting of doctors, nurses, and healthcare professionals.

Data were collected from various departments, including gynecology, urology, and general medicine. Analysis: Culture reports were analyzed in conjunction with the resistance and prescription patterns of antibiotic The results will be presented descriptively, providing relevant findings related to patient counseling and antibiotic resistance in UTIs. The study findings will be discussed in the context of existing literature, highlighting the implications of patient counseling on antibiotic resistance in UTIs. This study adhered to the STROBE guidelines and aimed to evaluate the impact of patient counseling on antibiotic resistance in UTIs. By following these guidelines, we ensured transparent reporting and contributed to the existing body of knowledge on this important topic.

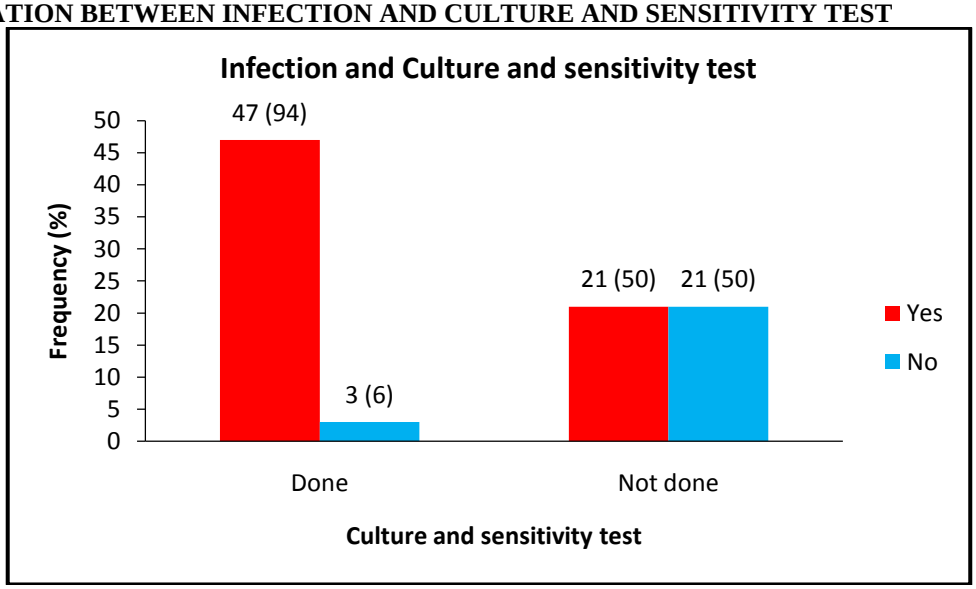
III. RESULTS



International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

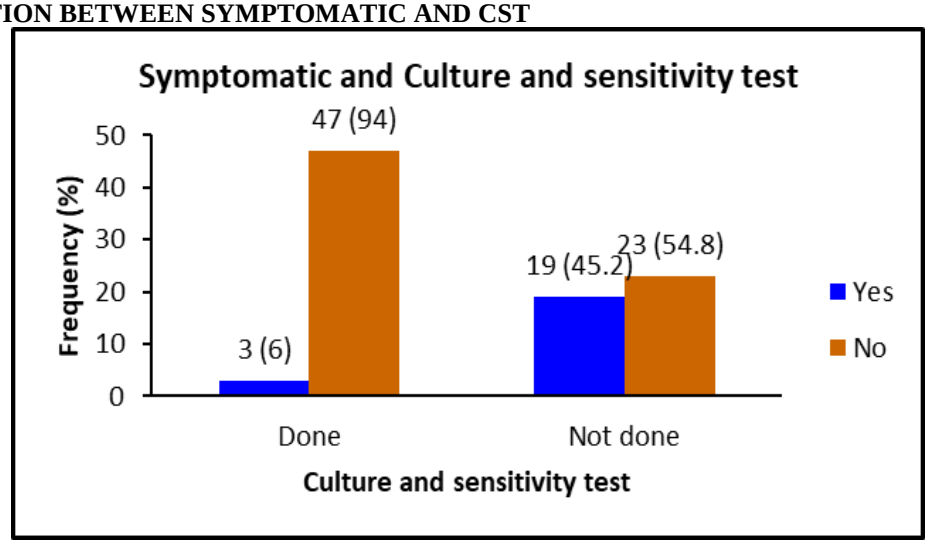
About 54.3% (n=92, 50) of the population had performed culture and sensitivity test of which only 26.1% (n=92, 24) of the population performed CST before the antibiotic therapy. 45.7% (42) of population had not performed CST and majority of the patients (73.9%) received antibiotic therapy without performing CST.

ASSOCIATION BETWEEN INFECTION AND CULTURE AND SENSITIVITY TEST



The Chi Squaretest was used to find out the association between gender and culture and sensitivity test. There was an association between ($p<0.05$) infection and CST with Chi Square value 22.919 and p value <0.001.

ASSOCIATION BETWEEN SYMPTOMATIC AND CST



The Chi Square test was used to find the association between symptomatic andCST. There was an association ($p < 0.05$) between symptomatic and CST with Chi Square value 19.315 and p value <0.001.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

ORGANISM IDENTIFIED

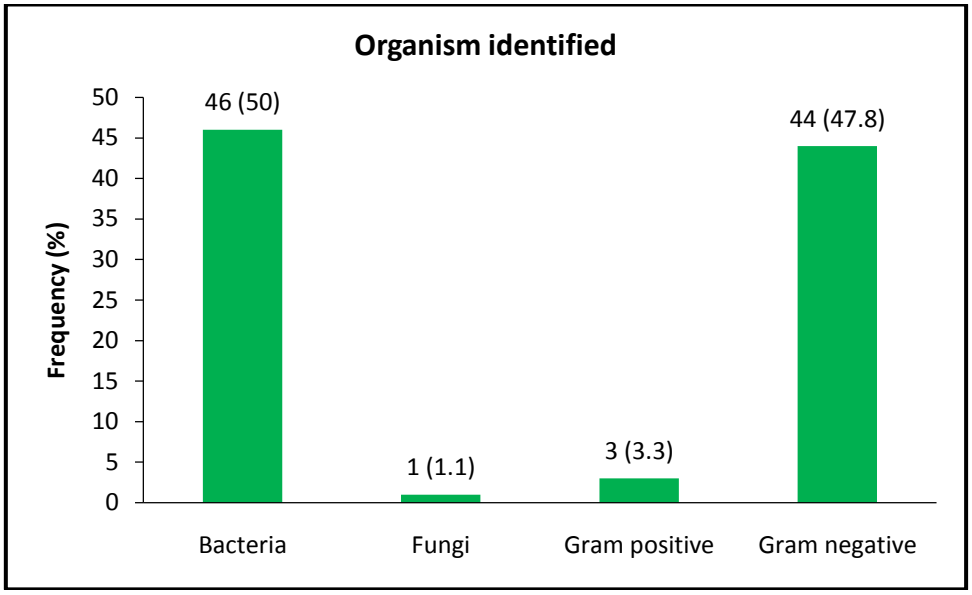


Figure 7: organism identified

Out of the 92 samples observed, majority of isolates constituting about 50% (n=92, 46) were bacteria followed by fungi constituting only about 1.1% (n=92, 1). Isolates extracted belongs to gram negative category i.e., 47.8% than gram positives.'

WHETHER ANTIBIOTIC CHANGED AFTER CST

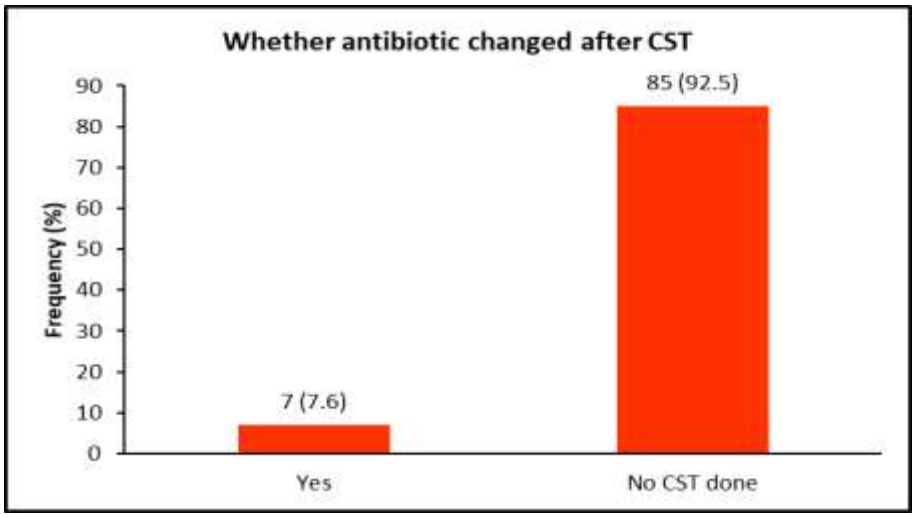


Figure 9: whether antibiotic changed after CST

Only 7.6% (n=92, 7) of the population undergone change in their therapy since they were resistant to the antibiotic given, while 92.5% (n=92,85) adhere to the initial therapy.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

ANTIBIOTICS PRESCRIBED

Generic name	Frequency	%
Amikacin	2	2.2
Amoxicillin + Clavulanic acid	4	4.3
Azithromycin	1	1.1
Cefoperazone + Sulbactam	14	15.1
Ceftriaxone	9	9.8
Ciprofloxacin	6	6.5
Colistimethate sodium	2	2.2
Doxycycline	24	26.1
Levofloxacin	6	6.5
Meropenem	13	14.1
Nitrofurantoin	5	5.4
Norfloxacin	1	1.1
Penicillin	1	1.1
Tamsulosin	1	1.1
Trimethoprim sulfamethoxazole	1	1.1
Not given	2	2.2

Table 2: antibiotics prescribed

A total of 26.1% (n=92, 24) of the population was given symptomatic treatment with doxycycline followed by 15.1% (n=92, 14) with cefoperazone and sulbactam, 14.1% (n=92, 13) with meropenem, 9.8% (n=92,9) with ceftriaxone, 6.5% (n=92, 6) with ciprofloxacin and levofloxacin, 5.4% (n=92, 5) with nitrofurantoin, 4.3% (n=92, 4) with amoxicillin clavulanate, 2.2% (n=92, 2) with Colistimethate sodium, 1.1% (n=92, 1) with norfloxacin, penicillin, tamsulosin and trimethoprim sulfamethoxazole.

CLASSIFICATION BASED ON RESISTANCE PATTERN OF ANTIBIOTICS

Resistant drug	Frequency	%
Ampicillin	16	17.4
Cefaclor	1	1.1
Cefpedim	1	1.1
Ceftriaxone	1	1.1
Cefotaxime	1	1.1
Ciprofloxacin	7	7.6
Colistin	1	1.1
Fosfomycin	1	1.1
Levofloxacin	7	7.6
Nalidixic acid	7	7.6
Nitrofurantoin	2	2.2
Norfloxacin	1	1.1
Tetracycline	1	1.1
Not known	45	48.9

Table 3: resistance pattern of antibiotics

Ampicillin was found to be the most resistant drug comprising of 17.4% (n=92, 16), while ciprofloxacin, levofloxacin and nalidixic acid constitutes only 7.6% (n=92, 7). It was followed by nitrofurantoin comprising of 2.2% (n=92, 2) and other drugs such as tetracycline, norfloxacin, Fosfomycin, cefaclor, cefpedim, ceftriaxone, cefotaxime and colistin constitutes only 1.1% (n=92, 1).

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

5.16 INTERVENTION BY CLINICAL PHARMACIST

		Frequency	%
Pharmacist intervention	Change of antibiotic done	1	1.1
	IV changed to tab	1	1.1
	Information given on multiple antibiotic	1	1.1
	Patient counseling done	88	95.7
	No culture reports	1	1.1

Table 4: intervention by pharmacist

Major intervention was done by providing patient counselling to 95.7% (n=92, 88) of the population. Change in antibiotic was done for 1.1% (n=92, 1) of the sample size, followed by 1.1% (n=92, 1) of the population. 1.1% (n=92, 1) of the population had no culture reports.

IV. DISCUSSION

The overuse of antibiotics is known to contribute to the rise of antibiotic resistance. The participants in this study belonged to the age group between 16-80, with a higher prevalence of UTI cases observed in the 60-79 age group. It was found that males in this age group were more susceptible to prostate problems, making them more prone to UTI. Analysis of the samples revealed a higher prevalence of UTI signs and symptoms in male patients compared to females. Culture and sensitivity tests were performed for 54.3% of the samples, while 45.7% of patients did not undergo these tests. This was primarily due to the severity of infection in most patients who underwent culture and sensitivity testing during their hospital admission. The time taken to obtain the reports and initiate therapy was also a matter of concern.

The most commonly isolated organism was E. coli, which remained the leading cause of UTI. The substantial number of isolates analyzed further strengthens the validity of this study. In the majority of cases, antibiotic therapy was initiated without conducting culture and sensitivity tests, particularly among outpatients. This was often due to the time-consuming nature of obtaining culture reports. Antimicrobial guidelines recommend treatment based on susceptibility patterns to minimize selection pressures and preserve the efficacy of antibiotics, especially when the development of novel antibiotics is limited.

Among the prescribed antibiotics, doxycycline (26.1%), meropenem (14.1%), cefoperazone-sulbactam (14.1%), ceftriaxone (9.8%), and ciprofloxacin (6.5%) were commonly used. Doxycycline was commonly prescribed for outpatients, while cefoperazone-sulbactam was more frequently administered to inpatients. Ampicillin exhibited the highest resistance rate among the antibiotics analyzed in this study.

V. CONCLUSION

Antimicrobial resistance poses a growing and concerning threat to patient management worldwide. This trend leads to increased costs in patient care, prolonged hospital stays, and higher mortality rates. The majority of common pathogens encountered in clinical practice have exhibited significant levels of resistance to commonly used antimicrobial agents. Many organisms have been reported as multidrug resistant.

To identify the antibiotic resistance patterns, culture reports of patients were utilized. It was observed that in the case of UTI treatment, empirical therapy was commonly prescribed to outpatient (OP) patients. Antimicrobial susceptibility testing, on the other hand, was primarily conducted for inpatients. Different physicians follow varying guidelines when it comes to antibiotic prescriptions, with some relying on their own experiences.

Culture reports for each patient were directly collected from the laboratory and analyzed to determine the resistance or sensitivity of the initiated antibiotic therapy. We were able to participate in the selection of the appropriate antibiotic regimen by considering the patient's laboratory reports and previous history of allergies.

Patient counseling was provided using an authorized script and informative patient leaflets. Through counseling, patients were educated about the importance of proper antibiotic use and the risks associated with using antibiotics without a physician's prescription. Furthermore, upon analysis, it was observed that many OP patients received therapy without knowledge of their resistance/sensitivity patterns due to the time-consuming nature of obtaining culture reports.

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

LIMITATIONS OF STUDY

This study involved a single-center data analysis, relying on the accuracy of the information collected from the patients. In the case of outpatients belonging to the geriatric category, they faced difficulties in recalling the antibiotics they had previously used. Furthermore, there was a lack of access to old prescriptions, making it impossible to conduct a proper assessment of the risk factors.

REFERENCES

[1]. Joseph T. Dipiro, Robert L. Talbert, Gary C. Yee, Gary R. Matzke, Barbara G. Wells, L. Michael Posey. Textbook of pharmacotherapy, A pathophysiologic approach. 2017; 10(1): 616-625.

[2]. WHO list of Antibiotic Resistant "Antibiotic Resistance"- World Health Organization July 2020 www.who.int

[3]. Richards KA, Cesario S, Best SL, Deeren SM, Bushman W, Safdar N. Reflex urine culture testing in an ambulatory urologic clinic. Implications for antibiotic stewardship in urology. International journal of urology. 2019; 26(1); 69-74.

[4]. G Evan, M Laverdieve, P Philips, C Quan, C Rotstein. Complicated urinary tract infection in adults. Canadian journal of infectious diseases and medical microbiology. 2005; 16(6): 349-360.

[5]. Ayan Sabih, Stephen W Leslie. Complicated Urinary Tract Infections. National library of medicine; Jan 2022.

[6]. John. L Bruch, Michael Stuart Bronze. Pathophysiology of complicated Urinary tract infection. Drug and diseases. Stat Pearls Publishing; Nov 2022.

[7]. Timothy Jancel, Vicky Dudas. Management of uncomplicated urinary tract infection. Western Journal of Medicine; 2002: 176(1); 51-55.

[8]. Maharjan G, Khadka P, Siddhi Shilpakar G, Chapagain G, Dhungana GR. Catheter associated urinary tract infection and obstinate biofilm producers. Canadian journal of infectious disease. Medical microbiology; 2018:7624857 [PubMed].

[9]. Md. Mostafizer Rahman, Mridha Md. Kamal Hossain, Rubaya, Joyanta Halder, Md. Kamrul Karim, Anjuman Ara Bhuiya, Anwari Khatun**.** Association of antibiotic resistance traits in uropathogenic Escherichia coli isolates. Canadian journal of infectious diseases and medical microbiology; 2022: 10(1); 1-9.

[10]. Tasneem Ahsan, Shumaila Tahir, Sayeda Anjana Tahir, Haseeb Ahmed Bhatti. Antimicrobial multi drug resistance in urinary tract infection. Independent journal of allied health sciences; 2021: 01(10);1-7.

[11]. Yakup CAG, Demet HACISEYITOGLU, Abdurrahman Avar OZDEMIR, Yasemin CAG. Antibiotic Resistance and Bacteria in Urinary Tract Infections in Paediatric patients. Medeni medical journal; 2021: 36(10); 217-224.

[12]. Andrea Ong, Nitin Mahobia, Dave Browning, Matthew Schembri, Bhaskar K. Somani. Trends in antibiotic resistance for over 700,000 Escherichia coli positive urinary tract infections over six years (2014-2019) from a university teaching hospital. Central European journal of Urology; 2021: 74(1); 249-254.

[13]. Wajiha Imtiaz, Zainab Syed, Zara Rafique, Simon Colin Andrews, Javid Iqbal Dasti**.** Analysisof antibiotic resistance and virulence traits (genetic phenotypic) in klebsiella pneumoniae clinical isolates from Pakistan: identification of significant levels of carbapenem and colistin resistance. Journal of infectious and drug resistance; 2021: 14(1); 227-236.

[14]. Mario Gajdacs, Marianna Abrok, Andrea Lazar, Katalin Burien. Epidemiology and antibiotic resistance profile of bacterial uropathogens in male patients: a 10-year retrospective study. Journal of Farmacia; 2021: 69(3); 530-539.

[15]. Samir Issa Bloukh, Nageeb A. Hassan, Rand S. AlAni, Sabrina Ait Gacem. Urinary tract infection and antibiotic resistance among pregnant and non-pregnant females in UAE. Research journal of pharmacy; 2021: 14(1); 461-469.

[16]. Melanie C. Goebel, Barbara W. Trautner, Larissa Grigory. The five Ds of outpatient antibiotic stewardship for urinary tract infections. Journal of American society for microbiology; 2021: 34(4); 1-31.

[17]. Rozina Aktar Zahan, Nahreen Rahman, Nilufar Yasmin, Parvez Hassan. Drug resistance pattern of the isolated organism

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 849-856 www.ijprajournal.com ISSN: 2249-7781

while treating UTIs. American journal of laboratory medicine; 2020: 5(2); 47-54.

[18]. K. Vazouras, K. Velali, I. Tassioue, A. Anastasiou-Katsiardani, K. Athanasopouloug, A. Barbounih, C. Jacksonb, L. Folgori, T. Zaoutis, R. Basmacik, Y. Hsiab. Antibiotic treatment and antimicrobial resistance in children with urinary tract infections. Journal of global antimicrobial resistance; 2020: 20(1); 4-10.

[19]. Ali Mohammed Alshabi, Majed Saeed Alshahrani, Saad Ahmed Alkahtani and Mohammed Shabib Akhtar. Prevalence of urinary tract infection and antibiotic resistant pattern in pregnant women, Najran region, Saudi Arabia. African journal of microbiology research; 2019: 13(26); 407-413.

[20]. Deepak Sharma, Sara E Preston, Robert Hage. Emerging antibiotic resistance to bacterial isolates from human urinary tract infections in Grenada. Cureus; 2019: 11(9); e5752.

[21]. Barbara Kott. Antibiotic resistance among uropathogenic Escherichia coli. Polish journal of microbiology; 2019: 68(4); 403-415.

[22]. A. van Driel1 & D. W. Notermans & A. Meima & M. Mulder & G. A. Donker & E. E. Stobberingh & A. Verbon. Antibiotic resistance of Escherichia coli isolated from uncomplicated UTI in general practice patients over a 10-year period. European journal of clinical microbiology and infectious disease; 2019: 82(3); 2151-2158.

[23]. Upul Priyadarshini, Lasanthi B Piyasiri1, Champa Wijesinghe. Prevalence, antibiotic sensitivity pattern and genetic analysis of extended spectrum beta lactamase producing Escherichia coli and Klebsiella spp., among patients with community acquired urinary tract infection in Galle district, Sri Lanka. Ceylon medical journal; 2019: 64(1); 140-145.

[24]. Sebastian Bischoff, Thomas Walter, Marlis Gerigk, Matthias Ebert and Roger Vogel Mann. Empiric antibiotic therapy in urinary tract infection in patients with risk factors for antibiotic resistance in a German emergency department. Journal of BMC infectious disease; 2018: 56(18); 1-7.

[25]. Kais Kassim Ghaima Zainab Shaban Khalaf, Alaa Aziz Abdul Hassan and Noor Yahya Salman. Prevalence and antibiotic resistance of bacteria isolated from urinary tract infections of pregnant women in Baghdad Hospitals. Biomedical and pharmacology journal; 2018: 11(4): 1989-1994.

[26]. Tiyana Thomas, Reshmi L Tony, Anmol Thomas, Sana Venkata Mani Santhosh4, M. Gomathi1, Aneena Suresh, S. Ponnusankar. Antibiotic resistance pattern in urinary tract infection during pregnancy in south Indian population. Asian journal of pharmaceutics; 2018: 12(2); s625-s630.

[27]. Adelaide Ogutu Ayoyi1, Gideon Kikuvi, Christine Bii, Samuel Kariuki. Prevalence, aetiology and antibiotic sensitivity profile of asymptomatic bacteriuria isolates from pregnant women in selected antenatal clinic from Nairobi, Kenya. Pan African medical journal; 2017: 26(41); 10975.

[28]. Khadijah Yousef AL-Aali, Wajeih Yousef (2015). Prevalence of Asymptomatic bacteriuria in pregnant women, Western Region, Taif, Saudi Arabia. International journal of science and research; 2015: 2(12); 1125-1131.

[29]. Ingeborg Bjorkman, Johanna Berg, Nina Viberg & Cecilia Stalsby Lindborg. Awareness of antibiotic resistance and antibiotic prescribing in UTI treatment: A qualitative study among primary care physicians in Sweden. Scandinavian journal of primary health care; 2013: 31(1); 50-55.

[30]. Bhatt CP, Shrestha B, Khadka S, Swar S, Shah B, Pun K. Aetiology of urinary tract infection and drug resistance cases of uropathogens. Journal of Kathmandu Medical college; 2012: 1(2); 114-120.