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Original Article

Evaluation of Antibiotics Resistance Pattern in Respiratory Tract Infections and Urinary Tract Infections in Tertiary Care Hospital

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ABSTRACT

Background: The most prevalent infectious disorders are Urinary Tract Infections (UTI) and Respiratory Tract Infections (RTI), which are frequently related to morbidity and mortality. Due to improper antibiotic administration in these diseases, antibiotic resistance increased. This study aims to identify the patterns of antibiotic resistance in RTI and UTI. **Materials and Methods:** An investigation of a prospective observational cross-sectional type of study was carried out at the government general hospital's Department of general medicine between November 2021 and April 2022. The study included all patients of either gender over the age of 20 who had received at least one prescription for an antibiotic and had culture sensitivity test results. Information was gathered from the patient's medical case sheet regarding demographics, primary complaints, current medication history, and the results of an antibiotic sensitivity test. Based on the culture sensitivity test, the most prevalent microorganisms isolated from RTI and UTI were identified, and the antibiotic resistance pattern was established. **Results:** 160 samples from the general medicine department of the government public hospital were processed during the study period (100 sputum samples and 60 urine samples). A total of 293 antibiotics were prescribed among 160 samples, of which 183 (62.5%) were prescribed for RTI and 50 (27.32%) were found to be resistant. 40 (36.3%) of the 110 antibiotics administered for UTIs were found to be resistant. The remaining 203 (69.26%) patients received suitable antibiotic prescriptions for RTI and UTI. **Conclusion:** The isolates seen in recent years show the value of longitudinal surveillance data to identify shifts in antibiotic resistance trends, and it is not entirely excluded that the movements may pick up again.

Keywords: Respiratory Tract Infection, Urinary Tract Infection, Culture Sensitivity, Antibiotic Resistance.

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INTRODUCTION

Inappropriate antibiotic prescription by a doctor is the most significant acknowledged factor for the emergency of antibiotic resistance, according to the definition of antibiotic resistance, which is the resistance of microorganisms to antimicrobial agents that occurs when bacteria changes to protect itself from antibiotics.[1] Since antibiotics have been believed to be a cure-all for bacterial infections for more than 60 years, they have become widely used, but not always in the best or most suitable ways. It has favored the emergence, selection, and ultimately the spread of bacterial strains resistant to these therapies because of this situation of misuse, particularly in infections that don't require antibacterial medications (viral infections), incomplete antibiotic therapy, or use of the wrong antibiotics for the susceptibility of the organisms. This has resulted in a dangerous "weapons race" of discovery and production of new antibacterial drugs. At the same time, microorganism does their part to develop a mechanism that prevents these drugs from being effective in eliminating them.[2] According to estimates, antibiotic-resistant infections will endanger 10 million lives annually by the year 2050. As a result of a global campaign led by the UK Government, 193 countries decided to prioritize reducing antibiotic resistance at the 2016 United Nations General Assembly in September.[3] Respiratory tract infections are among the most prevalent and diverse groups of diseases that have consistently been a significant cause of morbidity in clinical medicine. Any infectious condition of the upper or lower respiratory tract is called a respiratory tract infection. The common cold, tonsillitis, laryngitis, pharyngitis,

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rhinitis, and otitis media are all examples of Upper Respiratory Tract Infections (URTIs). Infections of the Lower Respiratory Tract (LRTIs) include pneumonia and acute bronchitis. Respiratory tract infections can be brought on by bacteria such Moraxella catarrhalis, Hemophilus influenza, and *pseudomonas aeruginosa, Streptococcus pneumonia*, among others.[4] Gramme negative microorganisms like *Pseudomonas* spp., *E. coli*, and *Klebsiella* spp. and gramme positive bacteria like *staphylococcus aureus, streptococcus pneumonia*, etc., In LRTI patients, they were found to exist.[5] *S. pneumoniae* and *H. influenzae* are the primary causes of acute bacterial sinusitis, the fifth most frequent diagnosis for which antibiotics are being recommended. A consequence of chronic obstructive pulmonary illness is this ailment.[6] The problem worsens due to increasing antibiotic use, inadequate resistance, and lax adherence to conventional precaution in healthcare settings. Patients who are receiving critical care are impacted by respiratory infections like pneumonia that cause respiratory failure. Awareness of or resistance to antibiotics motivates the need to use local antibiogram as one of the techniques to offer empiric antibiotic recommendations.[7] After respiratory infections, the second most typical bacterial infection in humans is Urinary Tract Infection (UTI). *Staphylococcus saprophyticus, Klebsiella*, Enterobacter, Proteus, and Enterococci have also been found as the cause of UTIs. Several studies indicate that gram-negative bacilli, particularly the Enterobacteriaceae bacteria family, are the most prevalent pathogens in the emergence of UTIs. Rapid and accurate diagnosis is crucial to decrease the illness's duration and stop disease development towards renal impairment and upper UTIs.[8] This study aimed to reveal the most common antibiotics-resistant microorganism in respiratory and urinary tract infections and their antibiotics resistance pattern in tertiary care hospitals. The current research is carried out with sectional prospective, observational, cross-sectional, and descriptive statistics.

MATERIALS AND METHODS

This study aims the evaluation of antibiotics resistance patterns in respiratory tract infections and Urinary tract infections.

Objectives

The key objective of the study includes;

- To categorize the subjects based on demographics.
- To differentiate patients treated with different antibiotics.
- To identify the most common microorganism isolated in urinary tract infections and respiratory tract infections.
- To assess the antibiotics resistance pattern in respiratory and Urinary tract infections in the government general hospital.

Study design and study period

A prospective, observational and cross-sectional type of study was conducted in the Inpatient department of general medicine in the government general hospital, Kadapa.

The present study was conducted for 6 months i.e., from Nov 2021 to April 2022.

Source of data

Data were collected from patient case sheets.

Sample size

A total of 160 subjects were included in the study.

Inclusion criteria

- Patients are prescribed at least one antibiotic.
- Patients of either gender above 20 years of age are considered.
- Patients with culture sensitivity test reports.

Exclusion criteria

- Patients who are allergic to antibiotics or known allergies.
- Pediatrics and pregnant women patients were not included.

Method of collection of data

It is a prospective, observational, and cross-sectional study conducted in the government of general hospital, Kadapa, in the available medicine department. Informed consent was obtained from the study participants after explaining the study protocol.

Statistical analysis

All the data of recruited subjects were recorded in a Microsoft Excel spreadsheet.

Descriptive statistics were used to analyze different demographic parameters like Mean, simple percentage, and standard deviation.

RESULTS

Based on Gender, 90 (56.25%) male predominance was observed over 70(44%) female samples as shown in Figure 1a.

Determines the most common isolated microorganism, a total of 100 sputum samples were collected, most common resistant microorganisms isolated were gram-negative bacteria 32 (30%) *Klebsiella* species in 27 subjects was found to be the most common isolated gram harmful microorganisms as shown in Figure 1b.

Depicts a total of 183 antibiotics prescribed in respiratory tract infections, 50 (27.3%) ceftriaxone (30), Ciprofloxacin (6),

Azithromycin (5), Cefperazone (4), Augmentin (4), Amoxicillin (2), to be resistance and they were treated with empirical drugs 50 (27.32%) Azithromycin (18), Amoxyclave (12), Amikacin (10), Ciprofloxacin (10), and 83 (45.3%), Ceftriaxone (34), Azithromycin (27), Amoxyclave (13), Cefperazone (2), Amoxicillin (1), Ciprofloxacin (1) and antibiotics were found to be sensitive as shown in Figure 2.

7 Depicts a total of 110 antibiotics were prescribed in urinary tract infections, 40 (36.3%) antibiotics were found to be resistance, Cefperazone+sulbactam (15) Ceftriaxone (8), Norfloxacin (7) Ciprofloxacin (5), Amoxicillin (3), Amikacin (1) Cefixime (1). Treated with Empirical therapy 40 (36.36%) Antibiotics Nitrofurantoin (19), Azithromycin (9), Amoxyclave (5), Amoxycillin (3), Ceftriaxone (2), Ciprofloxacin (1), Amikacin (1) and 30 (27.27%) antibiotics were found to be sensitivity Nitrofurantoin (8) Cefperazone+sulbactam (5), Azithromycin (4) Cefixime (4), Norfloxacin (4) Ciprofloxacin (2) Amoxyclave (2) as shown in Figure 3.

Describe the antibiotics resistance pattern in respiratory tract infections and urinary tract infections. A total of 293 antibiotics were prescribed in 160 subjects among them 90 (30.56%) drugs were replaced with empirical drugs 90 (30.7%), 113 (38.56%) drugs were sensitive as shown in Figure 4.

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DISCUSSION

The clinical study evaluated antibiotic resistance patterns in respiratory tract infections and urinary tract infections in tertiary care hospitals in the Department of general medicine.

During this study period, 60 urine samples were reported from subjects in which 22 were males and 32 were females. This

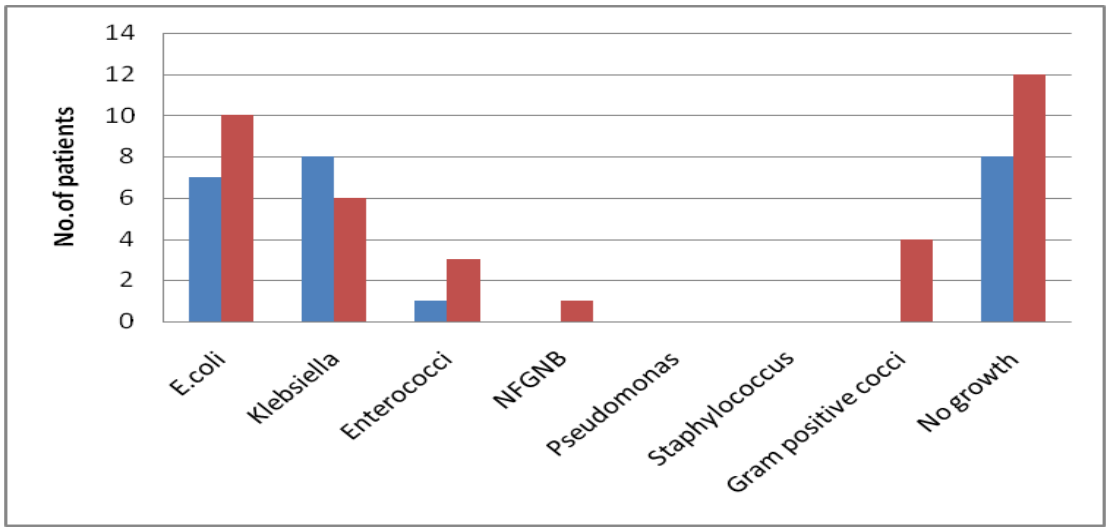

Figure 1a: Graphical representation of Micro-organisms isolated in Urinary tract infection based on Gender.

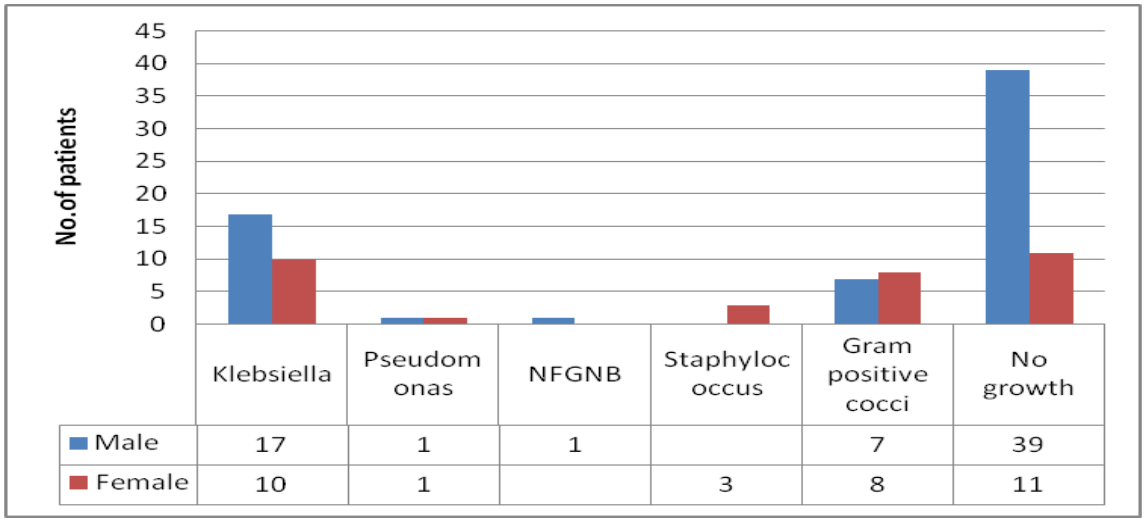

Figure 1b: Graphical representation of most common microorganism isolated in Respiratory tract infections based on gender.

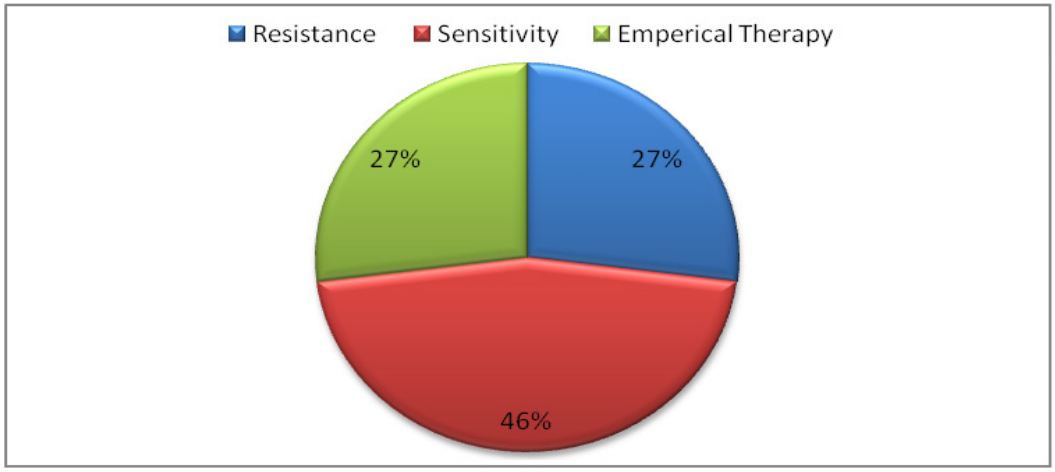

Figure 2: Graphical representation of antibiotic resistance, sensitivity, empirical therapy pattern in Urinary tract infection.

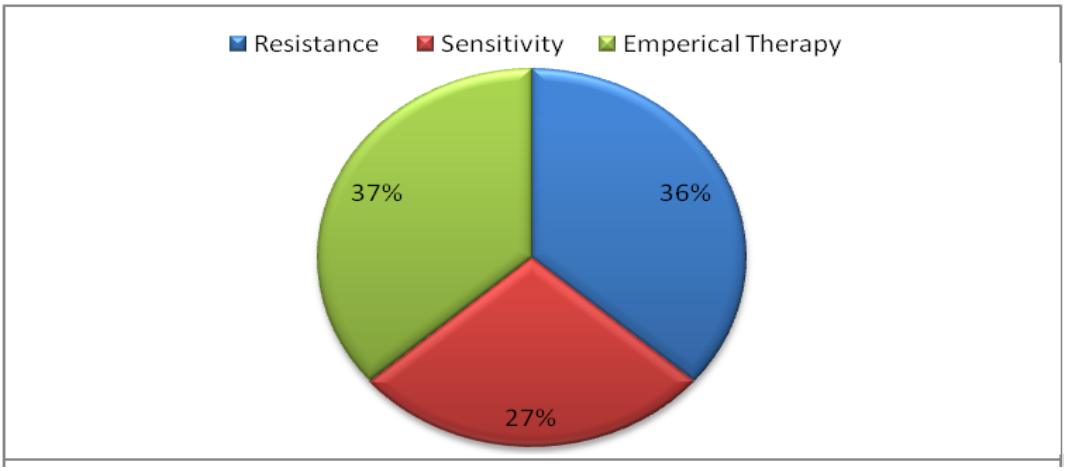

Figure 3: Graphical representation of antibiotic resistance, sensitivity, empirical therapy pattern in Respiratory tract infections.

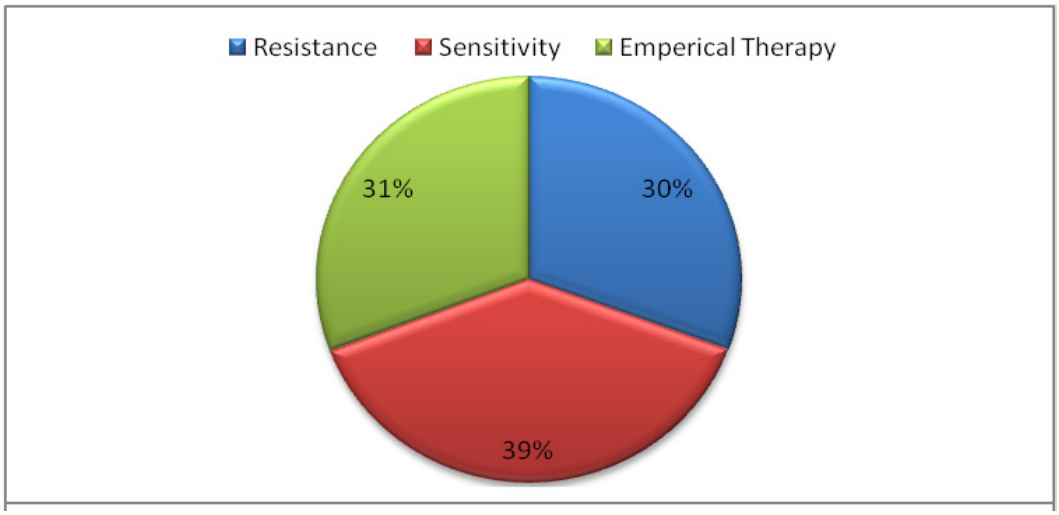

Figure 4: Graphical representation of resistance, sensitivity and empirical drug.

is similar to the study conducted by Orhiosefe Omigie *et al*, that most females were more affected by UTI than their male counterparts.[9]

In our study, antibiotic resistance patterns in sputum and urine were identified. The resistance of ceftriaxone (30) observed predominately among sputum subjects, out of 100 subjects' sputum 50 patients were found to be resistant, which is similar to Yuone N Wekesa *et al*., which is estimated that almost all of the *E. coli* and *Klebsiella* species were resistant species to ceftriaxone or ceftazidime.[10]

Among UTI- *E. coli* species (17) were more predominance, which is similar to smita *et al*., who revealed *E. coli* as the predominant bacterial pathogen for the community-acquired UTIs in Jaipur, Rajasthan.[11]

In the present study, the empirical therapy for *E. coli* isolates is Nitrofurantoin which is similar to kibert M, *et al*., conducted that *E. coli* isolates showed high rates of resistance to erythromycin, amoxicillin and tetracycline. Nitrofurantoin, Norfloxacin, gentamycin and ciprofloxacin are considered appropriate for empirical treatment of *E. coli* in the study area.[12]

Most common microorganisms isolated in urine and sputum was identified. Among UTI-*E. coli* species (17) and among sputum-*Klebsiella* species (27) microorganisms were predominant which is similar to Ingvildodsbu *et al*., Although decreasing trends in antibiotic resistance among *E. coli* and *Klebsiella* spp. Isolates were observed in recent years, if they cannot be ruled out, the trends might increase again.[13]

CONCLUSION

According to our investigation, gram-negative bacteria were the most prevalent isolated resistant microorganism in urinary and respiratory tract infections. There is more resistance to ceftriaxone for respiratory tract infections and cefperazone plus sulbactam for urinary tract infections. On the other hand, Azithromycin is an empirical medication therapy for study participants with respiratory tract infections. The hospital's Infection Control Committee (ICC) receives the current study's report to take the necessary preventive action to decrease the cases of *E. coli* resistance in urinary tract infections and *Klebsiella* species in respiratory tract infections. Our findings showed that despite declining trends in antibiotic resistance among the *Klebsiella* and *E. coli* species. The relevance of longitudinal surveillance data to detect changes in antibiotic resistance trends is demonstrated by isolates observed in recent years, and it cannot be completely ruled out that the movements may increase once more.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

UTI: Urinary tract infection, **RTI:** Respiratory tract infection; **URTI:** Upper respiratory tract infections; **LRTI:** Lower respiratory tract infections; **SPP:** Species; ***E. Coli:*** *Escherichia coli*; ***S. pneumoniae*:** *Streptococcus pneumoniae;* ***H. influenzae:*** *Haemophilus influenzae*.

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