

## **A retrospective appraisal of bacteriological profile and antibiogram patterns among elderly with urinary –tract-infection visiting a private healthcare institution in South-south Nigeria**

### **Abstract**

**Background:** A urinary tract infection (UTI) is an infection that can affect any portion of the urinary system (kidneys, ureters, bladder, and urethra). It's worth noting that the majority of UTIs affect the lower urinary tract. This infection has been identified as the most frequent bacterial illnesses, accounting for a significant portion of the workload in microbiological diagnostic laboratories.

UTIs account for 15.5 percent of hospitalizations in individuals over the age of 65, and it has been reported as one of the most common types of infection among the elderly, particularly those in institutionalized care.

**Objectives:** Our aim was to retrospectively appraise and evaluate the bacteriological profile and antibiogram patterns in elderly adults visiting our private healthcare center.

**Methods:** The retrospective survey was conducted amongst elderly patients who visited the hospital within the period of three years (October 2018- October 2021). Questionnaire designed was used to collect data from the Health Information Management unit of the hospital and these information were analyzed using SPSS 20 package with a level of significant set at p-value of < 0.05.

**Results:** Females made up over 70% of the study participants, while men made up 30.2 percent. A substantial percentage of the elderly (53.8%) between the ages of 60 and 65 had E. coli growth as the cause of their UTI. More than a third (33.3 percent) of the elderly between the ages of 60 and 80 had staphylococcus and proteus as the cause of their UTI. The majority of the elderly patients' samples showed staphylococcus aureus and E coli growth, with E coli growth reported in 33.3 percent and 66.7 percent of male and female participants, respectively, and staph aureus growth reported in 22.2 percent and 77.8% of male and female participants' urine cultures, accordingly. The majority of the bacteria grown were susceptible to Quinolones and Ceftriazone combination medicine (Ceftriazone + Tazobactam for E. coli and Ceftriazone + Tazobactam/Sulbactam for Staphylococcus aureus), however common hospital antibiotics such as Ceftriazone, Augmentin, Amoxicillin, Cefixime, and cefuroxime were not sensitive to the urine cultured germs.

**Conclusion:** The rate of UTI in the elderly was relatively high, and antibiotic resistance to routinely administered medicines was surprising. The findings of this study have bolstered the need for comprehensive national control programs to combat antibiotic resistance, as well as the establishment of Geriatric clinics and geriatric public care programs across Nigeria's private and public health institutions, whose responsibility it is to raise awareness about the dangers of UTI and to develop robust treatment plans for the elderly.

**Keywords:** bacteriological-profile, antibiotic -sensitivity, UTI, elderly, Nigeria

## **Introduction**

Noticeable changes in the aged are common, and these changes might be intrinsic or extrinsic in character, increasing the risk of chronic non-communicable diseases.<sup>1</sup> These chronic diseases

vary with age, and in many cases, as people get older, they become a major cause of morbidity and mortality.<sup>1, 2</sup> The aforementioned factors linked to increased aging, changes in immunity, and the use of instrumentation among the elderly have been linked to an increased risk of urinary tract infection among the elderly.<sup>3-4</sup>

Urinary tract infection (UTI) is one of the most common infections in the elderly.<sup>5-7</sup> It constitutes approximately 25% of all infections in older adults.<sup>5,8</sup> UTI can be broadly defined as an infection of the kidneys, bladder or urethra.

Globally, it has been estimated that the prevalence of UTI among the elderly in non-institutionalized care was 10.9% for men and 14% in women.<sup>9</sup> However, in Nigeria the prevalence of UTI in the elderly have been reported to within the range of 11% - 53%.<sup>10-12</sup> The occurrence of UTI have been reported more among the elderly females because of their short urethra and other associated factors, however, some other studies have reported more UTI infection elderly male.<sup>9,12.</sup>

Common factors and associated conditions that increases chances of UTI in elderly include: hormonal changes, reduction in colonizing lactobacilli causing an increase in vaginal pH, Fecal soiling and poor perineal hygiene neurologic disease (i.e., stroke), fecal impaction, cystocele (in women), incomplete voiding In men and benign prostatic hyperplasia (BPH).<sup>9,13-14</sup>

Furthermore, bacteria that have inhabited the peri-urethral portions of the gastro intestinal tract usually cause urinary tract infections. Gram-negative bacteria such as *E. coli*, *Proteus* species, *Klebsiella* species, *Enterobacter* species, and *Pseudomonas* species are the most commonly implicated bacteria. *Staphylococcus aureus* *Staphylococcus epidermidis* are also among the microorganisms frequently implicated..<sup>12,15-17</sup>

There is limited data available on the pattern of bacterial growth and the antibiogram profile of UTI among elderly presenting at non-government hospitals, hence this study will bridge this gap by providing the bacteriological profile pattern and sensitivity pattern of the elderly. Furthermore, in order to develop guidelines for better treatment of the elderly with the goal of achieving outstanding results, it is also necessary to identify the common organisms in our hospital that cause UTI and their sensitivity/resistant pattern.

## **Materials and Methods**

### **Study area**

Lily hospital Benin is a multi-bedded hospital established in 2015. The hospital has its headquarter in Warri, Delta States with branches in other part of Nigeria. The private health institution has a relatively large patient load with a comparatively high number of elderly patient, compared to other private institutions in the South-South Nigeria.

The first class private health care institution offer clinical care, laboratory services, radiological services (MRI, CT scan, X-ray) and occupational health services etc. These services are rendered either on inpatient or outpatient basis. The outpatient clinic is run by consultant family physicians and medical officers in the department of Family Medicine. There are 8 consulting

rooms for the following subunits; Emergency room and General outpatient clinic. The clinic is opened 24hours daily including weekends.

### **Study Design**

The study was a hospital based retrospective study design.

### **Study Population**

The study population were elderly patients who attended the outpatient clinic of Lily Hospital, Benin City between October 2018 and October 2021.

### **Study duration**

The study exercise was conducted over a period of three months.

### **Inclusion Criteria**

1. All the elderly patients who visited outpatient clinic during the retrospective review with age 60 years and above with positive bacteria culture tests were included in the study.

### **Exclusion Criteria**

Any elderly patient with a missing information on the electronic medical records were excluded.

### **Sampling technique**

The entire population of the elderly patients who meets the inclusion criteria will be recruited for this study (A general population sampling technique was utilized).

### **Research Assistants**

Research assistants included 6 volunteer health care workers from different units of the hospital. They were trained for 3 days on how to synthesize the data from the hospital patient's records in the hospital health information management department. Additionally, during the three days training, the research assistants were given a training on the background of urinary tract infection among the elderly.

### **Study Instruments/Data collection**

The data of the elderly were obtained from patient's record in the department of Health Information management of the hospital. The data collected focused on the elderly aged 60 years and above who attended the hospital during the time period under consideration, as well as those who had positive culture tests.

### **Data management**

Data were entered into a spreadsheet and analyzed using IBM SPSS (statistics product and service solution) version 22. Descriptive data were presented as charts and in frequency distribution tables.

### **Ethical Considerations**

1. Ethical Approval: Ethical Approval to conduct this research will be obtained from Ethics and Research Committee of Lily Hospital, Warri, Delta State.

## Results

**Table 1: Sex distribution of the elderly**

Frequency	Percentage (%)
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MALE	32	30.2
FEMALE	74	69.8

Almost 70 percent of the study participants were females while 30.2 percent were females, Table 1.



BACTERIAL GROWTH	Age in years				
	60-65	66-70	70-75	76-80	>80
E. COLI	21(53.8%)	2(5.1%)	0(0.0%)	1(2.6%)	15(38.5%)
STAPHYLOCOCCUS AUREUS	15(33.3%)	12(26.7%)	10(22.2%)	7(15.6%)	1(2.2%)

PSEUDOMONAS	2(20.0%)	8(80.0%)	0(0.0%)	0(0.0%)	0(0.0%)
AERUGINOSA					
PROTEUS SPP	4(66.7%)	0(0.0%)	0(0.0%)	0(0.0%)	2(33.3%)
*OTHERS	6(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)

**Table 2: Age and bacterial growth pattern among the elderly**

**\*Others-Candida, klebsiella, enterococcus**

A large proportion (53.8%) of the elderly between the ages of 60-65 had growth of E. coli responsible for their UTI. Greater than one third (33.3%) of the elderly between ages 60-65years and above 80years had staphylococcus and proteus responsible their UTI.

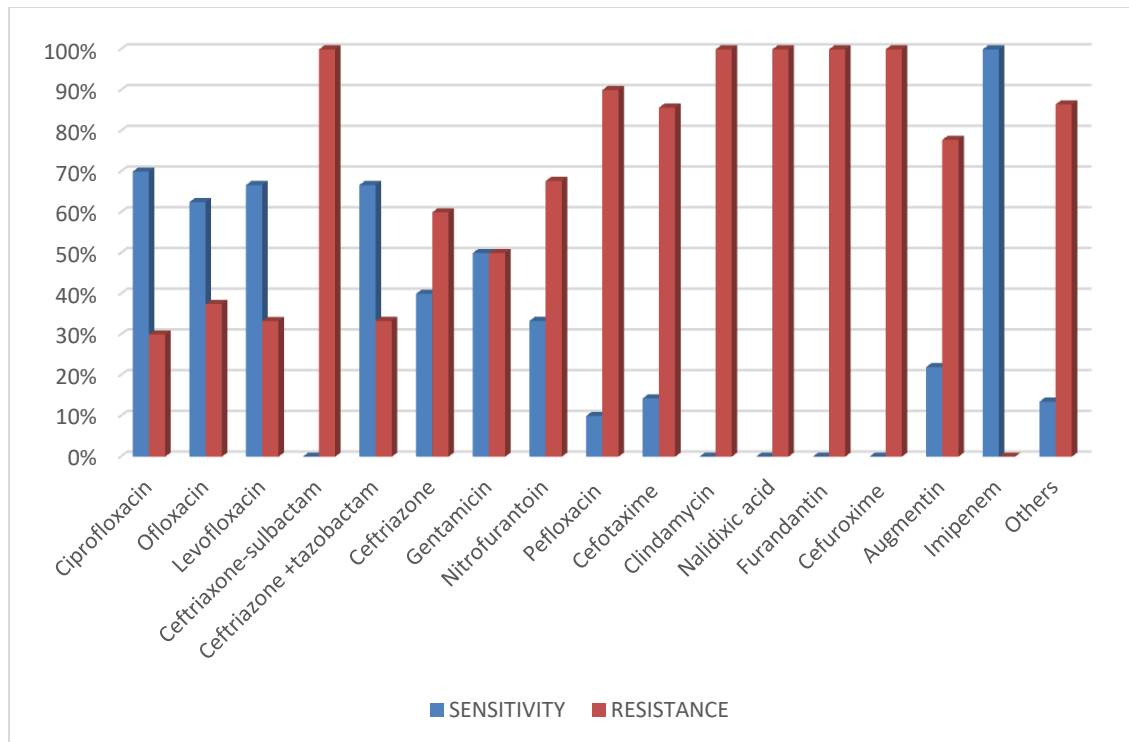
**Table 3: Sex distribution of UTI by organism**

BACTERIAL GROWTH	MALE	FEMALE
E. COLI	13 (33.3%)	26(66.7%)

STAPHYLOCOCCUS AUREUS	10 ( 22.2%)	35( 77.8%)
PSEUDOMONAS AERUGINOSA	0 ( 0.0%)	10 (100.0%)
PROTEUS SPP	5(83.3%)	1 (16.7%)
*OTHERS	4(66.7%)	2(33.3%)

\*Klesiella, candida,enterococcus etc

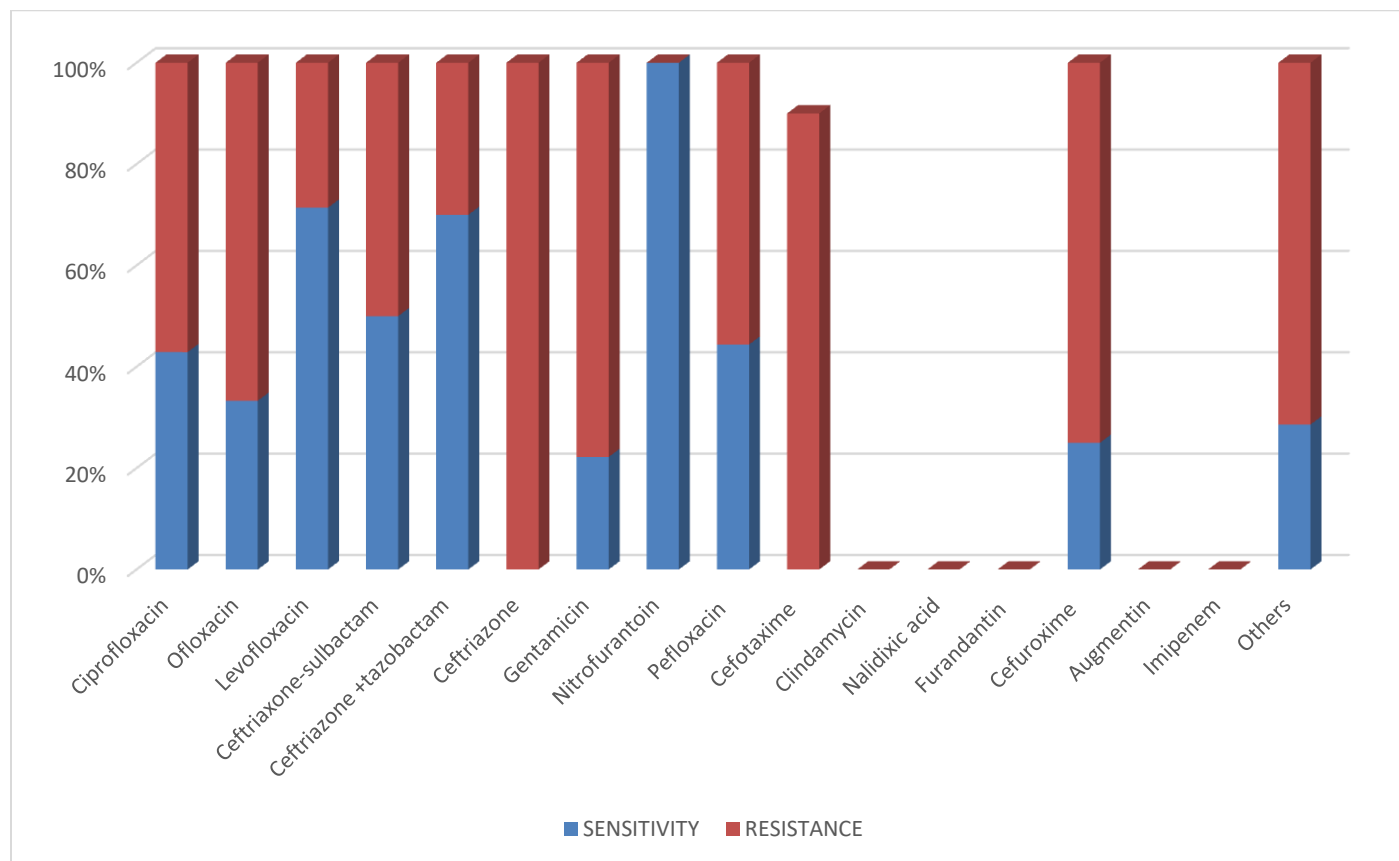
Table 2 showed the sex distribution of UTI by organism, with 77.8% and 66.7% of the total growth of staphylococcus aureus and E. coli reported in the elderly female while 22.2% and 33.3% were reported responsible for the UTI in males. Other organism (66.7% in males and 33.3% in females) were also responsible for UTI in both sex.



\*Others- Azithromycin, Septrin and amoxicillin

Figure 1: Antibiotics sensitivity and resistance pattern for E.coli

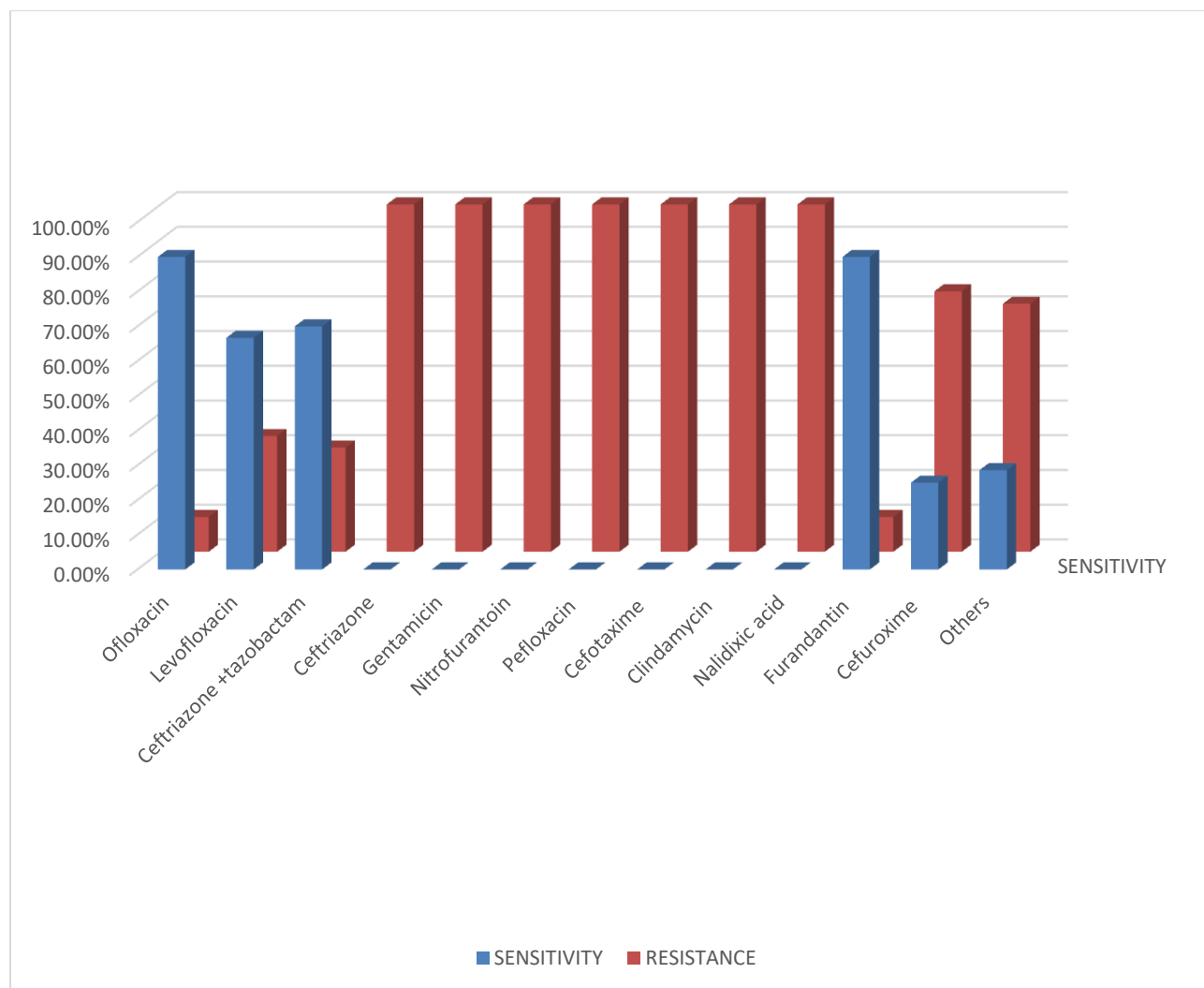
E. Coli was found to more sensitive to quinolones (Ciprofloxacin, Ofloxacin And Levofloxacin). Also Ceftriaxone + Tazobactam And Imipenem were also found to be sensitive to E. coli infection



\*Others- Azithromycin, Septrin and amoxicillin

Figure 2: Antibiotics sensitivity and resistance pattern for *Staphylococcus aureus*

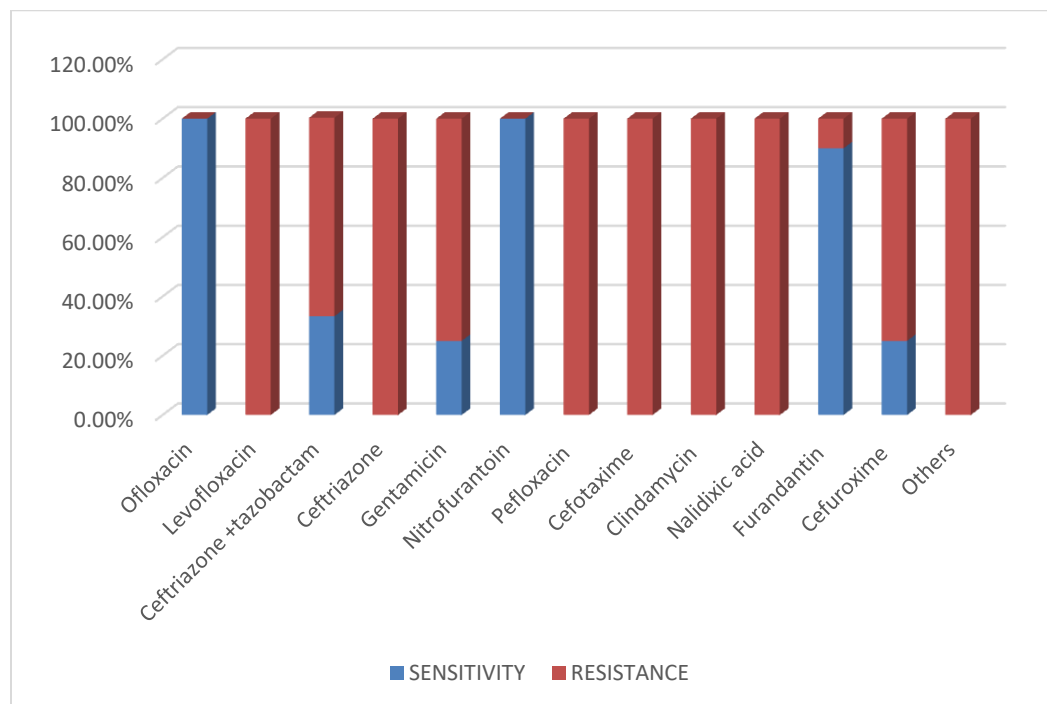
Majority of the *Staphylococcus* growth were found to be responsive to Levofloxacin And Ceftriaxone combination antibiotics. Surprisingly there was resistance against ceftriaxone alone



\*Others- Azithromycin, Septrin and amoxicillin

Figure 3: Antibiotics sensitivity and resistance pattern for *Pseudomonas auroginosa*

Majority of the *Pseudomonas* growth were reactive To Ofloxacin, Levofloxacin And Ceftriazone+Tazobactam



\*Others- Azithromycin, Septrin and amoxicillin

Figure 4: Antibiotics sensitivity and resistance pattern for Proteus

Majority of the Proteus species growth were reactive to Ofloxacin, Nitrofurantoin and Furandantin

## **Discussion**

The clinical presentation of older individuals with UTI is typically unusual, with an increased risk of multiple drug load, drug–drug interaction and co-morbidities.<sup>10-22,22</sup> As a result, identifying the pathogenic agent and its effective antibiotic sensitivity to the UTI in question plays a critical role in effective early management among the elderly around the world.<sup>12, 18 22</sup>

The development of bacterial resistance to a wide range of antibiotics is raising serious health issues in the world. Infectious microorganisms are increasingly resistant to a variety of medicines, putting drugs' capacity to manage urinary tract infection (UTI) under jeopardy. This problem is exacerbated in the elderly, who are already immune-compromised due to their age and co-morbidities.<sup>3,4,18-21</sup>

The gender distribution of patients in our study matches that of earlier studies, with females having a higher rate of positive urine cultures than their male counterparts. The variations in the structure and microbiota between male and female genitourinary systems may play a role in the preponderance of positive culture among females.<sup>22, 23</sup> However, in another study done in other part of Nigeria, majority of the study participants were males.<sup>10</sup> In addition, it was discovered in this study that elderly people between the ages of 60 and 70 had higher rates of UTI, which supports the findings of another study in Southern Nigeria.<sup>11</sup>

Among the uropathogens analyzed from the retrospective study, *Staphylococcus aureus* was the most common microorganism isolated from the urine culture of the elderly. This finding was not in keeping with finding from other studies where *E. coli* and *Klebsiella* species were attributed as the most common organism causing UTI among the elderly.<sup>10, 11,18,22,24</sup> However, other studies done found *Staphylococcus aureus* to be majorly responsible for the UTI.<sup>15-17</sup> The similarities



and discrepancies in the type and distribution of uropathogens could be due to variances in study regions, host variables, and sample collecting procedures. The importance of using narrow-spectrum antibiotics after culture reports is demonstrated by this finding, with the sole purpose of avoiding inappropriate antibiotic use and preventing antimicrobial resistance.

In contrast to what previous investigations have found, the predominant organisms cultivated in our study (*Staphylococcus aureus* and *E. coli*) were found to be sensitive to quinolones and Ceftriazone+tazobactam.<sup>20,25</sup> Coincidentally, the results were comparable to those of another study, in which many of the aged cultures produced *staphylococcus aureas*, which was sensitive to Levofloxacin.<sup>22</sup> There was also significant resistance to routinely used antibiotics such as Augmentin, Ceftriaxone Cefuroxime, Amoxicillin, and others. This high prevalence of resistance to routinely used antibiotics has sparked widespread concern, echoing findings from earlier studies, and there is a palpable fear that resistance may spread.<sup>10, 11,18,25</sup>

## CONCLUSION

Our research clearly identifies the common pathogens, *Staphylococcus aureus* and *E.Coli*, as well as the sensitivity and resistance pattern of UTI in the elderly, This may probably influence the unnecessary use of antibiotics in elderly. Ciprofloxacin, Levofloxacin, Ofloxacin, and Ceftriazone+Tazobactam were the most sensitive antibiotics, whereas Augmentin, Ceftriaxone, Cefuroxime, Ceftazidine, and other antibiotics were the most resistant.

## RECOMMENDATIONS

When choosing UTI treatment approaches, the sensitivity and resistance pattern of uropathogens to popular antimicrobial drugs must be considered. Furthermore, in order to permit ongoing observation of the occurrence of antibiotic resistance as these levels and patterns continue to evolve, the hospital needs to strengthen record keeping and implement a prospective surveillance system.

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