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Deceptively Simple Infection: A Study on Clinical Profile and Outcome of Urinary tract infection in Elderly presented to Tertiary Care Hospital

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Abstract:
Background*: Urinary tract infections(UTI) are among the most widespread bacterial diseases that afflict people of all ages, with a higher frequency among females, paediatrics, and geriatrics .The high incidence of UTIs and their associated sequelae, which can include sepsis in severe cases, chronic renal disease, and recurrent infections, constitute a considerable public health burden.The presence of comorbidities, prolonged indwelling catheters and other factors increase the risk of hospitalized elderly patients.*
Materials and Methods*: A retrospective study of patients admitted to emergency medicine department of age above 60 years with symptoms of urinary tract infection and positive urine cultures panning over a year were included from March 2023 to March 2024 and followed up through their hospital course/ stay. Demographic profile, clinical features, predisposing factors, urine culture reports and outcome were noted and analyzed.*
Results*: Of the 128 patients included in our study, 66.4% were males and 33.5% were females. Burning Micturition was the most common clinical presentation (79.6%). Diabetes mellitus was the most common Predisposing factor observed in (68.75%) of the patients. In organism responsible for UTI of the uropathogen profile, Escherichia coli was the commonest isolate (33.59%) seen. Mortality rate was 23.43%. Significantly higher mortality was seen in patients with complicated UTI ($p<0.001$), and increasing number of predisposing factors, high leucocyte count, Use of Urethral catheters in the study population.*
Conclusion: *Elderly urinary tract infections are related with higher rates of morbidity and mortality in the population; the severity of the infection is mostly determined by the coexisting conditions. Early diagnosis, aggressive treatment and adequate antibiotic therapy will aid in the prevention of antibiotic resistance as well as the reduction of total geriatric population mortality.*
Key Word*: Urinary Tract Infection (UTI), Elderly, Antibiotics susceptibility, Uropathogen, Dysuria, Complicated UTI.*

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I. Introduction

One of the most prevalent bacterial illnesses in the elderly population is urinary tract infection (UTI), which poses serious healthcare risks and morbidity. UTI risk increases with age due to immune system alterations, genitourinary system abnormalities, and a history of comorbidities[1]. In contrast to younger populations, older persons have a greater prevalence of urinary tract infections (UTIs), with a considerable rise observed among both community-dwelling elderly people and long-term care facility residents [2].

It can be challenging to diagnose and treat UTIs in elderly adults because they frequently have atypical presentations or asymptomatic bacteriuria [3]. Nonspecific symptoms like confusion, falls, or a general decline in functional capacity may be the key signs, rather than traditional symptoms like dysuria, urgency, and frequency [4]. Due to the atypical presentation, diagnosis might be difficult, treatment may be delayed, and consequences like acute renal damage and urosepsis can arise [5].

The pathophysiology of urinary tract infections (UTIs) in the elderly is complex and includes age-related physiological changes, such as postmenopausal women's decreased estrogen levels, which alter the vaginal flora, and a history of persistent illnesses like diabetes mellitus and also urinary incontinence, which increase the risk of infection [6]. The risk of infection is further increased by the usage of urinary catheters and various other invasive devices [7].

II. Material And Methods

This was a retrospective observational study done in the department of Emergency Medicine and Microbiology at The Oxford Medical College, Hospital & Research Centre, Bengaluru conducted over a period of one year from March 2023 to March 2024.

Study Design: Retrospective observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of Emergency Medicine and Microbiology at The Oxford Medical College, Hospital & Research Centre, Bengaluru, Karnataka, INDIA.

Study Duration: March 2023 to March 2024 (1 Year).

Sample size: 128 patients.

Subjects & selection method:

After obtaining approval from Institutional ethics committee and written informed consent from participants, 125 patients fulfilling inclusion criteria were included in the study. Data including Demographic profile and clinical profile was taken using detailed history of symptoms and clinical examination was done. The anatomical location of the infection site, simple UTIs presenting as cystitis, complicated UTIs in people with genitourinary tract structural or functional abnormalities, the causative organism, and the antibiotic susceptibility with either discharge or death as the outcome were all monitored in these patients. The laboratory tests included complete blood picture, renal and urine microscopy including culture/sensitivity, ultrasonography (USG) Abdomen & Pelvis, computerized tomography (CT) KUB if required.

Inclusion Criteria:

1. Age More than 60 Years
2. Patients with symptoms of urinary tract infection
3. Positive urine culture spanning.

Exclusion Criteria:

1. Culture negative patients
2. Patients who did not wish to partake in the study

Statistical Analysis:

Descriptive and inferential statistical methods were used. All the entries were double-checked for any possible error. Descriptive statistics were reported as mean ± standard deviation. Categorical variables are reported as percentages. Chi-square test will be used to analyze group differences for categorical data. The data was managed using statistical software SPSS, version 29. (IBM Inc. Chicago IL, USA) and Microsoft Excel 2021 (Microsoft Corp, Redmond, WA). A probability of <0.05 was accepted as significant.

III. Result

Among study population, 59.3% patients were in age group of 61 to 70 year, 30.4% were in 71 to 80-year group and 10.1% patients were above age of 80 years. Male and female formed 66.4% and 33.6% of study population respectively.

Table no.1 shows, in our study population, Burning Micturition was seen in (79.6%) patients followed by Urgency (67.1%), Increased Frequency of Micturition (55.4%), Fever (52.3%), Pain Abdomen (46.0%), Loin tenderness & Backache (35.9%), Reduced urine output (29.6%), Hematuria (22.6%), Pyuria(14%) of study population.

Table no 1: Clinical Presentation of UTI in Elderly.

Clinical Presentation	No. of Patients	Percentage
Burning Micturition	102	79.6%
Urgency	86	67.1%
Increased Frequency of Micturition	71	55.4%
Fever	67	52.3%
Pain Abdomen	59	46.0%
Loin Tenderness & Backache	46	35.9%
Reduced Urine output	38	29.6%
Hematuria	29	22.6%
Pyuria	18	14.0%

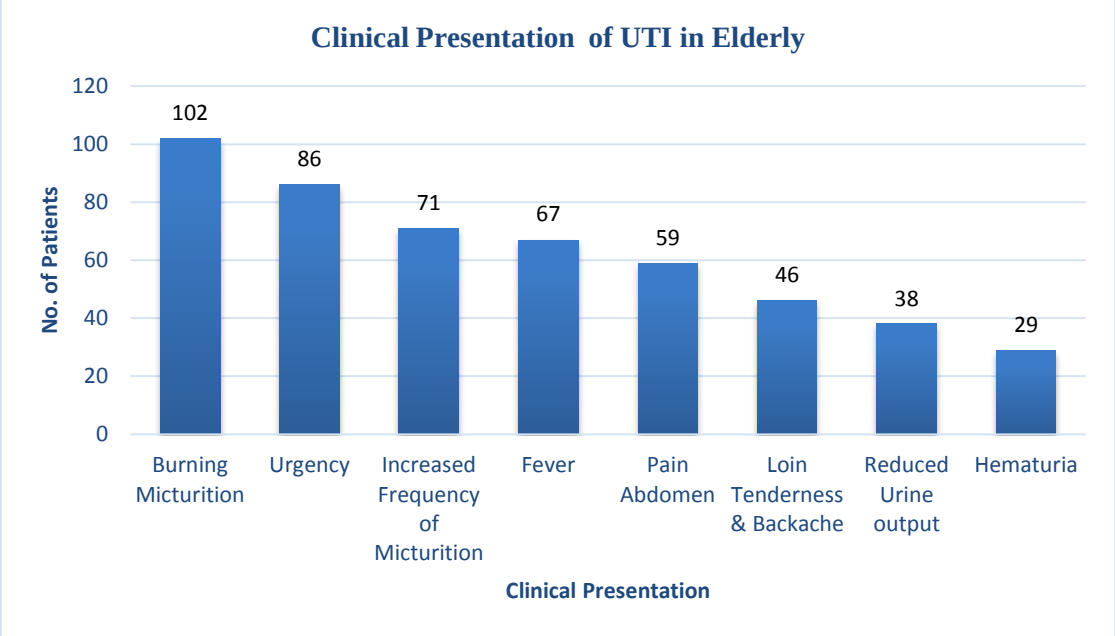

Table no.2 shows Association between Predisposing factors & UTI in elderly, Diabetes mellitus was predisposing factor associated with UTI seen in (63.3%) patients followed by benign prostatic hyperplasia (28.3%) among males and chronic kidney disease (21.6%) of the study population (Table 2).

Table no 2: Association between Predisposing factors & UTI in Elderly.

Predisposing Factors	No. of Patients	Percentage
Diabetes Mellitus	88	68.75%
Benign Prostatic Hyperplasia	47	36.71&
Catheter Associated	34	26.56%
Urinary Calculus	28	21.87%
Cerebrovascular Accident (CVA)	13	10.15%
Associated with other infections	09	07.03%
Immunocompromised State	03	02.34%

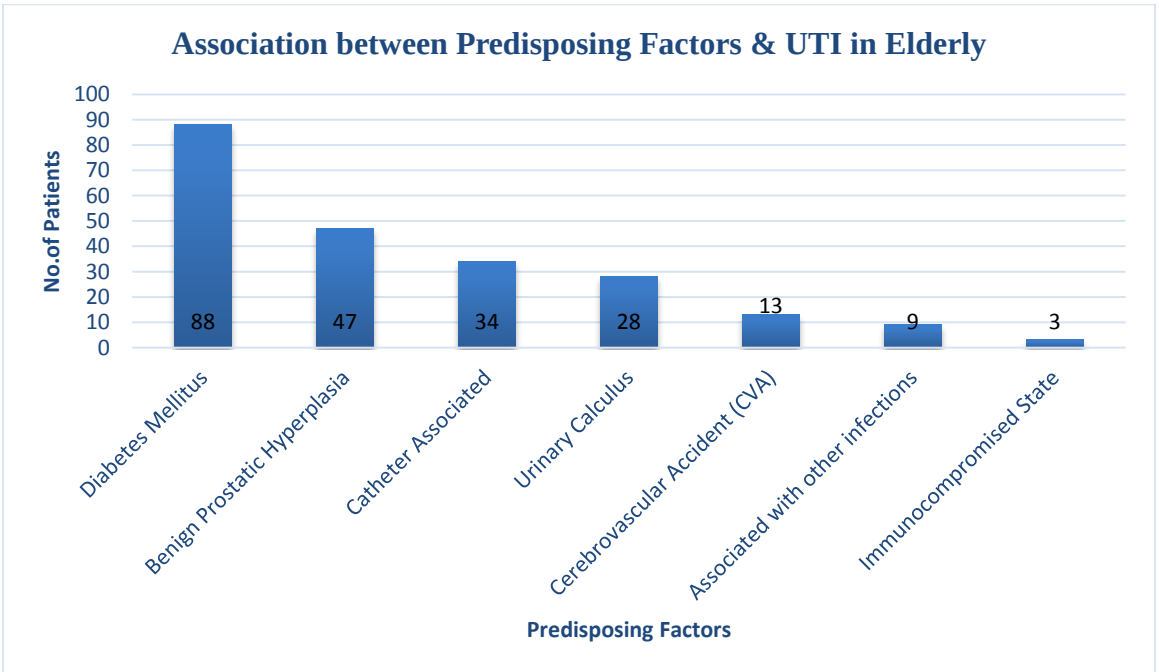

Table no.3 shows growth of gram-negative organisms in 85 (66.40%) patients and gram-positive organism in 17 (13.28%) patients and a positive Candida species growth in 26 (20.31%) of the patients respectively in urine culture in the study population. E. coli was isolated from urine culture in 43 (33.59%) patients followed by Klebsiella group 31 (24.21%), Candida group 26 (08.59%), Enterococcus group 11 (08.59%), Staph. Aureus 06 (04.68%), Pseudomonas group 05 (03.90%), Proteus group 03 (02.34%), Acinetobacter 02 (01.56%), Citrobacter 01 (0.78%) in urine culture in the study population.

Table no 3: Organisms Growth in Urine Culture of the Patients

Organisms	No. of Cultures Growth seen	Percentage
Escherichia Coli	43	33.59%
Klebsiella	31	24.21%
Candida	26	20.31%
Enterococcus	11	08.59%
Staphylococcus aureus	6	04.68%
Pseudomonas	5	03.90%
Proteus	3	02.34%
Acinetobacter	2	01.56%
Citrobacter	1	0.78%

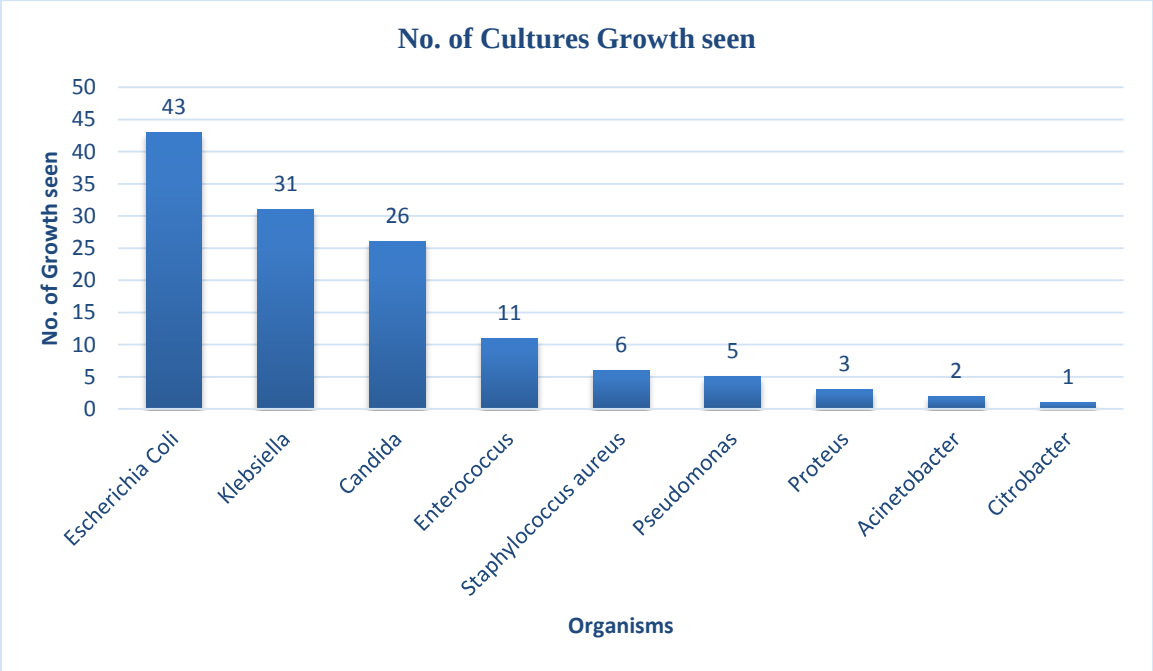

Table no 5: E. coli isolates were sensitive to Imipenem (95.34%) followed by Meropenem (90.69%) followed by Piperacillin+tazobactam (86.04%) respectively. Organisms were least susceptible to Cefaperazone and Amoxicillin – Clavulanic acid.

Table no 5 : Antibiotics Sensitivity to E.coli

Antibiotics	No. of Sensitivity to E.coli	Percentage
Imipenem	41	95.34%
Meropenem	39	90.69%
Piperacillin – Tazobactam	37	86.04%
Amikacin	34	79.06%
Ampicillin	32	74.41%
Cotrimoxazole	30	69.76%
Nitrofurantoin	29	67.44%
Cefazolin	26	60.46%
Cefataxime	25	58.13%
Norfloxacin	24	55.81%
Ceftriaxone	20	46.51%
Ciprofloxacin	16	37.20%
Cefaperazone	10	23.25%
Amoxicillin – Clavulanic acid	03	06.97%

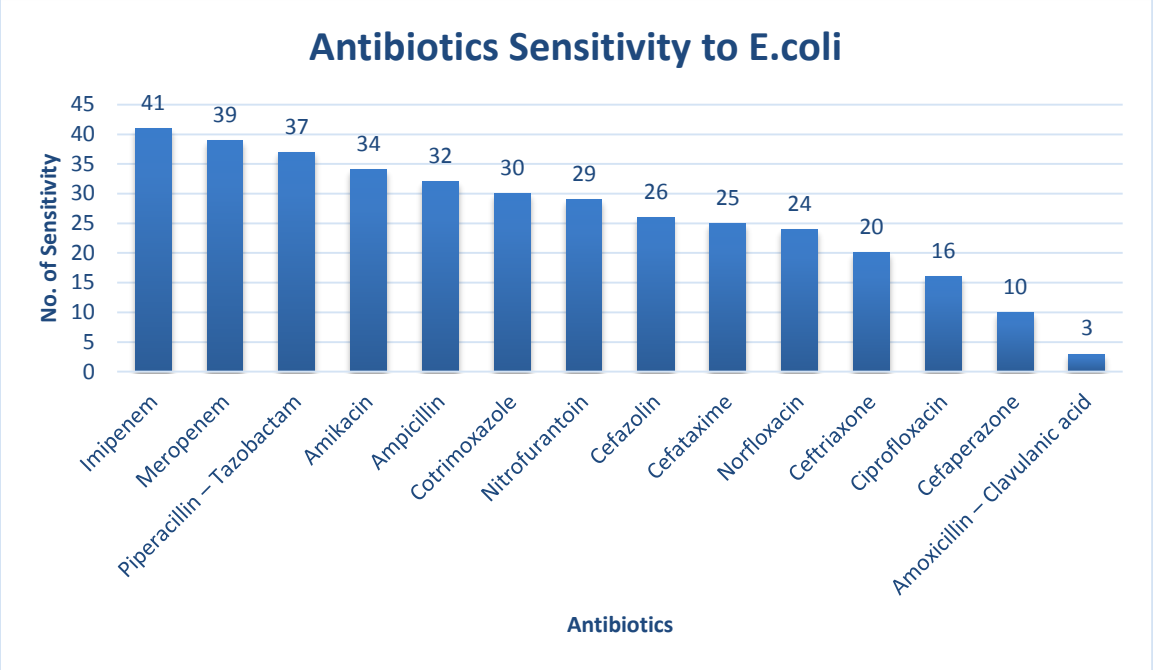

Table no.6 shows that 30 (23.43%) elderly patients with UTI died during hospitalization and 98 (76.56%) patients from study population were discharged. There was no significant difference in mortality between men and women and in different age groups.

Table no. 5: Outcomes of Elderly patients with UTI

Outcome	No. of Patients
Discharged	98
Died	30

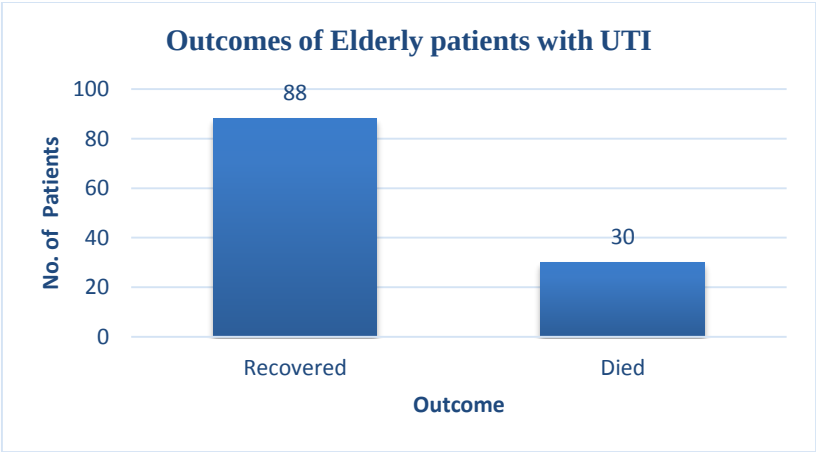

Table no.7 shows that there is no statistically significant association between diabetes status and mortality (since $p > 0.05$). The difference in mortality rates between patients with and without diabetes could be due to chance.

Table no 7: Association between Outcomes in Elderly UTI with Diabetes**.**

Diabetes Mellitus	No. of Deaths/ No. of Patients	Mortality (%)	Level of Significance
Yes	30/88	34.09%	0.159
No	08/40	20.00%	

Table no.8 shows that There is a highly statistically significant association between the type of UTI (complicated vs. uncomplicated) and mortality (since p value is 3.48×10^{-10} i.e., < 0.05). The difference in mortality rates is very unlikely to be due to chance, indicating that patients with complicated UTIs have a significantly higher mortality rate.

Table no 8: Association between Outcomes in Elderly UTI with Type of UTI**.**

Type of UTI	No. of Deaths/ No. of Patients	Mortality (%)	Level of Significance
Complicated UTI	31/51	60.78%	< 0.05
Uncomplicated UTI	06/77	07.79%	

Table no.9 shows that there is a highly statistically significant association between the use of urethral catheters and mortality (since p value is 5.89×10^{-8} i.e., < 0.05). The difference in mortality rates between patients with and without urethral catheters is very unlikely to be due to chance, indicating that the use of urethral catheters is associated with a significantly higher mortality rate.

Table no 9: Association between Outcomes in Elderly UTI with Use of Urethral Catheters**.**

Use of Urethral Catheters	No. of Deaths/ No. of Patients	Mortality (%)	Level of Significance
Present	04/30	13.33%	< 0.05
Absent	26/30	86.66%	

Table no.10 shows that there is a statistically significant association between the number of predisposing factors and mortality (since p value is 0.0045 i.e., < 0.05). The difference in mortality rates based on the number of predisposing factors is unlikely to be due to chance, indicating that more predisposing factors are associated with higher mortality.

Table no 10: Association between Outcomes in Elderly UTI with No. of Predisposing factors**.**

No. of Predisposing factors	No. of Deaths/ No. of Patients	Mortality (%)	Level of Significance
0-1	04/30	13.33%	0.0045
2-3	10/30	33.33%	
>3	16/30	53.33%	

Table no.11 shows that there is a highly statistically significant association between leucocyte count (>11,000 vs. <11,000 cells/cumm) and mortality (since p value is 5.89×10^{-8} i.e., < 0.05). The difference in mortality rates based on leucocyte count is very unlikely to be due to chance, indicating that higher leucocyte counts are associated with a significantly higher mortality rate.

Table no 11: Association between Outcomes in Elderly UTI with Leucocyte count**.**

Leucocyte Count	No. of Deaths/ No. of Patients	Mortality (%)	Level of Significance
>11,000 cells/cumm	26/30	86.66%	< 0.05
<11,000 cells/cumm	04/30	13.33%	

IV. Discussion

UTIs can involve any part of the urinary system, including the kidneys, ureters, bladder, and urethra, but they are most frequently associated with lower urinary tract infections, such as cystitis, and upper urinary tract infections, such as pyelonephritis [8].Most infections of the urinary tract are not complicated. UTIs are considered complicated when patients suffer from functional, metabolic, or structural problems [9]. UTIs, which can range from mild cystitis to potentially fatal pyelonephritis, are a significant cause of morbidity and sepsis in older people [10].

Our study populations included a total number of 128 patients aged above 60 years suffering from Urinary tract infection. The mean age of presentation was 68.7±8.47 years of which males were 66.4% and females 33.6% respectively.

In present study, lower urinary tract symptoms were more common with burning micturition being the most common symptom followed by urgency, and increased frequency of micturation which may be attributed to more number of cases suffering from diabetes mellitus and obstructive uropathy like Benign prostate hyperplasia in our study population. Comparing with study by Mahesh E et al., Fever was the most frequent symptom, followed by dysuria [11]. Our study had fever in fourth place this is because the elderly population experiences a reduced fever response due to their physiologically lower basal body temperature [12].

Diabetes mellitus was the most common predisposing factor in our study found in 68.75% cases followed by benign prostatic hyperplasia in male patients (36.71%). Diabetes patients are more likely to get infections, with urinary tract infections being the most common type [13]. Increased risk of UTI is directly correlated with longer duration and more severe diabetes, which leads to neutrophil dysfunction, diapedesis, and phagocytosis [14].

The most common pathogenic organisms observed in our study was gram-negative organisms and was similar when compared to the other studies. Gram negative pathogens were responsible for urinary tract infection in our study group in 66.40% of the patients with E. coli being the most common (33.59%) followed by other gram negative organisms isolated in urine culture being Klebsiella, Pseudomonas, Proteus, Acinetobacter and Citrobacter group.

Enterococcus and Staphylococcus aureus were the gram-positive pathogenic isolates in the urine culture with Enterococcus being the fourth most common isolate in our study group (08.59%). In a study by Bagshaw et al, recorded enterococci as the third most frequent uropathogen in intensive care unit-acquired urinary tract infection after E. coli and Pseudomonas aeruginosa [15].In the last few years, enterococcal infections have become frequent occurrences in hospital settings. Currently they are an important cause of nosocomial infections with increasingly common isolates that are resistant to multiple antibiotics [16, 17].

A Study done by Ramaprasad AV et al, in India showed effectiveness of quinolones like ciprofloxacin against E. coli [18]. In contrast to it, our study showed E. coli were highly sensitive to carbepenems like imipenem and meropenem; and they were least sensitive to Amoxicillin- clavulanic acid & cephalosporin group thus showing resistance to higher antibiotics which is pointing towards emergence of drug resistance.

In our study, Candida group contributed (20.31%) for urinary tract infection in elderly. It is becoming a more significant subset of nosocomial UTIs, of which Candida spp. are nearly always the cause [19].

Our study had use of Urethral Catheters, complicated UTI, Increased number of predisposing factors as a risk factor for mortality and were considered statistically important. Early diagnosis, prompt therapy, regular monitoring, Aseptic precautions during catheterization are key factors for improved outcomes in these patients.

Elderly individuals who have UTIs are at high risk of developing sepsis or septic shock, so treating clinicians should monitor these patients closely. Patients at high risk need to receive the highest level of care and management since they have the potential to develop acute kidney injury as a result of urosepsis. There was a discernible difference in the outcomes of UTI patients based on leucocyte counts, which are a need for sepsis, and the existence of an upper UTI in our investigation.

The study's greatest strength were observational design of this retrospective study, the data collection in our tertiary hospital to track changes in the trend of uropathogens and antibiotic resistance in order to analyze the data for future management and prudent antibiotic use for our hospital's patients.

The study's limitations included its single site design, limited sample size, non-generalizable results, and failure to identify the source of the infection, decrease in culture positivity rate because of we being tertiary care referral Hospital most Patients with UTI were partially treated. Those with symptoms of UTI but no growth on urine culture were not included in this study. Further studies are required to evaluate these factors.

Management of UTIs in the elderly requires a tailored approach, taking into consideration the risk of antibiotic resistance, potential side effects of treatment, and the importance of avoiding overtreatment, particularly in cases of asymptomatic bacteriuria [20]. Recent guidelines emphasize the need for judicious use of antibiotics and the importance of individualized care plans to optimize outcomes and minimize adverse effects [21].

V. Conclusion

Elderly urinary tract infections are related with higher rates of morbidity and mortality in the population; the severity of the infection is mostly determined by the coexisting conditions. Early diagnosis, aggressive treatment and adequate antibiotic therapy will aid in the prevention of antibiotic resistance as well as the reduction of total geriatric population mortality. Given the significant impact of UTIs on the elderly population, a comprehensive understanding of the epidemiology, risk factors, clinical presentation, and management strategies is essential for healthcare providers.

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