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Original Research Article

Urinary tract infection in elderly: clinical profile and outcome study done at Kempegowda Institute of Medical Science and Hospital, Bengaluru, India

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ABSTRACT

Background: Urinary tract infection (UTI) being the most common bacterial infection with considerable morbidity and mortality. In hospitalized geriatric patients, the risk is more attributable to differing characteristics such as anatomical and hormonal changes, presence of comorbidities such as neurological and urological abnormalities, diabetes mellitus and prolonged indwelling catheter use in hospitals and long-term care facilities.
Methods: A retrospective study of patients admitted to medicine wards of age above 60 years with symptoms of urinary tract infection and positive urine culture spanning over a year were included. Demographic profile, clinical features, predisposing factors, laboratory features, urine culture reports, antimicrobial susceptibility patterns and outcome were noted and analysed.
Results: Of the 120 patients included in our study, 58.2% were males and 41.8% were females. Dysuria was the most common major symptom (77.5%). Diabetes mellitus was the most common Predisposing factor observed in (63.3%) of the patients. Gram negative organism were responsible for (68.27%) of the uropathogen profile; Escherichia coli was the commonest isolate (31.66%) seen. Mortality rate was 29.16%. Significantly higher mortality was seen in patients with diabetes mellitus ($p<0.001$), complicated UTI ($p<0.001$), serum creatinine >1.4mg/dl ($p<0.001$) and increasing number of predisposing factors. Mortality was also associated with higher leucocyte count in the study population.
Conclusions: Urinary tract infection in elderly increases the population mortality and morbidity; and the co morbid factors associated play a key role in the severity of the infection. Early management and appropriate antibiotic therapy will help in preventing antibiotic resistance and also in decreasing the overall geriatric population fatality.

Keywords: Antibiotic use, Diabetes mellitus, Elderly, Urinary tract infection

INTRODUCTION

Urinary tract infections (UTIs) are the most common infectious problem among older adults both in the community and institutional settings.[1] A considerable difference from typical clinical presentation of UTI marked by absent or reduced fever, change in mental status and nonspecific symptoms such as anorexia and increased lethargy is seen in elderly population.[2] In noninstitutionalized elderly populations, UTIs are the second most common form of infection, accounting for nearly 25% of all infections.[3]

In elderly populations, there are concerns about increasing antimicrobial resistance in infecting organisms. The increased likelihood of resistant bacteria makes it essential that a urine specimen for culture and susceptibility testing be obtained before instituting antimicrobial therapy.[4]

Urinary tract infection in the elderly accounts for both complicated and uncomplicated Urinary tract infection of which; complicated with structural abnormalities account for a majority.

Diabetes mellitus and its long-term complications is a major co morbid factor which increases the mortality and morbidity in urosepsis patients in elderly. Strict glycaemic control and monitoring is required to curb the severe extent of spectrum of urinary tract infection.

METHODS

This was a retrospective observational study done in the department of Medicine and Microbiology at Kempegowda institute of medical sciences and hospital, Bengaluru conducted over a period of one year.

After obtaining approval from Institutional ethics committee and written informed consent from participants, 95 indoor patients from medicine wards of age 60 years and above having symptoms of UTI and urine culture showing significant growth were included in the study. Patients with negative urine culture, not willing to participate in the study were excluded.

Data including age, sex, occupation, predisposing factors and clinical profile was taken using detailed history of symptoms like dysuria, fever with chills, urgency, pyuria, haematuria, frequency, backache, pain in abdomen, loin tenderness, decreased frequency of micturition and clinical examination was done.

Patients were observed with respect to anatomical location of infection site, uncomplicated UTI manifesting as cystitis, complicated UTI in individuals with functional or structural abnormalities of the genitourinary tract, causative organism and susceptibility to various antibiotics till estimated outcome either discharge or death. The laboratory tests included complete blood picture, renal and liver function test and urine microscopy including culture/sensitivity, ultrasonography kidney ureter bladder (KUB), computerized tomography KUB if required.

Descriptive and inferential statistical methods were used. Data were analysed using Microsoft excel 2013. A probability of <0.05 was accepted as significant.

RESULTS

Among study population, 55.83% patients were in age group of 61 to 70 year, 30.8% were in 71 to 80-year group and 13.3% patients were above age of 80 years.

Male and female formed 58.2% and 41.8% of study population respectively. Male to female ratio being 1.5:1,1.3:1, 1.25:1 among age group of 61 to 70 years, 71 to 80 years and age more than 80 years respectively. In our study population, burning micturation was seen in (77.5%) patients followed by urgency (65.8%) and Increased frequency of micturition (52.5%). Fever was present 49.1% of study population (Table 1).

Table 1: Symptoms of UTI in elderly.

Symptoms/signs of UTI	Number of patients	Percentage
Burning micturation	93	77.5%
Urgency	79	65.8%
Frequency of micturation	63	52.5%
Fever	59	49.1%
Pain in abdomen	46	38.3%
Loin tenderness	30	26.6%
Backache	28	23.3%
Haematuria	19	15.8%
Reduced urine output	14	11.6%
Pyuria	12	10.0%

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 2: Association of predisposing factors.

Predisposing factors	Number of patients	%
Diabetes Mellitus	76	63.3%
Benign prostate hyperplasia	34	28.3%
Chronic kidney disease	25	21.6%
Cerebrovascular accident	17	14.1%
Cathether associated	14	11.6%
Urinary calculus	11	9.1%
Associated with other infection	09	7.5%
Immunocompromised state	04	3.3%
Alzheimer's disease/dementia	02	1.6%

Urine culture in the study population showed a growth of gram-negative organisms in 82 (68.27%) patients and gram-positive organism in 28 (23.4%) patients. And a positive *Candida* species growth in 10 (8.33%) of the patients respectively.

E. coli was isolated from urine culture in 38 (31.66%) patients followed by *Klebsiella* group 29 (24.15%) followed by *Enterococcus* group 22 (18.33%) (Figure 1).

E. coli isolates were sensitive to imipenem (94.73%) followed by meropenem (89.47%) followed by piperacillin+tazobactam (81.57%) (Table 3). *Klebsiella* group isolates were sensitive to imipenem (89.65%) followed by meropenem (82.75%) followed by amikacin (75.86%) (Table 3). Organisms were least susceptible to ceftriaxone followed by cefeperazone (Table 3).

Death occurred in 35 (29.16%) patients and 85 (70.83%) patients from study population were discharged. 35

(29.16%) of the 120 patients with UTI died during hospitalization (Table 4). There was no significant difference in mortality between men and women and in different age groups.

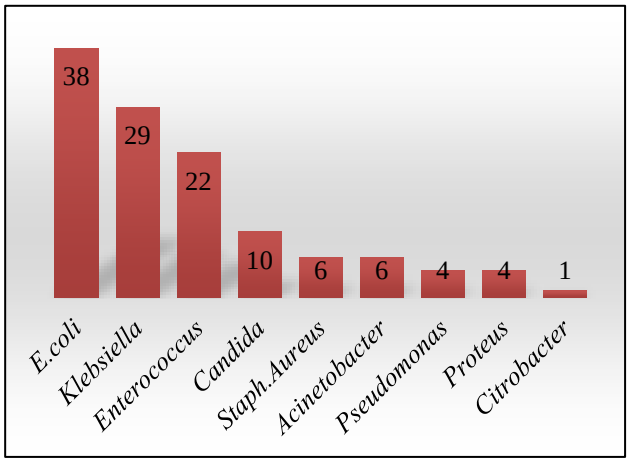

Figure 1: Organism growth.

Table 3: Comparison of antimicrobial susceptibility.

Antimicrobial	*E. coli* (n=38)	*Klebsiella* (n=29)
Imipenem	36(94.73%)	26(89.65%)
Meropenem	34(89.47%)	24(82.75%)
Piperacillin/tazobactum	31(81.57%)	17(58.62%)
Amikacin	29(76.31%)	22(75.86%)
Nitrofurontoin	27(71.05%)	13(44.82%)
Levofloxacin	27(71.05%)	12(31.37%)
Gentamicin	26(68.42%)	09(31.03%)
Ofloxacin	20(52/63%)	ND
Norfloxacin	16(42.10%)	ND
Ceftriaxone/tazobactum	12(31.57%)	05(17.24%)
Tetracycline	09(23.68%)	ND
Ciprofloxcin	07(18.42%)	ND
Cefaperazone/tazobactum	07(18.42%)	03(10.34%)
Amoxicillin/clavunic acid	02(5.26%)	ND

Significantly higher mortality was seen in patients with diabetes mellitus compared with patients without diabetes mellitus (34.21% versus 20.45%; p<0.001). Complicated UTI patients had higher mortality compared with uncomplicated UTI (28.88% versus 8%; p<0.001). Compromised renal function with serum creatinine >1.4 mg/dl was significantly associated with mortality: 56.89% (32/58) of these patients died compared to 8.06% (5/62) in patients with preserved renal function (p<0.001).

Mortality was significantly related to the number of predisposing factors, with mortality rates of 34.28% (12/35) in patients with 0-1 predisposing factor, 51.42% (18/35) in those with 2-3 factors and 14.28% (5/35) in those with three and more predisposing factors (Table 4). Mortality was not significantly related to the use of urethral catheters, with mortality rates of 14.28% in patients with urethral catheters compared with those 85.71% patients not having urethral catheters. Also, there was no significantly higher incidence of death in patients with neutrophilia (leucocyte count ≥11,000 cells/dl), compared to patients with normal leucocyte count (88.57% compared to 11.42%) (Table 4).

Table 4: Outcome of UTI in elderly.

Characteristic	Number of deaths/ Number of patients	Mortality (%)	Level of significance
Diabetes mellitus			
Yes	26/76	34.21%	<0.001
No	09/44	20.45%	
Type of UTI			
Complicated	29/48	60.41%	<0.001
Uncomplicated	06/72	08.33%	
Renal function: serum creatinine			
>1.4 mg/dl	32/58	56.89%	<0.0001
<1.4 mg/dl	05/62	08.06%	
Number of predisposing factors			
0-1	12/35	34.28%	<0.001
2-3	18/35	51.42%	
3+	05/35	14.28%	
Use of urethral catheters			
Present	05/35	14.28%	0.457
Absent	30/35	85.71%	
Leucocyte count			
≥11,000cells/dl	31/35	88.57%	0.296
<11,000 cells/dl	04/35	11.42%	

DISCUSSION

The majority of Urinary tract infections are uncomplicated infections. UTIs are considered complicated when patients have functional, metabolic, or structural abnormalities.[5] UTI is an important cause of morbidity and sepsis in elderly patients having a spectrum varying from benign cystitis to potentially life threatening pyelonephritis.[6] Our study populations included a total number of 120 patients aged above 60 years suffering from Urinary tract infection. The mean age of presentation was 69.4±7.37years and there was no considerable difference in gender distribution in our study group.

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. In study conducted by Mahesh E et al, fever was the most common symptom followed by dysuria.[7] In Elderly population, there is a physiological

lower basal body temperature and hence, there is a dampened fever response.[8]

Diabetes mellitus was the most common predisposing factor in this study found in 63.3% cases followed by benign prostatic hyperplasia in male patients (23.8%). Patients with diabetes have an increased risk of infections with the urinary tract being the most prevalent infection site.[9] Longer duration and greater severity of diabetes significantly increases chances of occurrence of UTI by causing neutrophil dysfunction, diapedesis and phagocytosis.[10]

In patients with chronic renal insufficiency, the risk might be increased by disease factors (papillary necrosis, nephrolithiasis, neurogenic bladder) and the management of comorbidities with Foley catheters and intravenous lines.[11]

However, prevalence of dementia and urinary catheterization was higher in study by Tal S et al, which could be attributed to high mean age at presentation.[12] 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 68.27% of the patients with *E. coli* being the most common (31.93%) followed by other 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 third most common isolate in our study group (18.33%). 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*.[13] 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.[14,15]

Our antibiotic sensitivity pattern included cephalosporins, penicillins, aminoglycosides, fluroquinolones and others. In our study, *E. coli* were highly sensitive to carbepenems like imipenem and meropenem; and they were least sensitive to cephalosporin group thus showing resistance to higher antibiotics. Study done by Ramaprasad AV et al, in India showed effectiveness of quinolones like ciprofloxacin against *E. coli* which was in contrast to our study thus pointing towards emergence of drug resistance.[16]

Other gram negative isolate from our study group, *Klebsiella*, *Proteus* and *Acinetobacter* group showed less sensitivity to piperacillin+tazobactum, levofloxacin, amikacin and other cephalosporins showing shifting trend in resistance to higher antibiotics. Irrational and inappropriate use of antibiotics for prophylaxis as well as treatment, excessive use of indwelling urinary catheters, nosocomial sources of infections might be responsible for emergence of drug resistant organisms.

In our study, *Candida* group contributed (08.33%) for urinary tract infection in elderly. It is increasingly becoming an important subgroup of nosocomial urinary tract infections and almost all are caused by *Candida* spp.[17]

Diabetes mellitus was the most common underlying disease noted in almost every study of candiduria and predisposes to *Candida* colonization of the vulvo-vestibular area in women by enhancing urinary fungal growth in the presence of glycosuria, by lowering host resistance to invasion by *Candida* spp. as a consequence of impaired phagocyte activity, and promoting stasis of urine in a neurogenic bladder with more likelihood to undergo urinary tract instrumentation and to receive antibiotics.[18,19]

The outcome of our study was noted by patients either getting discharged or by death. Present retrospective study of 120 elderly patients panned over a year admitted as inpatients in medicine wards showed low mortality rates (29.16%).

Our study had diabetes mellitus, complicated UTI as a risk factor for mortality and were considered statistically important. Complicated UTIs in diabetics include renal and perirenal abscess, emphysematous pyelonephritis, emphysematous cystitis, fungal infections, and papillary necrosis.[20] Early diagnosis, prompt therapy, regular monitoring of blood sugar levels are key factors for improved outcomes in these patients.

Higher mortality was also seen in Study group having higher creatinine >1.4mg/dl. UTI may cause sepsis or septic shock in elderly patients, so treating physicians should give utmost attention to these patients. There is the risk of developing Acute Kidney injury secondary to Urosepsis and utmost care and management must be given to high risk patients. Outcome of patients of UTI based on leucocyte counts which is a criteria for sepsis and presence of upper UTI showed no significant difference in our study.

The strength of this study was the observational pattern of this retrospective study, no interventions and collection of a data in our tertiary hospital to observe the change in the uropathogen trend and Antibiotic resistance so as to calculate the data in further management and judicious use of antibiotics for the patients attending our hospital.

The limitations of the study were single center study, non-generalizable results, small duration, non-assessment of source of UTI whether community or hospital acquired were the limitations of our study. Patients with partially treated UTI, those with symptoms of UTI but no growth

on urine culture, urine cultures showing fungal growth were not included in the study. Further studies are required to evaluate these factors.

CONCLUSION

In conclusion, this study focused on epidemiology, risk factors, clinical features and especially on outcome of UTI in elderly patients. Diabetes mellitus continues to be a major risk factor for UTI in elderly. And judicious and imperative antibiotic use is necessary for preventing further resistance in the population.

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