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A Cross-Sectional Assessment of Urinary Tract Infections Among Geriatric Patients: Prevalence, Medication Regimen Complexity, and Factors Associated With Treatment Outcomes

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A Cross-Sectional Assessment of Urinary Tract Infections Among Geriatric Patients: Prevalence, Medication Regimen Complexity, and Factors Associated With Treatment Outcomes

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Abstract

- **Background:** Urinary tract infections (UTIs) are the second most prevalent infection among the elderly population. Hence, the current study aimed to evaluate the prevalence of UTIs among older adults, medication regimen complexity, and the factors associated with the treatment outcomes of elderly patients infected with UTIs.
- **Methods:** A retrospective cross-sectional study was conducted at the Department of Urology, Hospital Pulau Pinang, Malaysia. The patients ≥65 years of age were included in the present study with a confirmed diagnosis of UTIs from 2014 to 2018 (5 years).
- **Results:** A total of 460 patients met the inclusion criteria and were included in the present study. Cystitis (37.6%) was the most prevalent UTI among the study population followed by asymptomatic bacteriuria (ASB) (31.9%), pyelonephritis (13.9%), urosepsis (10.2%), and prostatitis (6.4%). Unasyn (ampicillin and sulbactam) was used to treat the UTIs followed by Bactrim (trimethoprim/sulfamethoxazole), and ciprofloxacin. The factors associated with the treatment outcomes of UTIs were gender (odd ratio [*OR*] = 1.628; $p = 0.018$), polypharmacy ($OR = 0.647$; $p = 0.033$), and presence of other comorbidities ($OR = 2.004$; $p = 0.002$) among the study population.
- **Conclusion:** Cystitis is the most common UTI observed in older adults. Gender, the burden of polypharmacy, and the presence of comorbidities are the factors that directly affect the treatment outcomes of UTIs among the study population.

Introduction

- Urinary tract infections (UTIs) are the most common type of infection among the elderly population around the world and the most common cause of hospitalization due to bacterial infections
- Approximately 7 million hospital visits, 1 million emergency visits, and 100,000 hospitalizations are due to UTIs / Approximately, the overall incidence of UTIs among older men and women ranges in one infection per 14–20 persons-years
- The treatment and diagnosis of UTIs are more difficult among the elderly population as compared with the younger individuals because of many underlying risk factors, such as older age, spinal cord injuries, diabetes mellitus, impaired immune conditions, and most importantly catheterization

Introduction

- Older adults are more prone to UTIs as compared with young individuals due to the high rates of urinary retention, urinary incontinence, long-term hospitalizations, presence of comorbidities, accompanying urinary catheterizations, and declining immune responses
- Modifiable risk factors of UTIs among older people include urinary tract abnormalities, particularly in those with urinary retention or incontinence (e.g., prostatic hyperplasia), diabetes mellitus, urinary catheterization, and sexual intercourse, which is the major risk factor for both men and women in older age
- In a study on postmenopausal women, the incidence of UTI has been reported as 0.07 per person-year and 0.12 per person-year in women with uncontrolled diabetes mellitus. The incidence of UTI significantly increases in both men and women aged more than 85 years.

Introduction

- Polypharmacy is the major risk factor for overactive bladder syndrome in older adults. “Overactive bladder syndrome” is the complex of symptoms that include the sudden need to urinate with the fear of involuntary leakage, nocturia, leakage of urine prior to urine intention, and frequency
- The clinical presentation of UTIs among older adults leads to complexity in the diagnosis due to localized urinary symptoms. The increased prevalence of asymptomatic bacteriuria (ASB) among the elderly population may lead to more difficulty in the diagnosis of UTIs.
- In primary and secondary care, empirical antibiotics are prescribed for a suspected UTI, in which more than 50% of the prescribed antibiotics are considered unnecessary among elderly patients. To reduce the threat of antibiotic resistance to public health, antibiotic stewardship programs and national guidelines for the rational use of antibiotics have been adapted to control this situation

Methods

- a retrospective cross-sectional study at the urology department of a tertiary care public hospital
- all the medical records of older adults from January 2014 to December 2018 (5 years) were evaluated by using a convenience sampling technique. The inclusion criteria of the participants were:

- Patients aged ≥ 65 years, with complete medical and clinical information in the record, should have a UTI episode confirmed by the physician.

- Patients <65 years of age, incomplete records, and no information on UTI episodes were excluded from the study.

Results

- 460 participants were included, of which women 279 (60.7%) were in the majority as compared with men 181 (39.3%) with a mean age of 72 ± 4 years
- Most of the study participants, 342 (74.3%), were in the age range of 65–75 years of age, and 118 (25.7%) were above 75 years. The majority of the included population was married, 256 (55.7%), Chinese 271 (58.9%), non-smokers 312 (67.8%), and non-alcoholic 318 (69.1%)

Characteristics	*N* (%)	Treatment outcomes		*p*-value
		Improved	Not improved	
Gender				**0.017***
Male	181 (39.3)	114 (24.8)	67 (14.6)	
Female	279 (60.7)	205 (44.6)	74 (16.1)	
Age (years)				
65–75	342 (74.3)	246 (53.5)	96 (20.9)	**0.041***
>75	118 (25.7)	73 (15.9)	45 (9.8)	
Marital status				
Single	22 (4.8)	12 (2.6)	10 (2.2)	
Married	256 (55.7)	186 (40.4)	70 (15.2)	0.081
Divorced	47 (10.2)	27 (5.9)	20 (4.3)	
Widow	135 (29.3)	94 (20.4)	41 (8.9)	
Race				
Malay	127 (27.6)	93 (20.2)	34 (7.4)	
Chinese	271 (58.9)	185 (40.2)	86 (18.7)	0.509
Indian	62 (13.5)	41 (8.9)	21 (4.6)	
Home				
Own Home	428 (93.0)	296 (64.3)	132 (28.7)	0.748
Nursing home	32 (7.0)	23 (5.0)	9 (2.0)	
Smoking				
Smoker	148 (32.2)	107 (23.3)	41 (8.9)	0.345
Non-smoker	312 (67.8)	212 (46.1)	100 (21.7)	
Alcohol				
Alcoholic	142 (30.9)	95 (20.7)	47 (10.2)	0.447
Non-alcoholic	318 (69.1)	224 (48.7)	94 (20.4)	
Polypharmacy (number of medications)				
≤5	188 (40.9)	120 (26.1)	68 (14.8)	**0.033***
>5	272 (59.1)	199 (43.3)	73 (15.9)	
Co-morbidities				
Yes	336 (73.0)	247 (53.7)	89 (19.3)	**<0.001***
No	124 (27.0)	72 (15.7)	52 (11.3)	

**Using chi-square. $p < 0.05$.*

Prevalence of UTIs Among the Study Population

Urinary tract infections	*N* (%)	Co-morbidities	*N* (%)
Cystitis	173 (37.6)	Diabetes mellitus	198 (43.1)
Asymptomatic bacteriuria	147 (31.9)	Hypertension	156 (33.9)
Pyelonephritis	64 (13.9)	Dyslipidaemia	113 (24.5)
Urosepsis	47 (10.2)	Ischemic heart disease	59 (12.8)
Prostatitis	29 (6.4)	Chronic kidney disease	48 (10.4)

The most commonly used antibiotics in UTIs

Oral medications	*N* (%)
Unasyn (Ampicillin and Sulbactam)	263 (57.1)
Bactrim (Trimethoprim/sulfamethoxazole)	143 (31)
Ciprofloxacin	25 (5.4)
Levofloxacin	17 (3.7)
Cloxacillin	12 (2.6)
Hytrin (Terazosin)	390 (84.8)

Medication Regimen Complexity

- The number of prescribed medications ranges from 1 to 20, with a mean value of 5 medicines per patient included in the current study. Over 59.1% of the included participants are taking more than five medicines simultaneously, which leads to the high burden of polypharmacy. The total MRCI score for the study population ranged from 5 to 27 per patient, with a median of 14

MRCI total score	Mean (SD)	Minimum	Maximum
MRCI section A score	5.85 (2.937)	1	20
MRCI section B score	7.47 (2.890)	2	17
MRCI section C score	0.74 (0.802)	0	4
MRCI total score	14.04 (4.146)	5	27

Section A: Number of medications prescribed; Section B: Frequency of prescribed medicines; Section C: Additional instructions of prescribed medicines.

Factors Associated With the Treatment Outcomes of UTIs Among the Elderly Population

- The different associated factors involved in the treatment outcomes of UTIs among the elderly population have been predicted by using binary logistic regression analysis.
- Gender, marital status, age, race, smoking status, alcohol consumption, polypharmacy, and presence of co-morbidities are the factors that are analyzed to predict their association with the treatment outcomes of UTIs among the study population.
- Four (gender [*OR* = 1.628; *p* = 0.018], age [*OR* = 1.580; *p* = 0.042], polypharmacy [*OR* = 1.647; *p* = 0.033], and the presence of co-morbidities [OR = 2.004; *p* = 0.002]) of them show statistically significant association with the treatment outcomes in binary logistic regression

		Binary logistic regression				Multiple logistic regression			
				95% CI				95% CI	
Variables	***N* (%)**	**Odd ratio**	***p*-value**	**Lower**	**Upper**	**Odd ratio**	***p*-value**	**Lower**	**Upper**
Gender									
Male	181 (39.3)		Reference				Reference		
Female	279 (60.7)	1.628	**0.018***	1.089	2.434	1.529	**0.044***	1.011	2.312
Age (years)									
65–75	342 (74.3)		Reference				Reference		
>75	118 (25.7)	1.580	**0.042***	1.017	2.453	1.378	0.168	0.873	2.175
Marital status									
Single	22 (4.8)		Reference						
Married	256 (55.7)	0.452	0.078	0.187	1.092				
Divorced	47 (10.2)	0.889	0.821	0.321	2.463				
Widow	135 (29.3)	0.523	0.166	0.209	1.308				
Race									
Malay	127 (27.6)		Reference						
Chinese	271 (58.9)	1.272	0.315	0.796	2.032				
Indian	62 (13.5)	1.401	0.314	0.727	2.701				
Home									
Own Home	428 (93.0)		Reference						
Old Care Home	32 (7.0)	0.877	0.748	0.395	1.948				
Smoking									
Smoker	148 (32.2)		Reference						
Non-smoker	312 (67.8)	1.231	0.345	0.800	1.895				
Alcohol									
Alcoholic	142 (30.9)		Reference						
Non-alcoholic	318 (69.1)	0.848	0.447	0.555	1.297				
Polypharmacy									
≤5	188 (40.9)		Reference				Reference		
>5	272 (59.1)	0.647	**0.033***	0.434	0.966	0.642	**0.033***	0.426	0.966
Co-morbidities									
Yes	336 (73.0)		Reference				Reference		
No	124 (27.0)	2.004	**0.002***	1.302	3.085	1.872	**0.005***	1.205	2.907

*$p < 0.05$.

Discussion

- Urinary tract infections are the most common type of infections in all age groups, particularly in older adults, due to their compromised immune response and sedentary lifestyle.
- The current study shows a high prevalence of cystitis (37.6%) among the study population, followed by ASB (31.9%), pyelonephritis (13.9%), urosepsis (10.2%), and prostatitis (6.4%). Urine is stored in the bladder, and uropathogens can enter and colonize in bladder much easier than other parts of the urinary tract system and cause cystitis
- UTIs are more commonly due to bacterial infections, and they occur more frequently in women compared to men across all age groups.
- Hormonal changes, anomalies in the urinary tract, compromised immune system, urinary incontinence, functional disability, nutrition deficiency, and presence of other illnesses are the main risk factors contributing to UTIs in the elderly population
- Loss of estrogen in elderly women changes the flora of the vagina; a decrease in the number of lactobacilli in vaginal flora leads to periurethral colonization. Urine production is increased while the capacity of the bladder decreases, leading to a decrease in voided volume, which ultimately leads to a higher risk of UTIs among older women. The present study also shows the high prevalence of UTIs in women (60.7%) as compared with men (39.3%).

Discussion

- The choice of antibiotics to treat UTIs among older adults is more complex as compared with young individuals due to the presence of a large range of pathogens, possibility of antibiotic resistance is higher, particularly in hospitalized patients.
- It has been suggested that narrow-spectrum antibiotics be used to treat UTIs among the elderly population. For suspected UTI in the elderly population, the best practice is to send the urine sample for culture and sensitivity and wait for the results rather than to start broad-spectrum empirical therapy to reduce the risk of unnecessary antibiotic use in clinically well patients
- If empirically therapy is required, the patterns of previous isolates of sensitivity, resistance patterns, and previous medication records should be evaluated, and the choice of antibiotic should be reassessed after 48–72 h based on the results of urine culture and sensitivity tests

Discussion

- In the present study, polypharmacy is one of the most important risk factors involved in the treatment outcomes of UTIs among the elderly population. The majority of the included participants (59.1%) are taking more than five medicines simultaneously for the treatment of their diseases, which leads to the high burden of polypharmacy and medication regimen complexity.
- Older adults taking 5–8 drugs simultaneously were at high risk of hospitalization due to adverse drug reactions as compared with those who were taking 0–4 drugs. Clinicians are required to make modifications in the regimen of elderly patients experiencing UTIs to reduce the risk of drug interactions and adverse drug reactions.
- Women receiving alpha-blockers for their hypertension-caused incontinence were reported in a case-control study. When these antihypertensives were discontinued, almost complete resolution was observed in their urinary symptoms.
- The use of loop diuretics instead of thiazide among 172 elderly patients with hypertension and heart failure was associated with increased frequency of urine and relaxation of the bladder to reduce the risk of UTIs. Previous literature reported cough-induced incontinence after the initiation of ACE inhibitors among older adults and remits after discontinuation

Discussion

- The presence of comorbidities is a significant predictor among elderly patients with UTIs affecting their treatment outcomes in the present study.
- Diabetes mellitus (43.1%) and hypertension (33.9%) are the most common comorbidities present among the study population. Diabetes mellitus affects the immune system of older adults due to autonomic neuropathy that leads to incomplete emptying of the bladder and poor metabolic control, which all contribute to the increased risk of UTIs in elderly patients with diabetes mellitus.
- Limitations: First, given the retrospective study design, it is possible that there are confounding factors associated with the treatment decisions and clinical outcomes the authors did not include.
- Second, this is a single-center study and may not be generalizable to other settings.
- Additionally, given the retrospective nature of our study, the authors were unable to collect physical exam data.
- Additionally, they excluded a significant number of patients with incomplete medical records, which may limit the impact of our findings. Finally, we did not collect information on antibiotic-associated adverse events

Conclusion

- In conclusion, a high prevalence of cystitis (37.6%), asymptomatic bacteriuria (31.9%), and pyelonephritis (13.9%) were observed in the study population of elderly patients. Gender (*OR* = 1.529; *p* = 0.044), polypharmacy (*OR* = 1.642; *p* = 0.033), and the presence of other comorbidities (*OR* = 1.872; *p* = 0.005) were the potential risk factors for the treatment outcomes of UTIs in older adults. By reducing the burden of polypharmacy and medication regimen complexity, the treatment outcomes of UTIs among the elderly population could be improved.

Thank you