Original Article

Urinary Tract Infection in a Tertiary level Hospital of Bangladesh: Age and Gender Dependent Cross-sectional Observational Study

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Abstract

Background: *Urinary tract infection (UTI) is one of the most common clinical problem that practicing physicians come across worldwide. It is well established that, urinary tract infection is commonly a bacterial infection and antimicrobial resistance is an emerging issue in treating UTI, even for uncomplicated cases.* ***Objective:*** *The primary objective of our study was to identify the common causative organisms on the basis of gender, age group and some other demographic issues for UTI among patients attending in a tertiary care hospital of Jashore district in Bangladesh.* ***Materials and Methods:*** *This study was an observational study of cross-sectional design carried out at Ad-din Sakina Women's Medical College, Jashore. Standard procedure was followed in sampling and laboratory procedures.* ***Results:*** *Among 404 (female 340 vs male 64) cases 153 (37.9%) were found positive for bacterial culture; 134 female vs 19 male (87.6% vs 12.4%). E. coli was the most common causative organism (74.5%) among all cases. There was higher prevalence in positive culture in female subjects, but Chi-square test showed no statistical significance (p = 0.924). Variations in prevalence were observed in the context of 'age groups' but those were also not significant statistically (p = 0.479).* ***Conclusion:*** *E. coli was the most common organism isolated. Further large scale study was suggested to make conclusive remark regarding gender and age related superiority about discrimination of causative organism.*

Keywords: Urinary tract infection (UTI), Culture-based UTI diagnosis, Hospital-acquired UTI, Community-acquired UTI, Escherichia coli, UTI in Bangladesh, Age and sex discrimination in UTI.

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Introduction

Urinary tract infection (UTI) can affect in any part of the urinary system (kidneys, ureters, bladder and urethra). The most common causative organism of infection is Escherichia coli, though other bacteria and fungi are also involved.[1] About 150 million people develop UTI each year worldwide.[2] In clinical practice particularly in developing countries, UTI is one of the most commonly found bacterial disease.[3] UTI affects invariably in all age groups and both sexes.[4] It is also seen both in indoor and outdoor patients. Highest prevalence of UTI is found in female cases, having age 18 years and above.[5] UTI may involve both in upper and lower urinary tract. The lower urinary tract infection is more common which is termed as cystitis. It is characterized by some features like dysuria, frequency, urgency and occasionally lower abdominal pain. These symptoms are not only found in cystitis only, but also in upper UTI.[6]

The most common pathogenic organism of UTI is Escherichia coli, which is responsible for causing UTI in more than 80% cases.[7-8] Other relatively common pathogenic organisms responsible for UTI are Staphylococcus saprophyticus, Staphylococcus aureus, Proteus sp., Klebsiella pneumoniae, Pseudomonas aeruginosa and Enterococci.[9-11] The primary objective of our study was to identify the commonly causative organisms for UTI in the community we worked with, as well as variations in causative organism on the basis of gender and age group in the same population. Furthermore, as antimicrobial resistance is an emerging issue in treating UTI, continuous surveillance for resistant strains among different community regularly is also mandatory.[12]

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Materials and Methods

This retrospective study was carried out in the laboratory of the Department of Microbiology, Ad-din Sakina Women's Medical College, Jashore, Bangladesh. The duration of the study was 6 months (March to August 2024). Samples were collected from the patients with clinically suspected UTI cases, who were admitted in inpatient department and also from the outpatient department of Ad-din Sakina Women's Medical College hospital, Jashore, Bangladesh. Valid, informed and written consent were taken from the study subjects and for minor subjects, consent was taken from legal guardians.

Urine samples were collected aseptically through either midstream clean catch method or through bladder catheterization in case of hospital admitted patient.

The urine specimens for routine urinalysis were tested using a fully automated urine chemistry Analyzer UC-3500 & a particle analyzer UF-5000 sysmex corporation. Pyurea was defined as the presence of >5 WBC per high power field on arise sediment. The urine was mixed thoroughly and the top of the container was removed, standard loop was inserted vertically into the urine to allow urine to adhere to the loop. After that, the loop was touched to the blood agar & Mac Conkey's agar media. Then the plate incubated for 18-24 hours at 37°C and colonies were counted on each plate. Bacterial growth was obtained from culturing of samples according to the different morphological & biochemical characters.

General urine examination involved physical & chemical examinations of urine such as color, turbidity, pH, protein, specific gravity, bile pigment, bile salts & possible presence of blood. The urine spun in centrifuge at 500-3000 rpm for 5 min to allow sediments blood cells, bacteria & other particles. Light microscope was used to diagnose these sediments.

All statistical analysis was performed using 'IBM SPSS Statistics 25' software. Chi-square test was done for hypothesis testing to see the level of significance. 'p' value < 0.05 was considered 'statistically significant'.

Results

Urine samples from a total of 404 (female 340 vs male 64) cases with clinical symptoms of UTI were collected and analyzed over 6 months duration. Mean ± SD age of the study subjects was 35.59 ± 18.92 years with a range from 1 year to 75 years. Mean ± SD age of culture positive female and male was 34.93 ± 18.27 years and 40.26 ± 22.97 years respectively. Among the study subjects, 153 (37.9%) were found positive for bacterial culture; 134 female vs 19 male (87.6% vs 12.4%).

Table I showed, E. coli was the most common causative organism (74.5%) both in male and female subjects (75% and 74% respectively). In case of male subject number of Pseudomonas as the causative organism was a little bit higher when comparing with female subjects (21.1% vs 12.7%). Klebsiella appeared to be the third common causative organism both in female and male subject. In our study there were some minor

Table I : Gender of Subject: Organism Isolated in Culture - Cross-tabulation

Gender		A	B	C	D	E	F	G	Total	*p*
Female	Count	100	17	10	2	1	3	1	134	0.924
	% within Gender of the Subject	75%	12.7%	7.5%	1.5%	0.7%	2.2%	0.7%	100%	
	% within Organism Isolated in Culture	88%	81%	90.9%	100%	100%	100%	100%	87.6%	
Male	Count	14	4	1	0	0	0	0	19	
	% within Gender of the Subject	74%	21.1%	5.3%	0%	0%	0%	0%	100%	
	% within Organism Isolated in Culture	12%	19%	9.1	0%	0%	0%	0%	12.4	
Total	Count	114	21	11	2	1	3	1	153	
	% within Gender of the Subject	74.5%	13.7%	7.2%	1.3%	0.7%	2.0%	0.7%	100%	
	% within Organism Isolated in Culture	100%	100%	100%	100%	100%	100%	100%	100%	

A = E. coli; **B** = Pseudomonas; **C** = Klebsiella; **D** = S. saprophyticus; **E** = E. faecalis; **F** = Cytobacter; **G** = S. aureus. . ***p*** value < 0.05 denotes statistical significance.

variation in prevalence in different organism causing UTI among female vs male subjects, but Chi-square test showed no statistical significance (p = 0.924).

Table II showed higher incidence of E. coli causing hospital acquired UTI (HA-UTI). Incidence of community acquired UTI (CA-UTI), the rate of Pseudomonas was a little bit higher when compared to HA-UTI (22.6% vs 11.5%), although the difference was not significant statistically (p = 0.600).

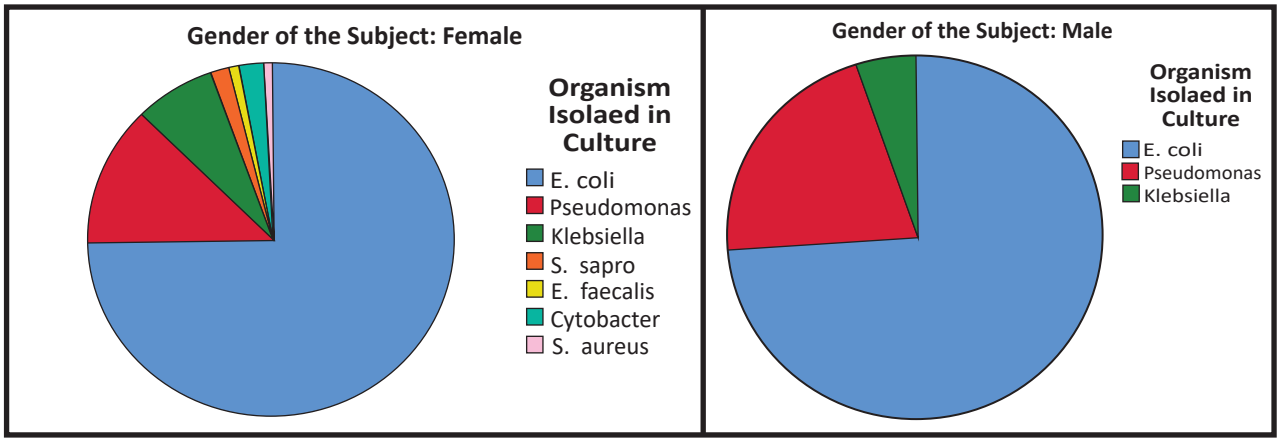

Figure 1: Pie chart showing organisms involved in UTI against female and male subjects.

Table II : Source of UTI: Organism Isolated in Culture - Cross-tabulation

Source		A	B	C	D	E	F	G	Total	*p*
Hospital Acquired UTI	Count	93	14	8	2	1	3	1	122	0.600
	% within Source of UTI	76.2%	11.5%	6.6%	1.6%	0.8%	2.5%	0.8%	100%	
	% within Organism Isolated	81.6%	66.7%	72.7%	100%	100%	100%	100%	79.7%	
Community Acquired UTI	Count	21	7	3	0	0	0	0	31	
	% within Source of UTI	67.7%	22.6%	9.7%	0%	0%	0%	0%	100%	
	% within Organism Isolated	18.4%	33.3%	27.3%	0%	0%	0%	0%	20.3%	
Total	Count	114	21	11	2	1	3	1	153	
	% within Source of UTI	74.5%	13.7%	7.2%	1.3%	0.7%	2.0%	0.7%	100%	
	% within Organism Isolated	100%	100%	100%	100%	100%	100%	100%	100%	

A = E. coli; **B** = Pseudomonas; **C** = Klebsiella; **D** = S. saprophyticus; **E** = E. faecalis; **F** = Cytobacter; **G** = S. aureus. ***p*** value < 0.05 denotes statistical significance. **UTI**, Urinary Tract Infection.

Table III, showed the most commonly found culture positive subjects belonged to the age groups '19-30 years' and '31-45 years' in female (29.1% and 25.4%) and in case of male subjects, age group '31-45 years' and '46-60 years' appeared to be with higher culture positive frequencies (26.3% and 26.3%). Although apparently some age group showed some gender specific predominance in particular age group, but they were not proved to be significant statistically.

Table III : Frequency and percentage of culture positive cases among different age groups against gender.

Age Group	Female Count	*p* (2-sided)	Male Count	*p* (2-sided)	Total Count
0-18 years	23 (17.2%)	0.688	4 (21.1%)	0.352	27 (17.6%)
19-30 years	39 (29.1%)		2 (10.5%)		41 (26.8%)
31-45 years	34 (25.4%)		5 (26.3%)		39 (25.5)
46-60 years	27 (20.1%)		5 (26.3%)		32 (20.9)
> 60 years	11 (8.2%)		3 (15.8%)		14 (9.2%)
Total	134 (100%)		19 (100%)		153 (100%)

p < 0.05 = statistically significant. Percentages are shown within parentheses.

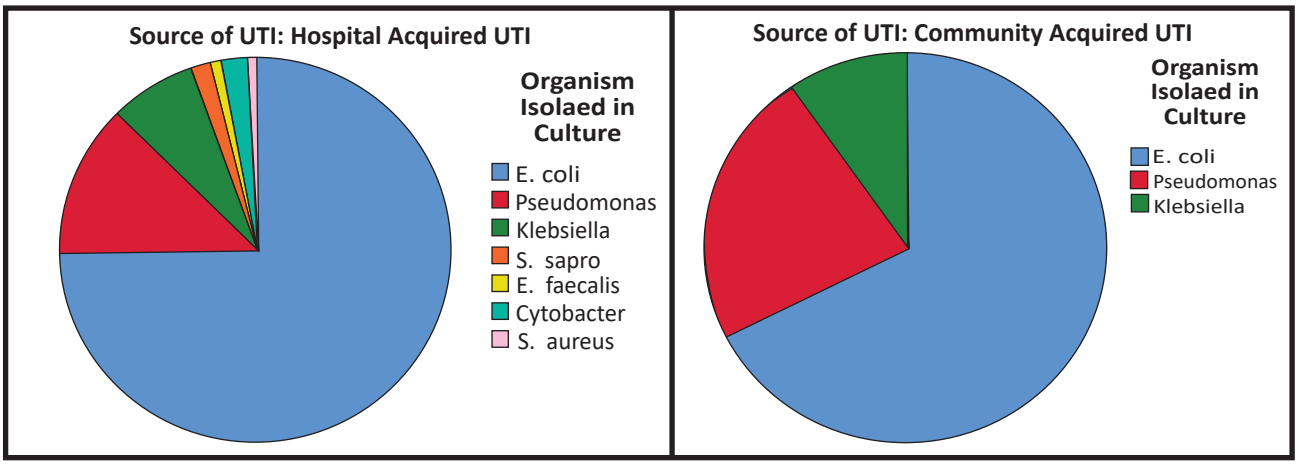

Figure 2: Pie chart showing organisms involved in UTI against hospital acquired and community acquired cases.

Table IV : Age Group: Organism Isolated in Culture Cross-tabulation

Age Group		A	B	C	D	E	F	G	Total	*p*
0-18 years	Count	21	2	3	0	1	0	0	27	0.479
	% within Age Group	77.8%	7.4%	11.1%	0%	3.7%	0%	0%	100%	
	% within Organism Isolated	18.4%	9.5%	27.3%	0%	100%	0%	0%	17.6%	
19-30 years	Count	31	4	3	2	0	0	1	41	
	% within Age Group	75.6%	9.8%	7.3%	4.9%	0%	0%	2.4%	100%	
	% within Organism Isolated	27.2%	19.0%	27.3%	100%	0%	0%	100%	26.8%	
31-45 years	Count	32	4	2	0	0	1	0	39	
	% within Age Group	82.1%	10.3%	5.1%	0%	0%	2.6%	0%	100%	
	% within Organism Isolated	28.1%	19.0%	18.2%	0%	0%	33.3%	0%	25.5%	
46-60 years	Count	22	7	2	0	0	1	0	32	
	% within Age Group	68.8%	21.9%	6.3%	0%	0%	3.1%	0%	100%	
	% within Organism Isolated	19.3%	33.3%	18.2%	0%	0%	33.3%	0%	20.9%	
> 60 years	Count	8	4	1	0	0	1	0	14	
	% within Age Group	57.1%	28.6%	7.1%	0%	0%	7.1%	0%	100%	
	% within Organism Isolated	7.0%	19.0%	9.1%	0%	0%	33.3%	0%	9.2%	
Total	Count	114	21	11	2	1	3	1	153	
	% within Age Group	74.5%	13.7%	7.2%	1.3%	0.7%	2.0%	0.7%	100%	
	% within Organism Isolated	100%	100%	100%	100%	100%	100%	100%	100%	

A = E. coli; **B** = Pseudomonas; **C** = Klebsiella; **D** = S. saprophyticus; **E** = E. faecalis; **F** = Cytobacter; **G** = S. aureus. . ***p*** value < 0.05 denotes statistical significance.

E. coli was the commonest organism (74.5%) Isolated in urine culture. Pseudomonas showed some degree of higher incidence (21.9% and 28.6%) in age group '46-60 years' and '> 60 years' when compared with other age groups for the same organism. Age group entitled '19-30 years' and '31-46 years' had higher rate for positive isolation of organism in culture; although these variations mentioned above was not proved to be significant (p = 0.479) statistically (Table IV).

Discussion

As the etiological factors, patterns of antibiotic resistance and even the differences of challenges in treating the same causative organism in different demography, continuous surveillance is essential in various geographical areas with different people with different age, sex, race and associated comorbidities. The primary objective of this cross sectional study was to identify and to evaluate the prevalence of common causative

organisms on the basis of gender, age group and some other demographic issues for UTI among patients attending in a tertiary care hospital of Jashore district in Bangladesh. The aim of the study was also to compare the study outcome with the already existing information so that local physician might make appropriate decision about the available treatment options suitable for the indigenous UTI patients.

In this study a total of 404 (female 340 vs male 64) cases with clinical symptoms of UTI were selected by random sampling. Between them, 153 (37.9%) were found positive for bacterial culture; 134 female vs 19 male (87.6% vs 12.4%). Almost all other studies showed higher prevalence of UTI among female particularly among young sexually active women.[13] A similar study conducted in Dhaka city of Bangladesh by Sanjee SA et al. in 2017 demonstrated that among 55.08% positive culture, 34.75% was female and 20.33% was male subject.[14] On the contrary Islam MA found positive culture in 29% cases, which was also in agreement with our study.[15]

Our study also revealed that E. coli was the most common causative organism (74.5%), both in male and female subjects (75% and 74% respectively). Islam MA et al. in their research also showed that among causative organisms, E. coli was 51.6%, Klebsiella was 12.1% and Pseudomonas was 4.4%; which were more or less similar to our research outcome.[15]

Moreover, in this study, among 153 culture positive cases, 79.7% was HA-UTI and 20.3% was CA-UTI which was almost similar to the study conducted by NS Ochada et al.[16] Compromised immunity in hospitalized patients due to comorbidities and catheterization might contribute to this issue. JP Horcajada and his associates in their study[17] found that among 279 (42% of their study subjects) culture positive cases, 246 (37%) were CA-UTI and 142 (21%) were HA-UTI and this outcome was very much divergent with our study result.

The present study also demonstrated highest incidence of E. coli (76.2%) to be the agent causing HA-UTI, it was 67.7% in case of CA-UTI. In the incidence of CA-UTI, the rate of Pseudomonas was higher when compared to HA-UTI (22.6% vs 11.5%), although the difference was not significant statistically (p = 0.600).

E. coli was the most frequent organism (74.5%) responsible for all age group isolated in urine culture. Pseudomonas showed higher incidence (21.9% and 28.6%) in age group '46-60 years' and '> 60 years' when compared with other age groups for the same organism. Age group entitled '19-30 years' and '31-46 years' had higher rate for positive isolation of organism in culture; although these variations mentioned above was not proved to be significant (p = 479) statistically (Table IV). SH Almukhtar et al in their study showed that 58.4% of participants were from the age group

Competing interest : The authors declare that they have no competing interests.

Limitation of the study : Although samples were collected by random sampling, there were few male cases when compared to female cases; this was due to the fact that the hospital from the samples was collected is traditionally visited by more female patients then male patients.

Conclusion

Female in their sexually active age group showed highest prevalence of UTI, although in our study the result was not statistically significant. E. coli was the commonest organism to be isolated in urine culture. HA-UTI had more prevalence than CA-UTI, although this was not proved to be significant statistically in our study. Further large scale study is required to make conclusive remark with better sampling technique.

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