Original Article

Antibiotic Sensitivity Pattern of Bacteria Associated with Urinary Tract Infection in a Medical College Hospital of Dhaka

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Abstract

Urinary tract infection (UTI) is one of the most common infections both in the world and in our country as well. Escherichia coli are one of the most frequently isolated bacteria in complicated or uncomplicated, nosocomial or community acquired urinary tract infections. Antibiotic resistance among urinary pathogens to commonly prescribed drugs is increased day by day. The aim of the present research was to determine the prevalence and to find out the causative agents of UTI and their antibiotic sensitivity pattern among suspected UTI patients. A retrospective research was conducted at Ashiyan Medical College Hospital, Dhaka, Bangladesh by analyzing the records of urine samples. Urine samples (n=520) were collected from patients with signs and symptoms of urinary tract infections. Bacteria were isolated and identified by conventional biochemical profile. Antibiotic sensitivity pattern against different antibiotic was determined by Kirby-Baur method. In this research, 78 (15%) out of 520 urine samples were positive for pathogenic organisms. Of the various pathogenic organisms isolated, Escherichia coli constituted for 52.56% followed by Pseudomonas aeruginosa, Staphylococcus species, Klebsiella pneumoniae and Proteus species. Escherichia coli was found to be most sensitive to amikacin, meropenem, imipenem and nitrofurantoin. Mainly Gram negative bacilli are responsible for UTI and most frequent isolated bacteria was Escherichia coli. The most effective antibiotics were amikacin, meropenem, imipenem, nitrofurantoin. The choice of antibiotic therapy in UTI should depends on the local sensitivity pattern of the infecting organisms.

Keywords: *Urinary tract Infection, Isolated bacteria, Antibiotic sensitivity.*

Introduction

Urinary tract infection (UTI) is the most common bacterial infection of all. It is one of the most important causes of morbidity. It occurs in both male and female, but is more common in females than in males due to anatomical difference, hormonal effects and behavioral pattern. The major pathogens causing UTI are Escherichia coli, Klebsiella pneumonia, Proteus species, Pseudomonas aeruginosa, Staphylococcus species.[1] Most frequently Escherichia coli are located in complicated or uncomplicated or community acquired urinary tract infections.[2] Indiscriminate and extensive use of antimicrobial agents is a common practice in third world countries like Bangladesh which leads to emergence of resistant microorganism. As a common practice in our country, antimicrobial treatment is started before the laboratory report of urine culture are available which may spread the antimicrobial resistant strains.[3] Besides this, antimicrobial susceptibility data of UTI causing microorganisms changes over periods and places. Therefore, the purpose of our investigation was to determine the recent status of prevalence of bacterial pathogens and their antimicrobial sensitivity in UTI patients in a medical college of Dhaka, Bangladesh. It would help and guide the physicians by providing information about choice of proper antibiotic for suspected UTI treatment.

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Methods

This research was carried out in the Microbiology Department of Ashiyan Medical College Hospital from 01 January 2018 to 31 December 2018. A total of 520 urine samples were collected from patients who suspected to have urinary tract infection. Then urine was inoculated on MacConkey's and Blood agar media using calibrated platinum loop. After that culture plates were incubated at 37^0 C for 24-48 hours. Pure bacterial colony of > 10^5 CFU/ml of a single species was considered positive for UTI. Antimicrobial susceptibilities of isolated organisms were determined using disc diffusion method. For confirmation of specific bacterial species, standard biochemical tests (Motility indole urea agar media, Triple sugar agar media, citrate, catalase, coagulase, bile soluble test) were performed.

Results

A total of 520 clinical urine samples were collected. Out of the collected 520 urine samples, 78 (15%) samples were found positive. Out of 520 cases males were 166 (31.92%) and females were 354 (68.08%). (Figure 1)

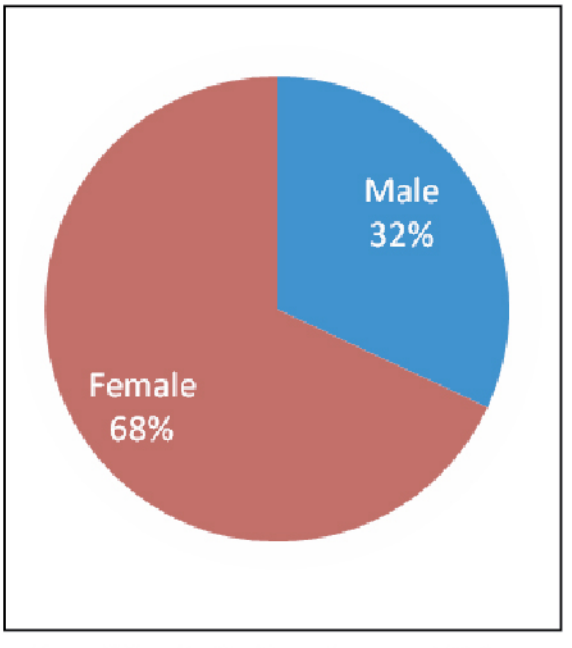

Figure 1 Sex distribution of suspected UTI patients (n= 520)

Most common age group affected was 21-30 years with 185 (35.57%) cases followed by > 50 years with 99 (19.03%) cases. (Figure 2)

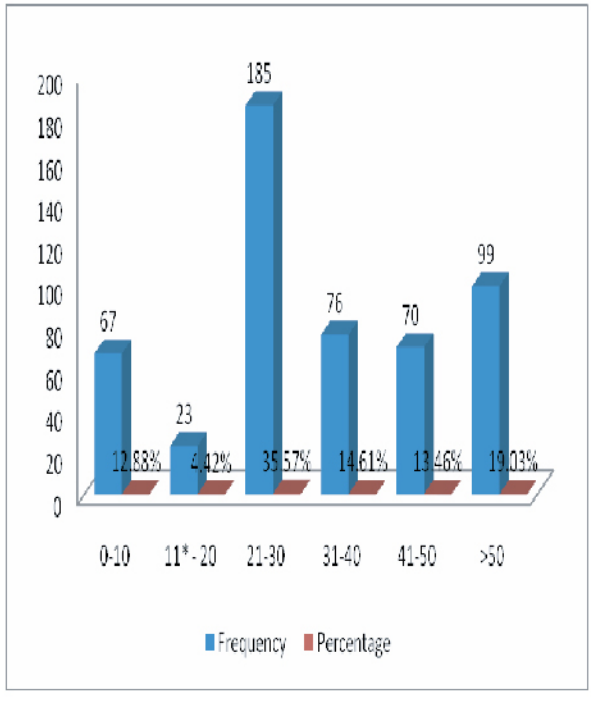

Figure 2 Age distribution of suspected UTI patients (n= 520)

A total of 78 (15%) bacterial growths were isolated from 520 urine samples. Escherichia coli was the predominant isolates 41 (52.56%) followed by Pseudomonas aeruginosa 19 (24.36%), Staphylococcus species 11 (14.1%), Klebsiella pneumoniae 04 (5.13%) and Proteus species 03 (3.85%). (Table I)

Table I Distribution of isolated uropathogens (n= 78)

Bacterial pathogens	Frequency (%)
Escherichia coli	41 (52.6%)
Pseudomonas aeruginosa	19 (24.4%)
Staphylococcus species	11 (14.1%)
Klebsiella pneumoniae	04 (5.1%)
Proteus species	03 (3.8%)

Amikacin, meropenem, imipenem and nitrofurantoin showed the highest sensitivity against 99%, 98%, 98% and 92% Escherichia coli. Meropenem, amikacin, imipenem and ciprofloxacin were found to be the most susceptible drug for Pseudomonas aeruginosa with the rate of 91%, 88%, 85% and 82%. In case of Staphylococcus species, the highest susceptible antibiotics were meropenem (100%), imipenem (100%), amikacin (100%) and nitrofurantoin (82%). Sensitivity of Klebsiella pneumoniae was 100% against meropenem, 94% against imipenem and 93% against amikacin. Meropenem, imipenem and amikacin were found to be 100%, 96% and 95% sensitive for Proteus species. (Table II)

Table II Antibiotic sensitivity pattern of isolated organisms in UTI (n= 78)

Antibiotics	Escherichia coli (41)	Pseudomonas aeruginosa (19)	Staphylococcus species (11)	Klebsiella pneumoniae (04)	Proteus species (03)
Amoxicillin	04%	16%	40%	20%	22%
Meropenem	98%	91%	100%	100%	100%
Imipenem	98%	85%	100%	94%	96%
Amikacin	99%	88%	100%	93%	95%
Gentamicin	40%	65%	65%	48%	60%
Ciprofloxacin	60%	82%	88%	64%	84%
Ceftriaxone	78%	78%	75%	41%	26%
Cefuroxime	41%	36%	25%	41%	26%
Cotrimoxazole	25%	50%	65%	52%	68%
Nitrofurantoin	92%	13%	82%	62%	43%
Nalidixic acid	20%	30%	30%	40%	32%

Discussion

Urinary tract infection is an emerging issue as a common clinical problem in both the community and health care associated settings. Moreover, antimicrobial resistance to uropathogens creates major health problem in different parts of the world.[4,5]

The prevalence rate of UTI accounted for 38.6%, 35.5%, 34.5%, and 36.68% in India.[6,7,8,9] In our research, out of the collected 520 urine samples, 78 samples (15%) were found positive which is similar to the research of Siddiqua et al.[10] The prevalence of UTI varies according to sex and age.[11] The present research showed a high prevalence of UTI in females (68.08%) than in males (31.92%) which correlates with the findings of others.[12,13] The probable reason behind this high prevalence of UTI in females is due to close proximity of the urethral meatus to the anus and shorter length of urethra.[14,15] The occurrence of UTI was highest in the age group of 21-30 years. Our result agrees with the research of Yasmeen et al.[16]

Most of the researches reveal the involvement of Gram negative enteric organisms which are commonly responsible for UTI such as Escherichia coli, Klebsiella pneumoniae and Proteus species.[17] In our research Escherichia coli was the largest group with a prevalence of (52.6%). This finding is in similar to other researches done in other countries such as India, Ethiopia, Saudi Arabia, Cameroon.[18,19,20,21,22]

The sensitivity rate of carbopenems (meropenem and imipenem) among uropathogens was as follows- Escherichia coli (98% and 98%), Pseudomonas aeruginosa (91% and 85%), Staphylococcus (100% and 100%), Klebsiella pneumoniae (100% and 94%) and Proteus (100% and 96%). A research conducted in India showed that meropenem was highly sensitive against Gram negative bacilli.[23] Another research done in Spain also showed the reduced susceptibility of Escherichia coli isolates from patients with UTI to fluoroquinolones. This reduced susceptibility might be due to using antibiotics without restriction. In several researches it has been shown that the high prescribing habits of the physicians are the driving factor for the antibiotic resistance for this group of antibiotics.[24]

Conclusion

The antibiotic resistance of uropathogens has now become a public health concern in Bangladesh. This is due to abusing antibiotic and practicing incomplete antibiotic regimen. So it should be closely monitored both at the regional and national levels. So continuous monitoring should be done to evaluate the trend of resistance of antimicrobials for sustained optimization of empirical therapy.

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