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Research Article

STUDY OF BACTERIAL PATHOGENS CAUSING URINARY TRACT INFECTION AND ANTIBIOGRAM PATTERN IN SYMPTOMATIC ADULTS

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ABSTRACT

Objectives: Urinary tract infections (UTIs) are most common infection seen in community and hospital. It is important to know the causative agent and antibiotic susceptibility pattern to administer specific treatment and prevent drug resistance. Hence, the present study was conducted to know the most common etiological agent and antibiogram of symptomatic UTIs.

Methods: The study was conducted at a tertiary care hospital. All the adult patients presented with symptoms of UTI were involved. As per the standard guidelines, clean catch mid-stream urine sample was collected and inoculated on MacConkey's agar and blood agar by standard loop technique. The isolates with significant bacteriuria were subjected for Kirby-Bauers' disk diffusion antibiotic susceptibility testing.

Results: One thousand two hundred and fifty symptomatic patients were screened for UTI**.** A total of 358 organisms were isolated in culture with significant bacteriuria. Among 358, *Escherichia coli* was commonest organism with 267 (74.5%), followed by *Klebsiella* species accounting for 52 isolates (14.5%) and *Citrobacter* species 25 (7.0%), and *Pseudomonas aeruginosa* 14 (4%). Higher degree of sensitivity was seen with imipenem (90%), amikacin (80%), and gentamycin (78%) followed by nitrofurantoin (75%) for *E. coli*. Lower degree of sensitivity was noted for norfloxacin (50%), ceftriaxone (62%), cotrimoxazole (56%), and pipericillin-tazobactum (60%). *Klebsiella* was sensitive to amikacin (74%) and imipenem (80%).

Conclusion: In the present study, *E. coli* was the most common organism causing UTI. Nitrofurantoin can be started as empirical treatment for lower UTI. Gentamycin was found to be equally effective as amikacin so that it can be used instead of amikacin to decrease the selective pressure on amikacin.

Keywords: Urinary tract infections, Bacterial pathogens, Symptomatic adults.

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INTRODUCTION

Among the infectious diseases, urinary tract infection (UTI) is most common infection in humans during their lifetime [1]. UTI can present with symptoms such as fever, burning micturition, and lower abdominal pain and can end up in permanent kidney scarring. The most common bacteria causing UTI is *Escherichia coli*, followed by *Klebsiella pneumonia*, *Staphylococcus* spp, *Proteus* spp, *Pseudomonas aeruginosa*, *Enterococcus* spp, and *Enterobacter* spp with dissimilarities in the sequence [2].

When a patient comes with symptoms of UTI, they will be started on empirical treatment before the availability of urine culture report. To start empirical treatment, one should have knowledge about common prevalent organisms and their drug sensitivity pattern [3].

Sometimes physician may start on broad-spectrum antibiotics against specific antibiotic in view of antibiotic resistant to commonest organisms. Many studies have shown changing pattern of bacterial pathogens and antibiotic susceptibility pattern [4].

Hence, for knowing the uropathogens prevalent in this locality and their drug sensitivity pattern which has large effect on empirical therapy of UTIs, we planned to conduct this study.

Objectives

The objectives of this study were to know the bacterial agents causing UTI and their antibiogram in symptomatic adult patients

METHODS

The present study was a prospective cross-sectional study conducted on UTI symptomatic adults (21–60 years) at a tertiary care hospital between 2021 July and 2022 June.

The prevalence of UTIs in India is around 37% [5]. If we take prevalence as 37% on an average, according to sample size formula $n=z^2P(1-P)/d^2$ where Z is confidence level of interval (95%=1.96), P as prevalence and d=0.05 precision. The sample size would be 358.

Sample size= 358.

Exclusion criteria

Pediatric patients, antenatal cases with asymptomatic bacteriuria, and patients with candiduria were excluded from the study.

Mid-stream clean catch urine sample was collected in a sterile, wide mouthed container from adult patients, and catheterized samples were also collected from bed ridden patients. The samples were processed within 1 h and the isolates were identified according to standard methods [6]. Antibiotic sensitivity testing was done on Mueller–Hinton agar by Kirby-Bauer disk diffusion method [7]. The following antibiotics were used for testing.

Ampicillin (10 mcg), cefazolin (30 mcg), cefuroxime (30 mcg), ceftriaxone (30 µg), norfloxacin (10 mcg), amikacin (30 mcg), gentamicin (10 mcg), co-trimoxazole (1.25/23.75 µg) imipenem (10 mcg), nitrofurantoin (300 mcg), cefoperazone-sulbactum (75/10 mcg), and piperacillin-tazobactam (100/10 mcg) as per CLSI guidelines [8].

RESULTS

In our study, 1250 urine samples were processed from symptomatic UTIs, out of which 358 (28.6%) samples showed significant growth. Females 217 (60.6%) were commonly affected compared to males 141 (39.4%) in age group between 31 and 40 years (Tables 1 and 2).

Among 358 isolates, *E. coli* was most common organism with 267(74.5%), followed by *Klebsiella* species accounting for 52 isolates (14.5%) and *Citrobacter* species 26 (7.0%), and *P. aeruginosa* 14 (4.0%) (Table 3).

The antibiotic susceptibility pattern is shown in Table 4. Highest sensitivity was seen with imipenem (89.9%) and amikacin (80.1%) and least sensitivity was seen with ampicillin (1.3%), cefazolin (19.8%), and cefuroxime (26.2%). The standard strains of *E. coli* (ATCC 25922), *K. pneumonia* BAA-2814, and *P. aeruginosa* (ATCC 27853) were used for quality control.

Statistical analysis

The data were analyzed using descriptive statistics of symptomatic UTI cases for prevalence, percentage, and frequency using Microsoft Excel.

DISCUSSION

In the present study, total of 1250 sample were collected. The prevalence rate of UTI was 28.6% (358 isolates) in our study. It was slightly lower rate compared to study by Christy *et al*. (2019) and Sahay which showed 37.6% and 34.9%, respectively [5,9]. Females were more commonly infected than males which has been established by many studies [5,9]. *E. coli* was the commonest organism causing UTI which accounted for 74.5% which was comparable with study by vasuki Balasubramanyam *et al*. and higher than study by Sahay [1,9]. The antibiotic susceptibility pattern for *E. coli* is described in Table 4. There was higher degree of resistance noted for ampicillin, cefazolin, and cefuroxime, which is expected because these drugs have higher activity against Gram-positive cocci with least activity against Gram-negative bacilli like *E. coli*. However, higher degree of resistance was also noted for norfloxacin, cotrimoxazole, ceftriaxone, and pipericillin-tazobactum. The reason might be many factors such as improper antibiotic prescribing pattern, irrational usage, and unnecessary prophylactic usage and over the counter availability [10]. Resistance to amikacin and gentamycin was lower. Resistance to nitrofurantoin was about 25%, which is unusual and higher. The variation could be due to differences in geographical area, hospital, and patient conditions.

Table 1: Gender distribution

Gender	Isolates	Percentage
Female	217	60.6
Male	141	39.4

Table 2: Age-wise distribution

Age group	Number	Percentage
21–30	85	23.7
31–40	115	32.1
41–50	64	17.9
51–60	94	26.3

Table 3: Organisms isolated

Organism isolated	Number	Percentage
Escherichia coli	267	74.5
Klebsiella species	52	14.5
Citrobacter species	25	7.0
Pseudomonas aeruginosa	14	4.0

Table 4: Antibiotic susceptibility pattern

Antibiotic	Number	Percentage Sensitive
Ampicillin	5	1.3
Cefuroxime	94	26.2
Nitrofurantoin	269	75.1
Norfloxacin	179	50
Amikacin	287	80.1
Gentamycin	279	77.9
Ceftriaxone	222	62
Cefazolin	71	19.8
Pipericillin-Tazobactum	214	59.7
Cefeperazone-Sulbactum	211	58.9
Imipenam	322	89.9
Cotrimoxazole	200	55.8

CONCLUSION

In the present study, *E. coli* was the most common organism causing UTI. Nitrofurantoin can be used as an empirical therapy for lower UTI and gentamycin can be used in place of amikacin for upper UTI. Formulating the antibiotic policy and following the treatment guidelines are the prime thing which should be done by all hospitals to combat against antimicrobial drug resistance.

CONFLICTS OF INTEREST

None declared.

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