Research Article

ANTIBIOTIC RESISTANCE PATTERNS OF URINARY TRACT INFECTIONS IN TERTIARY CARE HOSPITAL AHEMEDABAD

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Abstract- Urinary tract infections (UTIs) remain the common infections diagnosed in outpatients as well as hospitalized patients. Knowledge on antimicrobial susceptibility pattern is essential for appropriate therapy. The aim of this study was to describe pathogens frequency and their resistance patterns .5377 samples were received and proceed, out of them 1701 (31.63%) were positive among which the most prevalent were E. coli (44.97%) followed by *Klebsiella species*. (21.81%), & Pseudomonas species (13.69%). Furthermore, we had a high percentage of samples from people aged 46-60 and aged less than 15, predominantly women. Among the gram-negative enteric bacilli high prevalence of resistance was observed against many antimicrobial agents. This study revealed that E. coli were the predominant bacterial pathogen of UTIs in Ahmedabad, India. This study is useful for clinician in order to improve the empiric treatment and case management of UTIs.

Keywords- UTI, Antibiotic, Nitrofurantoin, Gram-negative bacteria.

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Introduction

Urinary tract infection is a common problem worldwide. Its clinical characteristics and susceptibility rates of bacteria are important in determining the treatment of choice and its duration. Urinary tract infections (UTI) are frequent problems, exceeded only by respiratory and gastrointestinal infections. It affects around 150 million people worldwide each year [1,2]. UTI is defined as a tissue invasion by means of bacterial colonization of any part of the urinary tract, from the urethra to the kidneys [3]. Thus, it may involve the lower or upper urinary tract. Episodes of UTI occurring in premenopausal, non-pregnant, women with no known urological abnormalities are classified as uncomplicated, while all others are considered complicated UTI. This concept and knowledge of local susceptibility rates are important in decision making of the optimal choice for empirical antimicrobial therapy and its duration [1, 2].

UTI are caused by gram negative bacteria, gram positive bacteria and candida but most UTI are caused by gram-negative bacteria, being Escherichia coli the most commonly isolated. Other bacteria involved are Proteus mirabilis, *Klebsiella species*, Pseudomonas species, Acinetobacter species, Enterococcus species, Enterobacter species, Group *B Streptococcus* and *Staphylococcus saprophyticus* [3,4]. Variations in microbial spectrum and susceptibility patterns may occur in different regions, and the previous use of antimicrobials is an important predictor of resistance [5,6].

National and international studies have shown increased resistance to commonly used antimicrobials [7-9]. The aim of this study was to describe pathogens frequency and their resistance patterns.

Materials and Methods

A prospective study was carried out at tertiary care hospital from 1st January2017 to 31st June 2017.

The urine specimens were processed and incubated on MacConkey and Blood agar, at a temperature of 35 ± 2 °C, for 48 hours. In urine routine microscopy A count ≥ 100,000 CFU per millilitre of urine was considered positive after incubation, and these isolates were identified. The antimicrobial susceptibility was determined on urinary isolates using the disk diffusion method, according to current CLSI. The quality control strains used were *E. coli* ATCC 25922, *E. coli* ATCC 35218, *K. pneumonia* ATCC 700603, *P. aeruginosa* ATCC 27853, *E. fecalis* ATCC 29212 and *S. aureus* ATCC 25923. *S. aureus* ATCC 43300.Only aerobic bacterial infections were analysed in this study.

Results

Total 5377 samples were received and proceed, out of them 1701(31.63%) were positive. Out of 1701 isolates, 178 were ICU and 1523 NON-ICU (Wards &OPD). [Table-1] Frequency of common urinary pathogens:

Table-1 *Frequency of common urinary pathogens*

ORGANISM	ISOLATES	%
Total urinary pathogen (n-1701)		
Escherichia coli	765	45
Klebsiella species	371	21.81
Pseudomonas species	233	13.69
Candida species	171	10.05
Acinetobacter species	78	4.58
Proteus species	41	2.41
Enterococcus species	31	1.82
Staphylococcus aureus	11	0.64

Table-2 *Positivity according to age and sex*

Age-group	Female	Male	TOTAL
1-15	209	223	432
16-30	204	161	365
31-45	178	168	346
46-60	363	195	558
Total	954	747	1701

Table-3A *Antimicrobial resistance of gram positive isolates AST*

Drug	Enterococcus species %	Staphylococcus aureus%
Amikacin	-	0
Gentamicin	48.38	0
Tobramicin	-	-
Ciprofloxacin	54.83	9.09
levofloxacin	41.93	9.09
Nitrofurantoin	0	0
Cefoxitine	48.38	18.18
Oxacillin	-	18.18
Cefuroxime	-	18.18
Erythromycin	54.83	9.09
Azithromycin	54.83	9.09
Clindamycin	54.83	9.09
Doxycycline	54.83	0
Vancomycin	0	0
Teicoplanin	0	0
Linezolid	0	0
MRSA	-	18.18

Table-3B *Antimicrobial resistance of candida*

Drug	Candia species %
Amphothericin- B	0.58
Clotrimazole	36.25
Fluconazole	22.80
Itrconazole	12.28
Ketoconazole	11.11
Miconazole	27.4
Nystatin	1.75
Voriconazole	10.5

Table-3C *Antimicrobial resistance of gram negative isolates*

Name	Ecoli %	Kleb %	Proteus %	Acinetobacter %	Pseudomonas %
Amikacin	28.75	57.41	41.46	48.71	71.67
Gentamicin	40.91	62.8	43.9	52.56	76.82
Tobramicin	41.3	62.53	43.9	48.71	72.96
Ciprofloxacin	73.59	75.47	41.46	56.41	75.96
levofloxacin	67.45	74.12	41.46	56.41	76.82
Nitrofurantoin	3.92	23.45	100	0	0
Cefuroxime	73.59	75.74	90.24	44.87	70.81
cefoxitine	70.06	78.16	73.17	0	0
Cefepime	65.49	80.32	70.73	67.94	69.52
Cefoperazone	71.5	82.47	75.6	66.66	70.38
Cefotaxime	70.98	82.74	75.6	71.79	62.23
Ceftazidime	70.32	78.7	80.48	67.94	60.08
Imipenem	11.63	32.88	19.51	38.46	51.5
Meropenam	11.5	32.88	19.51	38.46	51.5
AMPC	29.15	30.18	0	0	0
ESBL	23.92	23.71	0	0	0
Carbapenamase	11.63	32.88	0	38.46	51.5

* high level gentamycin is used in case of enterococcus

Discussion

The present study provides information regarding to species that cause UTI and their susceptibility to the main antimicrobials.

Most of the isolates from ICU patients were catheterized showing multidrug resistance.

All samples were collected in tertiary care teaching hospital. *E. coli* predominated among the isolated agents, accounting for *E. coli* (44.97%) followed by *Klebsiella spp* (21.81%), & Pseudomonas (13.69%). Similar data was found [10, 20] conclude that *E.coli* and *Klebsiella spp*. are the most common organism responsible for UTI.

Furthermore, we had a high percentage of samples from people aged 46-60 years and less than 15 years, predominantly women. Older people, especially women, had the highest incidence of asymptomatic bacteriuria and UTIs and more associated comorbidities like diabetes, considered an important risk factor for recurrent UTIs in women. The antimicrobial use in this group is very frequent, because of recurrent UTIs, mistaken treatment for asymptomatic bacteriuria, or

treatment of others infections [12].

Fluoroquinolones are widely used for empirical treatment of UTI, including the cases of upper urinary tract infection [11]. We observed high resistance rates of the main isolated species to the tested antimicrobials (>70% for *Escherichia coli*). That is more compared to Amudavalli and Amudhan Arvind (2017) and Cunha et al., (2016). It is because of indiscriminate use of this class of antimicrobials in community-acquired infections may have contributed to the high percentage of resistance observed. Therefore, quinolones as empirical therapy must be considered carefully or not used, especially for patients with pyelonephritis. In this respect, if susceptibility is confirmed by pathogen isolation, quinolones are alternatives for de-escalation therapy, given the possibility of their oral administration so it should be used carefully.

Aminoglycoside resistant was also observed in our study which was more in Pseudomonas (71.67%) followed by *Klebsiella spp* (48.71%), *E. coli* (28.75% & *Proteus spp* (41.46%). that was similar to akram et al [4] but we not observed resistance of aminoglycoside in gram positive isolates.

Most of the gram positive and gram negative organisms were susceptible to Nitrofurantoin but some E. coli spp. 3.92% and *Klebsiella spp* 23.45% were resistant. Therefore, these data reinforce the recommendation of various clinical guidelines related to the empirical prescription of nitrofurantoin for uncomplicated cystitis. We had put fosfomycin disk in spp. in multi drug resistant isolate almost all the species are sensitive to it [13-15].

In pregnant women, asymptomatic bacteriuria and UTI are common problems that should be treated with proper antimicrobials, due to a greater risk of pyelonephritis and the relationship between asymptomatic bacteriuria and obstetric complications [18,19]. The high percentage of strains resistant to first generation cephalosporins in our sample limits the empirical use of these drugs in pregnant women. Under these circumstances, nitrofurantoin or fosfomycin are safer alternatives for cystitis, while third-generation cephalosporins should be used for pyelonephritis, until the susceptibility test of the isolated bacteria is available [16, 17].

171 patients were positive for Candida, Out of which *Candida albicans* (40.48%) is more important uropathogen causing candiduria than nonalbicans. (tropicalis (33.33%), parapsilosis (5.95%), krusei (16.7%), dublinensis (4.17%). [21] Species identification are necessary for line of treatment because some species are inherently resistant to some drug like Candida Krusei is intrinsically resistant to fluconazole, and C. glabrata resistant to azole group, this study also indicates that both Amphotericin B and itraconazole was found to be the most effective antifungal agent.

Guidelines of the American Infectious Diseases Society recommend that antibiotics with a resistance above 20% should be avoided prescribing empirically to patients with uncomplicated urinary tract infection unless susceptibility is confirmed by prior isolation in culture [18]. So, clinician should be very cautious while selecting the empirical treatment or give treatment after culture report.

Conclusion

The isolates in our study were found to have resistance to four or more antibiotics which is quite alarming, so antibiotic resistance is becoming a major problem for the public health which threatens the lives of hospitalized as well as chronic patients. Overuse and misuse of the antibiotic is the single most important cause of development of acquired resistance. We are not left with oral antibiotics and antibiotic which are sensitive that antibiotics are costly and injectable. Therefore, it is an important issue to formulate the strict antibiotic policy in our hospital. More studies are required to know the exact magnitude of the problem in India.

Application of research: The antibiograms of various isolates will help to formulate the antibiotic policy of or hospital, Implementation of antibiotic usage study and antimicrobial stewardship program.

Research Category: Original

Ethical approval: This is a retrospective study, and permission was taken from Head, The Department of Microbiology, B.J. Medical College, Ahmedabad, 380016, Gujarat, India. This article does not contain any studies with human participants or animals performed by any of the authors. This approval was obtained by Head of department, Microbiology.

Author Contributions: All author equally contributed.

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Abbreviations:
UTI   : Urinary Tract Infection
CFU   : Colony Forming Units
ATCC : American Type Culture Collection

Conflict of Interest: None declared

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