Research Article

MICROBIOLOGICAL PROFILE OF URINARY TRACT INFECTIONS AND IT ANTIBIOTIC SUSCEPTIBILITY PROFILE IN A TERTIARY CARE HOSPITAL

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ARTICLE INFO	ABSTRACT

Background: Urinary Tract Infections are considered as one of the most common bacterial infections with an estimated annual global incidence of 250 million. The extensive and inappropriate use of antimicrobial agents has invariably resulted in the development of antibiotic resistance which, in recent years, has become a major problem worldwide.

Methods: This observational study was conducted at SKIMS Medical College Srinagar J&K India from January 2015 to January 2017. The study included all the patients who were admitted or visited the outpatient department in the hospital with symptoms of UTI.

Results: Out of 2400 clinically suspected cases of UTI, culture was positive in 720 (30%) samples. Maximum patients were in the age group of 21-40 yrs followed by 41-60 yrs. Males (41.10%) were less prone to urinary tract infections than females (58.90%). *Escherichia coli* was the most common isolate 56.11% followed by *Enterococcus spp* 13.5% (n=310), *Klebsiella pneumoniae* 11.11% (n=80), *Proteus* spp. 6.6% (n=48), *Staphylococcus aureus* & *Enterobacter* spp. 3.3% (n=24), *Pseudomonas aeruginosa* 3.1% (n=22) and *Acinetobacter* spp.1.4% (n=10). Most of the urinary isolates were sensitive to, carbepenems, Amikacin, and Nitrofurantoin.

Conclusions: Regular monitoring is required to establish reliable information about resistance pattern of urinary pathogens for optimal empirical therapy of patients with UTIs. Knowledge of uropathogens and their antimicrobial susceptibility pattern in a geographical region will help in appropriate and judicious antibiotic usage in a health care setup.

INTRODUCTION

Urinary Tract Infections (UTIs) account for a significant part of the workload in clinical microbiology laboratories. [1] UTI consists of microbial invasion in any structure of urinary system. The severity of infection ranges from asymptomatic colonization to symptomatic invasion of the tissues of any of the structures of the urinary system. [2] It is estimated that 20% or more of the female population suffers some form of UTI in their lifetime. Infection in the male population remains uncommon through the fifth decade of life, when enlargement of the prostate begins to interfere with emptying of the bladder. The most common pathogenic organisms of UTI are *Escherichia coli, Staphylococcus saprophyticus* and less common organisms are *Proteus sp., Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococci sp.* and *Candida albicans*.[3]

Many times, physicians resort to prescribing broad spectrum antibiotics over specific antibiotics in the view of resistance

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of the causative organism to the antibiotic. Poor patient compliance and incomplete course of antibiotic therapy have resulted in the evolution of resistance to many of these antibiotics. In last decade bacteria emerged with new forms of virulence and new patterns of resistance to antimicrobial agents. The emergence of resistance to such drugs is a natural biological phenomenon. [4] In patients with suspected UTI, antibiotic treatment is usually started empirically, before urine culture results are available. To ensure appropriate treatment, knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory. [5]

Thus, the aim of this study was to determine bacterial etiology of UTI and evaluate their in vitro susceptibility pattern to commonly used antimicrobial agents.

METHODS

The study was done at SKIMS Medical College Srinagar J&K India from January 2015 to January 2017. The study included all the patients who were admitted or visited the outpatient department in the hospital with symptoms of UTI during the study period. Only one sample from each subject was considered.

Sample collection

A total of 2400 clean catch midstream urine samples were collected in a sterile container from both outpatient and inpatient attending the hospital. Urine samples were transported immediately to department for processing.

Isolation & Identification of Organisms

Urine samples were inoculated on agar plates by using calibrated loop delivering 0.001 ml of sample and incubated at 37^{0}C for 24 hrs. For gram-negative bacilli more than 10^{5} colonies per ml and for Gram positive cocci 10^{3}-10^{5} colonies per ml of single organism were considered significant. The organisms were identified by colony characters, Gram's staining, and biochemical reactions. Antimicrobial susceptibility of the isolates was determined against various antimicrobial agents (Hi – Media Mumbai India) commonly used in the hospital, by Kirby Bauer disk diffusion method on Muller Hinton agar plates according to Clinical and Laboratory Standard Institute (CLSI) guidelines. [6]

RESULTS

Out of 2400 clinically suspected cases of UTI, culture was positive in 720 (30%) samples (Table 1).

Table 1 Total no of isolates

Culture results	Sample	%
Positive	720	30%
Negative	1680	70%
Total	2400	100%

Out of 720 culture positive cases, 448 (62.20%) samples were from indoor patients while 272 (37.80%) samples were from outpatient department. Out of 720 maximum patients were in the age group of 21-40 yrs ie 58.60% (n=422) followed by 41-60 yrs 16.10% (n=116) (Table 2).

Table 2 Distribution of culture positive cases according to age

Age (years)	Total
0-20	97(13.48%)
21-40	422(58.60%)
41-60	116(16.10%)
> 60	85(11.80%)
Total	720(100%)

Among 720 culture positive samples, 58.90 % (n=424) were obtained from females and 41.10 % (n=296) were obtained from males (Table 3).

Table 3 Distribution of culture positive cases according to sex

Gender	No of isolates
Male	296 (41.10%)
Female	424 (58.90%)
Total	720 (100%)

Table 4 Frequency of uropathogens

Isolate	Total	%
E.coli	404	56.11
Klebsiella sp.	80	11.11
Enterococcus sp.	108	15
Enterobacter sp.	24	3.3
Proteus sp.	48	6.6
Staphylococcus aureus	24	3.3
Pseudomonas aeruginosa	22	3.1
Acinetobacter spp	10	1.4
Total Growth	720	100%

Escherichia coli was the most common isolate 56.11% (n=404) followed by *Enterococcus spp* 13.5% (n=310), *Klebsiella pneumoniae* 11.11% (n=80), *Proteus* spp. 6.6% (n=48), *Staphylococcus aureus* & *Enterobacter* spp. 3.3% (n=24), *Pseudomonas aeruginosa 3.*1% (n=22) and *Acinetobacter* spp.1.4% (n=10) (Table 4). Enterobacterecie is the predominant cause of UTI, *E.coli* showed higher sensitivity to Amikacin (88%), Gentamicin (69%), Nitrofurantoin (92%), Imipenem (84%), *Klebsiella pneumoniae* also showed similar sensitivity pattern ie Amikacin (60%), Gentamicin (50%), Nitrofurantoin (80%), Imipenem (80%), similar results were seen for *Proteus* and *Enterobacter spp*. *Pseudomonas aeruginosa* and *Acinetobacter* spp.showed higher sensitivity to Imipenem ie 82% & 70%. Amoxicillin clavulanate, ofloxacin & ceftriaxone showed higher resistance (Table 5).

Table 5 Antimicrobial sensitivity pattern (% age) of Gram negative bacilli isolated from urine samples

ISOLATE	E.coli (%)	Klebsiella sp. (%)	Pseudomonas sp. (%)	Proteus sp. (%)	Enterobacter sp. (%)	Acinetobacter sp (%)
			DRUGS			
Amikacin	88	60	50	58	66	50
Amoxycillin clavulanate	10	20	--	20	20	10
Gentamycin	69	50	50	46	41	50
Ofloxacin	18	15	--	46	46	30
Cotrimoxazole	42	30	--	31	38	50
Nitrofurantoin	92	80	--	--	75	60
Levofloxacin	34	30	46	--	46	60
Ceftriaxone	21	20	41	29	38	40
Piperacilin-tazobactam	42	30	41	50	60	40
Cefoperazone sulbactam	32	20	46	46	46	40
Imipenem	84	80	82	79	83	70

Among gram-positive isolates, *Enterococcus spp* showed higher sensitivity towards Linezolid (100%), Vancomycin (90%), followed by Amipicillin and Amoxycillin ie 61% each. *Staphylococcus aureus* also showed higher sensitivity towards Linezolid (100%), Vancomycin (100%) followed by Nitrofurantoin (60%) (Table 6). About 54% of isolates of *Staphylococcus aureus* were Methicillin resistant ie MRSA.

Table 6 Antimicrobial sensitivity pattern (% age) of Gram positive cocci isolated from urine samples

Isolate	*Enterococcus sp.* (%)	*Staphylococcus aureus* (%)
	Drug	
Ampicillin	61	20
Penicillin	21	20
Amoxicillin	61	20
Cefoxitin	--	54
Nitrofurantoin	57	60
Linezolid	100	100
Vancomycin	90	100

DISCUSSION

Bacterial infection of the urinary tract is one of the common causes for seeking medical attention in the community. [7] Effective management of patients suffering from bacterial UTIs commonly relays on the identification of the type of organisms that caused the disease and the selection of an effective antibiotic agent to the organism in question. [8] The changing trends in the aetiopatho genesis of urinary tract infections and increasing antimicrobial drug resistance are a matter of concern. Urethral catheterization and instrumentation related UTI is the most common nosocomial infection. The indiscriminate, inadequate usage of antibiotics

has contributed to the emergence of resistance strains. Urine culture sensitivity is routinely done in suspected cases of UTI and empirical therapy should be started immediately and modified if required once the report of urine culture sensitivity is available. [9] In our study we reported a culture positivity of 30% in clinically suspected cases of UTI, similar results were seen by studies done by Dalal *et al* who reported a positivity of 24.26% in their study. [10] Similarly, Lata *et al* reported a positivity rate of 42.89% in their study. [11]

Our study shows that females (58.90%) are more vulnerable to UTIs than males (41.10%). These results are similar to those reported from many other centres. [12] Similarly Lata *et al* reported a prevelance of 64.01% in females. [11] The elevated incidence of infection among females is related to differences between the male and female genitourinary systems in anatomy and micro flora. [9, 6, 13] The prevalence of Gram-positive cocci was not high in our study ie 18.3%; this is similar to other studies in different countries. [14, 15] *Escherichia coli* was the most common isolate 56.11% (n=404) followed by *Enterococcus spp* 13.5% (n=310), *Klebsiella pneumoniae* 11.11% (n=80), *Proteus* spp. 6.6% (n=48), *Staphylococcus aureus* & *Enterobacter* spp. 3.3% (n=24), *Pseudomonas aeruginosa 3*.1% (n=22) and *Acinetobacter* spp.1.4% (n=10). Results of this study are in concordance with the other studies done by Manjunath *et al* & Gupta *et al*. [9, 13]

In this study, gram negative isolates showed good sensitivity to Amikacin, Nitrofurantoin, Imipenem and Gentamicin; however, they showed heavy resistance to drugs like Amoxycillin, Cotrimoxazole, Ofloxacin, and Ceftriaxone. Gram-positive cocci showed high resistance to Penicillin while they showed good susceptibility pattern towards Linezolid and Vancomycin in *Staphylococcus aureus* and additionaly to Ampicillin and Amoxycillin in *Enterococcus spp*. Results of this study are in concordance with the other studies done by Manjunath *et al* & Gupta *et al*. [9, 13]

CONCLUSION

A large proportion of uncontrolled antibiotic usage has contributed to the emergence of resistant bacterial infections. As a result, the prevalence of antimicrobial resistance among urinary pathogens has been increasing worldwide. The current study elaborates different antimicrobial susceptibility pattern among uropathogens. High degree of resistance was found for organisms belonging to family *Enterobacteriacae* towards Cotrimoxazole, Fluroquiolones and Cephaolsporins. However, these organisms showed good response to antibiotics like Amikacin, Nitrofurantoin, Gentamicin and Carbapenems. Nitrofurantoin, which is an under used antimicrobial agent for empiric therapy of acute lower UTI is a very cheap and effective drug. Therefore, it can be concluded from the present study that the drug resistance among pathogens is an evolving process, therefore routine surveillance and clinical trials should be done regularly with the assistance of treating physicians to reach the most effective empirical treatment.

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