ORIGINAL ARTICLE

Study of Bacteria isolated from Urinary Tract Infections and to Determine their Susceptibility for Antibiotics at a Teaching Hospital

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ABSTRACT

Aim: To determine the pathogens causing urinary tract infections and susceptibility to antibiotics.
Methods: In this study, 300 patients with clinical symptoms and suspected UTI were sampled. Using the method of Clean-Catch, urine samples were collected from patients admitted to the Medical Ward at Aziz Fatima Hospital, Faisalabad from 1st January 2012 until 31st December 2012. Samples were sent to the Laboratory Diagnostics and Research laboratory of Pathology Aziz Fatima Hospital, Faisalabad. Urine specimens were cultured for detection of microbial agents of UTI. A total of 230 urine culture sensitivity reports were analyzed. The bacteria isolated were recognized by means of biochemical tests.
Results: In this study, 230 of 300 were shown to be positive for urine culture. The predominant single bacterial growth was observed in 200 (87%). The most frequent isolated organism was E.coli (82%). The other bacteria were Klebsiella sp. (10.5%), Pseudomonas sp. (4.5%), and Staphylococcus aureus (3%). Gram negative bacteria were more sensitive to Amikacin (85.41%) and Nitrofurantoin (80.15%). The isolated gram positive cocci were sensitive to Ceftazidime (88.8%), Nitrofurantoin (83.3%), Norfloxacin (77.7%) and Piperacillin-tazobactam (77.7%).
Conclusion: Gram-negative bacilli were accountable for the urinary tract infections in our patients. E.coli. was most frequent bacteria isolated and the most efficient antimicrobial agents were Amikacin, Nitrofurantoin, Meropenem and Cefipime in contrary to gram-negative bacilli and Nitrofurantoin, Ceftazidime and Norfloxacin in opposition to gram positive cocci.
Keywords: UTI, pathogens, antibiotics

INTRODUCTION

Urinary tract infections (UTIs) are one of the most widespread infections encountered by humans; go beyond in incidence among outpatients (1). Urinary tract infections are one of the most widespread transmissible diseases. These may be associated with symptoms or are completely symptomless, and any type of infection can result in grave consequences if not appropriately treated[2,3]. UTIs are one of the most extensive extra-intestinal bacterial infections. Currently, it signifies one of the most frequent diseases met in medical practice involving people of all times[4]. Newborns, girls, young women, and older men are more at risk to the UTIs. In women, bacterial cystitis is the most widespread bacterial disease. Every woman has a 60% lifetime possibility of developing bacterial cystitis, which develops mostly prior to the age of 24. But in men it is only 13%. Nearly 5% of girls and 1% of boys have a UTI around age of 11 years. It is also the most widespread source of nosocomial infections in adults[5,6]. Nearly 150 million people are diagnosed with UTI annually in the world. UTIs are classified into two types, one is complicated and other is uncomplicated. Uncomplicated UTIs are found to be in healthy female patients with otherwise normal urinary tracts. Complicated UTIs are related with co-morbid situations prolonging remedy or intensify the risks for unsuccessful healing. These include urinary tract abnormalities that obstruct urine flow, the placement of indwelling catheter, stone, or infection with resistant bacteria[7,8]. It is thought to be present if causative micro-organisms are found in the urinary tract with or without the presence of specific symptoms[9]. Majority of UTIs are safe and do not initiate any irreversible impairment. There is a hazard of permanent tissue destruction with a high danger of bacteremia if kidneys are involved[10]. An exact and quick diagnosis is necessary to cut short the treatment and to decrease the rate of the rise of infection to the upper urinary tract. Treatment of UTI is usually started empirically. UTIs are often treated with various broad-spectrum antibiotics because of concerns about infection with resistant organisms[11]. Extensive and inappropriate use of antimicrobial agents has constantly caused occurrence of resistance which has developed a main trouble worldwide. Those patients who have UTI, treatment should be started even urine culture results are not available. To ensure right treatment, knowledge of the organisms causing UTI and their antibiotic susceptibility should be present. As both temporal

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and local variables can change these data, they must be continual re-assessment to obtain a full clinical response before anti-biotic susceptibility of the isolate is established[12,13]. The objectives of this study were the detection of pathogens causing UTI and to determine their antibiotic susceptibility in patients referred to Aziz Fatimah Hospital, Faisalabad.

MATERIALS AND METHODS

A total of 300 reports of growing sensitivity of urine of the patients suspected of having infection of urinary tract, from January 2012 to December 2012, with the approval of the Institutional Ethical Committee were analyzed. Clean-catch midstream urine specimens from patients diagnosed clinically to be having UTI because of having fever, dysuria & increased frequency of urination, were inoculated on Blood Agar and McConkey Agar plates, and were incubated aerobically at 37 C overnight. The plates which showed significant development indicated considerable bacteruria, having colony counts > 10^5 cfu/ml, were directed for biochemical tests to identify anti-microbial susceptibility using Kirby-Bauer disc diffusion method. These were termed as "Sensitive" or "Resistant" on the basis of the zones of inhibition of bacterial growth as directed by the disc manufacturer. Antibiotics against which sensitivity was tested in this study included Amoxycillin, Amoxiclav, Ciprofloxacin, Norfloxacin, Levofloxacin, Co-trimoxazole, Gentamicin, Amikacin, Nitrofurantoin, Minocycline, Meropenem, Piperacillin-tazobactam, cefaperazone-sulbactam, Cefixime, Cefipime, Cefpirome, Ceftriaxone and Ceftazidime.

RESULTS

A total of 230 urine culture sensitivity reports were analyzed in this study from January 2012 till December 2012. The predominant growth of single bacteria was seen in 200(87%) samples. The commonest organisms isolated were Escherichia coli, Klebsiella, Pseudomonas and Staphylococcus aureus. (These represented 82%, 10.5%, 4.5% and 3% of isolates respectively). More than 80% of the isolates were responsive to Amikacin and Nitrofurantoin, whereas more than 70% were sensitive to Norfloxacin, ciprofloxacin and Levofloxacin. *E.coli* showed high sensitivity to Amikacin 160(97.6%), Nitrofurantoin 150(91.46%) and Ceftazidime 130(79.88%), with good susceptibility to Fluoroquinolones {Levofloxacin 122(74.4%), Cefipime 122(74.3%), Norfloxacin 120(73.1%), Meropenem 120(73.1%), Ciprofloxacin 109(66.46%) and Minocycline 120(73.1%). The Klebsiella showed highest sensitivity to Amikacin 18(85.71%) and Nitrofurantoin 16(76.10%), while it was also susceptible to the Ceftazidime 15(42%) and Fluoroquinolones (Levofloxacin 15(71.42%), Norfloxacin 15(71.42%) and Ciprofloxacin 14(66.6%) and Gentamicin 61.90% (13). Pseudomonas showed highest sensitivity to Ceftazidime 8(88.8%) and Fluoroquinolones (Norfloxacin 7(77.7%), Ciprofloxacin 6(66.6%), Cefixime 6(66.6%) followed by Aminoglycosides (Amikacin 5(55.5%), Meropenem 5(55.5%), Cefipime 5(55.5%) and Gentamicin 4(44.4%). The staphylococcus aureus showed high sensitivity to Nitrofurantoin 5(83.3%), Amoxiclav 4(66.6%), Meropenem 4(66.6%), Ciprofloxacin 4(66.6%), Gentamicin 3(50%), Cefpirome 3(50%), Cefixime 3(50%), and Amoxicillin 3(50%).

Fig. 1: %age of isolated bacteria from urine culture of pts

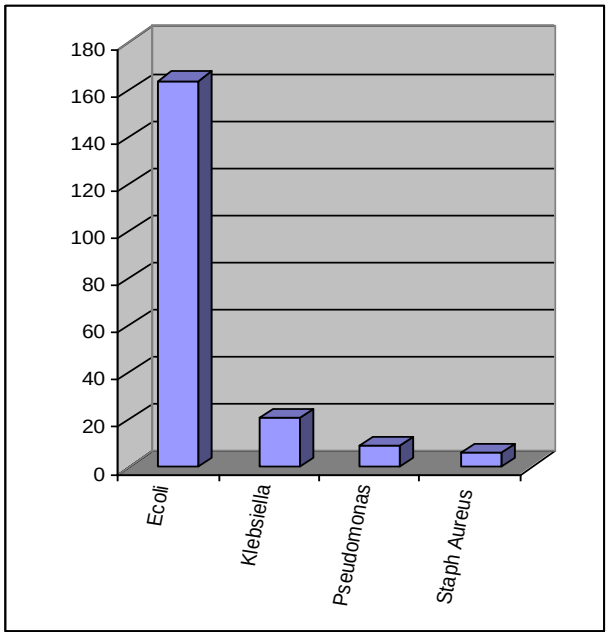


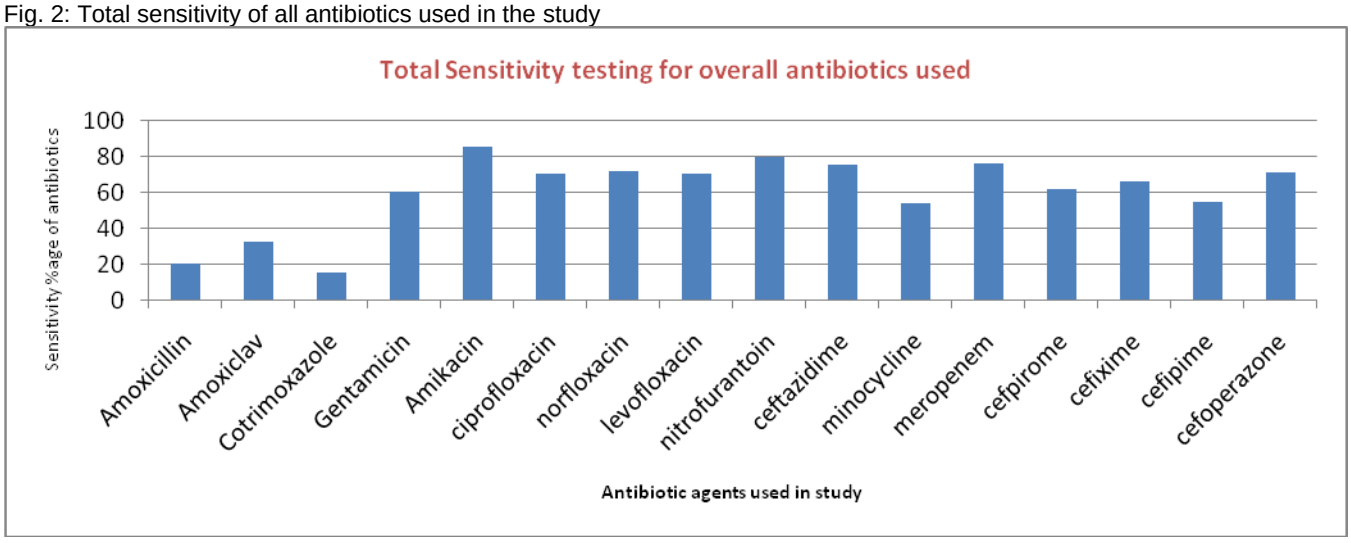
Table 1: Overall percentages of uropathogens sensitivity to antibiotics

Antibiotics	Sensitivity	Resistance
Amoxicillin	20.12%	79.88%
Amoxiclav	32.56%	67.44%
Cotrimoxazole	15.18%	84.82%
Gentamicin	60.64%	39.36%
Amikacin	85.41%	14.59%
Ciprofloxacin	70.43%	29.57%
Norfloxacin	71.63%	28.37%
Levofloxacin	70.43%	29.57%
Nitrofurantoin	80.15%	19.85%
Ceftazidime	75.43%	24.57%
Minocycline	54.15%	45.85%
Meropenem	76.2%	24%
Cefpirome	62%	38%
Cefixime	66%	34%
Cefipime	55%	45%
Cefoperazone	71%	29%
Piperacillin-Tazobactam	68%	32%
Ceftriaxone	72%	28%

Table 2: Antibiotic sensitivity & resistance pattern of isolated organisms in UTI

	E.coli (n=164)		Klebsiella (n= 21)		Pseudomonas (n=9)		Staph. Aureus (n=6)	
	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance	Sensitive	Resistance
Amoxicillin	14.8%	85.21%	33%	67%	ND		50%	50%
Amoxiclav	25.2%	74.80%	67.52%	32.48%	ND		66.6%	33.34%
Cotrimoxazole	14.8%	85.20%	10.34%	89.66%	ND		54.52%	45.48%
Gentamicin	51.3%	48.70%	61.90%	38.1%	44.4%	55.56%	50%	50%
Amikacin	97.6%	2.4%	85.71%	14.29%	55.5%	44.45%	ND	
Ciprofloxacin	66.46%	33.54%	66.6%	33.34%	66.6%	33.34%	66.6%	33.344%
Norfloxacin	73.1%	26.9%	71.42%	28.6%	77.7%	22.3%	66.6%	33.34%
Levofloxacin	74.4%	25.6%	71.42%	28.6%	60.54%	39.46%	66.6%	33.34%
Nitrofurantoin	91.46%	8.52%	76.10%	23.9%	ND		83.3%	13.1%
Ceftazidime	79.26%	20.74%	71.42%	28.6%	88.8%	11.2%	ND	
Minocycline	73.1%	26.9%	11.48%	88.52%	12.38%	87.62%	20.22%	79.78%
Meropenem	73.1%	26.9%	71.4%	28.6%	55.5%	44.45%	66.6%	33.34%
Cefpirome	61%	39%	57.1%	43%	44.4%	55.56%	50%	50%
Cefixime	60%	40%	62%	38%	66.6%	33.34%	50%	50%
Cefipime	74.3%	26%	48%	52%	55.5%	44.45%	33.3%	66.7%
Cefoperazone	58%	42%	52.3%	48%	44.4%	55.56%	33.3%	66.7%
Piperacillin-Tazobactam	30.4%	70%	48%	52%	ND		20.2%	79.78%
Ceftriaxone	76.2%	23.8%	66.6%	33.4%	77.7%	22.3%	ND	

Fig. 2: Total sensitivity of all antibiotics used in the study



DISCUSSION

Urinary tract infections (UTIs) are the frequent diseases universally and the relationship of antimicrobial resistance fluctuates in various sections. Due to the widespread use of antibiotics at community level there is increasing pattern of resistance of micro-organisms to the common antibiotics. UTIs cause seven million office visits and 100,000 hospitalizations annually in United States, so they are the most frequent bacterial infection in outpatients[14,15].

The use of drugs for urinary tract infection (UTIs) have changed from Co-trimoxazole to quinolones due to emergence of resistance and increased rate of treatment failure which leads to clinical failure. Reports from Canada and United States indicate that there is increased level of resistance to Cotrimoxazole from 15% to 25%. The use of fluoroquinolones is recommended, for uncomplicated UTIs, in areas where the incidence of resistance to Cotrimoxazole is more than 10%, as well as for the treatment of complicated UTIs and acute pyelonephritis[16,17].

Among the bacteria which are responsible for causing UTIs, Escherichia coli is still a frequent cause, other bacteria like Enterobacteriaceae, Pseudomonas aeruginosa, and Staphylococcus aureus are frequently isolated. In general, etiology and resistance patterns are not predictable for the person having severe urinary tract infection, which requires confirmation by culture and sensitivity tests[18].

A total of 230 urine culture reports were analyzed in this study between January 2012 and December 2012. The predominant growth of single

bacteria was observed in 200(87%) samples. In our study, we found a significant growth of Escherichia coli, Klebsiella, Pseudomonas, and Staphylococcus aureus. These represented 82%, 164; 10.5%, 21; 4.5%, 9 and 3%, 6 respectively of isolates.

In the present study, a high level of bacterial resistance was seen to Cotrimoxazole and Amoxicillin as they are effective against 15% and 29% of the micro-organisms respectively. Amoxiclav, Minocycline and Cefipime were slightly better and showed activity in 32%, 54% and 55% cases respectively.

There is increased rate of resistance against antibiotics such as amoxicillin and cotrimoxazole and out of these amoxicillin was not very useful as compared to cotrimoxazole against isolated bacteria[19].

The high prevalence of resistance to normally used antibiotics such as Cotrimoxazole, Amoxicillin and Amoxiclav has resulted in substantial fear[20]. The most successful anti-microbial agents in this study and other accounted researches were Amikacin, Nitrofurantoin, Ceftazidime, and Meropenem. Based on the study results, it has been found that the vulnerability of the bacteria to ciprofloxacin and other antibiotics was comparable to other studies[21] and the efficacy of Amikacin was also similar to other reports.

CONCLUSION

In the end we can conclude that the choice of drugs to be used for the treatment of UTI is moderately limited because of wide amount of resistance that the usual UTI organisms show against drugs which have been given previously. Drugs like Cotrimoxazole and aminopenicillins were believed to be effective against uropathogens are now rarely prescribed as initial therapy in areas where level of resistance to these antibiotics is high. But it is clear that Nitrofurantoin, fluoroquinolones and Minocycline are good choices for treating outpatients. To deal with the future problems of extended spectrum beta-lactamase (ESBL) producing E.coli, Nitrofurantoin is again an option along with Amikacin.

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