Bacteriological Profile and Antibiogram of Urinary Tract Infections at Microbiology Laboratory of a Private Teaching Hospital

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ABSTRACT

Background: Globally millions of people are affected by urinary tract infections. Susceptibility results of various laboratories indicated that most of the bacteria are developing resistance to the commonly used antimicrobial agents. Regular reviews of susceptibility is necessary for the use of specific antibiotics to avoid resistance.

Objective: To ascertain the distribution of the bacterial strains and their susceptibility to the commonly used drugs.

Material and Methods: The data of retrospective study was collected from microbiology laboratory of Peshawar Medical College from 1st May 2018 till 31st October 2018. The data obtained was statistically analyzed by using Statistical Package for the Social Sciences (SPSS) version 21.

Results: Urinary tract infection was most common in females (70.80%) as compared to males. It is common among the age group (21-40years). Most commonly isolated bacteria are gram negative bacteria. 71.4% of the cases among gram negative bacteria were of Escherichia coli (E.coli).

Conclusion: The results of the present study indicated that we have a very high percentage of urinary tract infections caused by E. coli which is mostly multi drug resistant infection. Therefore to prevent the development of further resistance, antibiotics should be prescribed after proper bacteriological examination along with culture and sensitivity.

Key Words: *Uropathogen, antimicrobial resistance, urinary tract infection*

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INTRODUCTION

The detection of bacteria in any part of the urinary tract (kidney, ureters, bladder and urethra) is known as urinary tract infection or UTI[1,2]. It is the most commonly encountered infection in medical practice and affects people of all age groups (infants to old age). It is estimated that 150 million people present annually to the hospitals with complaints of UTI. This affliction being the problem of developing and developed countries (alike), affects (around) 8.1 million patients annually in USA, who seek treatment for their condition. With a life time prevalence of 37%, UTI is the third most common infection in younger age group. Predominance towards female gender is shown i.e.(3%) as compared to males (1%) . It is also common in adult females as compared to males because of the short urethra, large bacterial load in the urothelial mucosa and some other factors such as obstruction in the urinary tract, sexual contact, use of birth control pills and pregnancy.[3] UTI is associated with higher rates of mortality and morbidity in children and if not treated early and effectively, it can lead to chronic complications like chronic pyelonephritis, stricture formation, permanent kidney damage and sepsis.[4]

Urinary tract infections are conventionally divided into complicated and uncomplicated types. Complicated UTIs affect males and females of any age group and are mostly associated with structural abnormality, diabetes, and immobility. The classical symptoms, with which UTI presents, are supra-pubic pain, fever, loin tenderness along with urgency and frequency[5]

The most commonly isolated pathogenic organism causing UTI is a gram negative bacillus(E. coli) which accounts for 80%-90% of the infections[6]. Other bacteria isolated in UTI include Klebsiella pneumoniae, Enterococcus, Enterobacter spp, Pseudomonas aeruginosa, Proteus mirabilis and Staphylococci[7].Bacteria that affect the urinary system are developing resistance to the commonly prescribed antibiotics at a very alarming rate; the reason being self medication and starting of a treatment regimen before obtaining an antimicrobial susceptibility profile of the organism.[8]

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E. coli and Staphylococcus aureus are the most predominant organisms that cause UTI in Pakistan. It is highly sensitive to Amikacin (2.2%). The second commonest organism found is staph aureus which is most sensitive to second generation cephalosporin (88.8%) followed by Nitrofurantoin (77.7%), Amikacin (80.6%) and Norfloxacin (65.5%). The third commonest organism that is found in our society is Klebsiella which is sensitive to Norfloxacin (75%) and nitrofurantoin (75%)[9]

The gold standard test for the diagnosis of UTI is a complete bacteriological profile with antimicrobial susceptibility. However, patients who present to outpatient department with symptoms of UTI are given antibiotics prior to a proper bacteriological examination of urine and antibiogram, which may lead to antibiotic resistance.[10]

The aim of the study is to ascertain the frequency of the bacterial strains involved in UTI and their susceptibility to the commonly used antimicrobial agents used in our setups.

MATERIAL AND METHODS

In this retrospective study, we retrieved data of 258 patients between 1 to 90 years of age, recorded in Microbiology laboratory of Peshawar Medical College (PMC) from 1st May 2018 till 31st October 2018. Most of these patients were referred from Kuwait Teaching Hospital, Mercy Teaching Hospital and Prime Teaching Hospital (allied teaching hospitals of Peshawar Medical College).

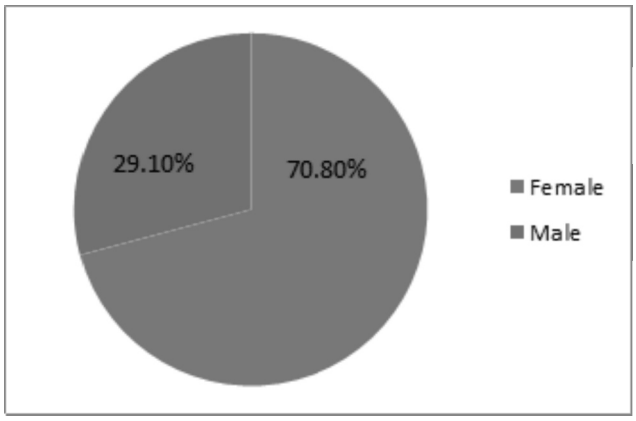
The protocol followed in our setup is that samples are collected in packed sterile bottles and transported to Peshawar Medical College Microbiology laboratory within 1-2 hours. The samples are inoculated on blood and MacConkey's agar by using a calibrated loop after through mixing of urine. These plates are then incubated for 24 hours at 37C in incubator.

Out of 258 samples, 175 cases showing bacterial growth were included in the study while 83 cases showing no growth after 48hours were excluded. After growth of bacterial colonies, antibiotic susceptibility is performed by Kirby-Bauer disk diffusion method using standard protocols provided by clinical and laboratory standard institute 2013. Bacterial growth was tested against disks of penicillin, ampicillin, amoxicillin, coamoxiclav, erythromycin, cotrimoxazole, methicillin, cloxacillin, chloramphenicol, tetracycline, cephalexin, vancomycin, clindamycin, minocycline, rifampicin, fusidic acid, imipenem/meropenem, gentamycin, tobramycin, amikacin, nitrofurantoin, urixin, nalidixic acid, norfloxacin, ciprofloxacin, ofloxacin, enoxacin, levofloxacin, sparfloxacin, doxycycline, linezolid, azithromycin, piperacillin, tazocin, aztreonam, ceftazidime, cefoperazone, sulzone, ceftriaxone, cefotaxime, cefuroxime, cefaclor, metronidazole. Data was analyzed in SPSS version 21 for statistical analysis.

RESULTS

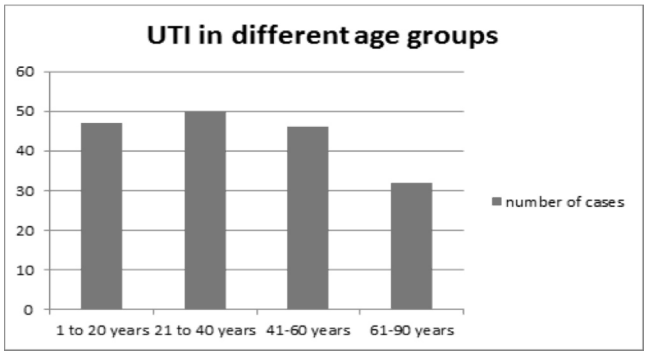
Data of 258 patients was recorded with mean age of 36.971. The minimum age recorded was 6 months while maximum age was 90 years. Out of 258 patients, 175(67.8%) urine samples showed significant bacterial growth. Results showed a female predominance i.e. 124(70.8%). 51(29.15%) were males.

Graph 1: Gender distribution of patients presenting with UTI



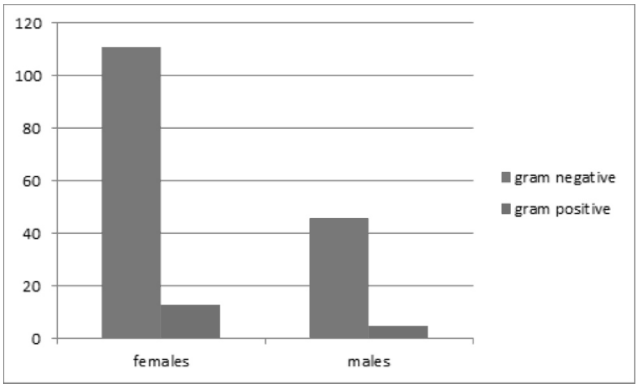
Age wise patients were divided into 4 groups of which highest numbers of cases were recorded in age group 41 to 60 years.

Table 1: UTI among different age groups



Gram positive and negative bacteria were seen in both genders which showed the high prevalenceofgram negative bacteria in female (table 2)

Table 2: Gender wise distribution of gram negative and positive bacteria



Among all the specimen Gram negative bacteria were more (89.7%) while gram positive cocci were only 10.2%. The most commonly isolated uropathogen was E. coli (71.43%) followed by Staphylococcus (10.29%), Klebsiella (7.34%), Pseudomonas (6.28%), Enterobacter (4%) and Citrobacter (0.57%) (Table 3)

The highest number of isolated uropathogen is E.coli which exhibited highest resistance to ampicillin (100%) followed by co-trimoxazole (92%), ciprofloxacin (76%), coamoxiclav (57.6%), amikacin (40%), ceftriaxone (56%), norfloxacin (29.6%), tazocin and nitrofurantoin (1.6%), imipenem (4%) as shown in Table 4

DISCUSSION

Microbial invasion and it's multiplication in the urinary tract leads to infections[8]. In our society the etiology of urinary tract infection and its susceptibility towards antibiotics have been constantly changing through the past years because of self-medication and unnecessary treatment regimen prior to exact diagnosis. As a result bacteria have developed antibiotic resistance which makes these infections very difficult to treat[11]

In present study, 67.8% of patients who had complaints like urgency, frequency, dysuria and fever had bacterial etiology. A female predominance was shown 70.85% (n=125) as compared to males 29.15 % (n=51) represented in Graph 1. Females are more prone to UTI because

Table 3: Number of Isolated Gram negative and Gram positive bacteria

Bacteria	Female	Male	Total	Percentage
Gram negative Bacteria				
E. coli	94	31	125	71.43%
Pseudomonas	3	8	11	6.28%
Klebsiella	10	3	13	7.43%
Enterobacter	4	3	7	4%
Citrobacter	0	1	1	0.57%
Gram positive Bacteria				
staphylococcus	13	5	18	10.29%
Total	124	51	175	100%

Table 4: Antibiotic susceptibility pattern of isolated organisms

	E.COLI	PSEUDOMONAS	ENTEROBACTER	KLEBSIELLA	CITROBACTER	STAPHYLOCOCCUS
Ampicillin	125	11	5	10	1	18
Cotrimaxazoe	115	11	3	8	1	14
Coamoxiclav	72	11	3	5	1	8
Amikacin	50	2	0	2	0	1
Ciprofloxacin	95	9	0	1	1	17
Imipenem	5	4	0	1	0	1
Tazocin	2	3	0	0	0	1
Nitrofurantoin	2	0	2	0	0	2
Norfloxacin	37	0	1	0	0	1
Ceftriaxone	70	9	1	1	0	12

of the anatomical structure (shorter urethra), high bacterial load in the urothelial mucosal lining and sexual activity[6]. In our study most of the cases were recorded among the middle age patients (21to 40 years). Results were compared to other studies that showed 49% of prevalence in the same age group[12,13]. UTI was also reported in children who were of 6 months only.

Analysis of our study shows that E. coli is the most common Uropathogen ,which accounts for (71.4%) of infected cases. The treatment of this organism is becoming increasingly difficult because of the resistance they have acquired against many antibiotics. It is alarming to observe the presence of such resistant strains in the environment[10]. E. coli was followed by staphylococcus (10.2%), Klebsiella (7.4%), pseudomonas (6.2%), Enterobacter (4%) and Citrobacter (0.5%) as shown in table 3.Isolated E. coli showed 100% resistance to Ampicillin and 92% resistance to cotrimoxazole. It also showed multidrug resistant patterns (resistant to more than three drugs at the same time). Different studies conducted across Pakistan showed resistance of E. coli to commonly used antibiotics like ampicillin and cotrimoxazole [11,14]

In our study gram positive bacteria i.e. staphylococcus was the second most frequent organism found (10.2%) and had maximum resistance towards ampicillin, ciprofloxacin, cotrimoxazole, ceftriaxone and coamoxiclav. However, they showed high susceptibility towards tazocin, methicillin and amikacin. Among 18 staphylococcus isolated samples, 1 sample was methicillin resistant staphylococcus aureus (MRSA).

Treatment of UTI has become more challenging over the past few decades because of the emerging bacterial resistance. Effective measures for awareness and education of common man as well as health personals about the correct use of antibiotics is needed[15]

The drugs of choice for UTI have become quinolones due to the fact that resistance is shown by bacteria against the commonly used drugs like ampicillin and co-trimoxazole. This effectiveness is due to the ability of the drug to target multiple sites on the bacteria rather than involving one or two target sites[5]. In our study E. coli exhibited highest resistance to ampicillin (100%) followed by co-trimoxazole (92%), ciprofloxacin (76%), coamoxiclav (57.6%), Amikacin (40%), ceftriaxone (56%), norfloxacin (29.6%), tazocin (1.6%), nitrofurantoin (1.6%) and imipenem (4%). Other studies also showed complete resistance of E.coli in UTI towards ampicillin and co-trimoxazole [16,17.]

CONCLUSION

In conclusion, the results of the present study indicated that we have a very high percentage of urinary tract infections caused by E. coli which is mostly multi drug resistant. Therefore, to prevent the development of further resistance, antibiotics should be prescribed after proper bacteriological examination along with culture and sensitivity.

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