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FREQUENCY AND SUSCEPTIBILITY PROFILE OF PATHOGENS CAUSING URINARY TRACT INFECTIONS (UTIS)

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Abstract:
Objective: *To determine the frequency of bacterial agents responsible for Urinary Tract Infections (UTI) and to get an updated knowledge about their pattern of antibiotic susceptibility*
Methods: *Descriptive cross sectional study was conducted for duration of 8 months at Microbiology laboratory of Benazir Bhutto Hospital, Rawalpindi, starting from March, 2019 to November, 2019. Urine cultures specimens from 440 patients with most common bacterial agents causing Urinary Tract Infections i.e. E.coli, Staphylococcus Aureus, Klebsiella, Enterococcus Faecalis, Pseudomonas Aeruginosa, Staphylococcus saprophytic Proteus Mirabilis were included. Specimens causing bacterial agents which are less likely to cause urinary tract Infections were excluded. Non-probability consecutive sampling technique was used to collect data. Data was collected with the help of Self structured Performa and laboratory testing. Data was analysed by using software, SPSS (Statistical Package for the Social Sciences) Version 22. Frequency and percentages were calculated. The research was conducted after due permission from the ERC (ethical review committee) and permission from pathology department of Benazir Bhutto Hospital, Rawalpindi.*
Results: *Study showed that out 440 urine samples collected from patients 296(67.3%) were female and 144 (32.7%) were male. According to our study findings Infective Agent E. coli is responsible for 74.8% cases, Klebsiella causes 10.5% , Enterococcus causes 5.5%, S. Aureus causes 3.9%, Pseudomonas causes 2.7%, Acinetobacter causes 1.4%, Enterobacter causes 1.1%, Proteus causes 0.2% of cases. Isolated Gram negative are susceptible to different antibiotics, proteus is susceptible to Piperacillin, Ceftriaxone, Gentamicin, Amoxicillin, Aztreonam, Ciprofloxacin, Sulzone, Meropenim. Enterobacter is susceptible to Aztreonam, Meropenim, Vancomycin. Pseudomonas is susceptible to Amikacin, Ciprofloxacin, sulzone, fosfomycin. Klebsiella is susceptible to Fosfomycin. E.coli is susceptible to Doxycycline. Gram positive bacteria(S. Aureus and enterococci) is susceptible to vancomycin.*
Conclusion: *Women have higher rate of Urinary tract Infections as compared to men. Urinary tract infections are caused more because of causative gents of Gram negative bacteria.*
Keywords: *Antibiotics, Bacterial Growth, Urine Sample, Urinary tract Infections.*

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INTRODUCTION:

Amongst common causes of illness in general population, one very important cause is Urinary Tract Infection (UTI) and among hospital visits it is considered to be the second most common cause.(1) Infection in any part of urinary system kidneys, bladder, ureters or urethra is known as urinary tract infection (UTI). Studies have shown that most urinary tract infections involve the lower urinary tract i.e. the bladder and the urethra, also known as cystitis, causing dysuria, urgency, frequency, and sometimes suprapubic tenderness.(2) Infection in urinary tract can include lower urinary tract only or both lower and upper urinary tracts.(3) Upper urinary tract infection can coexist with lower urinary tract Infection, during diagnosis both should be considered and patient should be tested for both. There are different kinds of pathogens affecting urinary tract causing infections some are gram positive and some are gram negative bacterial agents or pathogens including E. coli, Klebsiella, Enterococcus, S. Aureus, Pseudomonas, Acinetobacter, Enterobacter and Proteus.(4)

According to study conducted in Africa 32.3% patients attending hospital had urinary tract Infection.(5) Short-term morbidity in terms of fever, dysuria, and lower abdominal pain may appear during urinary tract infection and included in sign and symptoms of urinary tract infection. However, some times in urinary tract Infection no apparent symptoms i.e. asymptomatic.(6) There are several risk factors associated with urinary tract Infection is associated with incontinence, catheterization, age, sexual intercourse, pregnancy, menopause, antibiotic , use of diaphragm and spermicide, delayed post-coital micturition, use and a previous history of urinary tract Infection, reoccurrence is common in urinary tract Infections. Urinary tract infection not only reduces quality of life but is considered to be serious threat to public health care.(7)

Different drugs are used to treat urinary tract infection such as Piperacillin, Cefalexin, Ceftriaxone, Gentamicin, Amikacin, Amoxicillin, Nitrofurantoin, Aztreonam, CoTrimoxazol, Ceftazidime, Ciprofloxacin, Sulzone, Fosfomycin, Meropenim, Vancomycin, Imipenem, Cefepime and Doxycycline. Most of antibiotic drugs prescribed for urinary tract Infection is prescribed in primary health care.(8) Antibiotics for infection have been helpful in not only shortening the duration of symptoms but also prevent reoccurrence of infections. Drug resistance against Urinary Tract Infections (UTIs) is major problem worldwide. (9) Self-medication usage of antibiotics is common in different parts of the world, in countries where antibiotics are sold without prescription and illegally. Resistance may be reduced by prescribing less antibiotics and reducing inappropriate prescriptions. Excessive and inappropriate antibiotic prescribing only serves to increase unwanted side effects and the risk of antibiotic resistance both in individually treated patients and at the societal level. In health care practice the initial prescription of antibiotics for urinary tract infections is usually without knowing the causative pathogen and their susceptibility to antibiotics being prescribed..(10) Increased drug resistance causes more severe infections and complications along with longer hospital stays and increasing mortality rate. Overprescribing of antibiotics is associated with an increased risk of adverse effects, more frequent re-attendance and increased medicalization of self-limiting conditions. One of important cause of antibiotic over prescription is diagnostic uncertainty. Test those are easy to use and interpret, precise accurate, fast and reliable using standard laboratory procedure and techniques should be used to find out causative agent and prescribing appropriate medication improving overall health and medical practice. (11)

The rationale behind conducting this study is to determine the pattern of bacterial agents responsible for urinary tract infections (UTIs) in Benazir Bhutto Hospital, Rawalpindi and to have an updated knowledge about their antibiotic susceptibility and resistance pattern. This might help the clinicians while choosing the antibiotics in empirical treatment of Urinary tract infections till the infective agents are identified by culture sensitivity.

MATERIAL/SUBJECTS/PATIENTS AND METHODS

Descriptive cross sectional study was conducted for duration of 8 months at Microbiology laboratory of Benazir Bhutto Hospital, Rawalpindi, starting from March, 2019 to November, 2019. Urine cultures specimens from 440 patients with most common bacterial agents causing Urinary Tract Infections i.e. E.coli, Klebsiella spp., Enterococcus Faecalis, Proteus Mirabilis, Staphylococcus Aureus, Pseudomonas Aeruginosa, Staphylococcus saprophytic were included. Specimens causing bacterial agents which are less likely to cause urinary tract Infections were excluded. Non-probability consecutive sampling technique was used to collect data. Data was collected with the help of Self structured Performa and laboratory testing. Data was analyzed using software, SPSS (Statistical Package for the Social Sciences) Version 22. Frequency and percentages were calculated. ALL ethical consents were taken in consideration. The research was conducted after due permission from the ERC (ethical review committee) and permission from pathology department of Benazir Bhutto Hospital, Rawalpindi.

RESULTS:

Table 1 Results for gender distribution in Urine sample

Gender	**No.**	**%**
Male	144	32.7
Female	296	67.3
Total	440	100

Table 2 Relationship between UTI cases and associated bacteria

Infective Agent	**No.**	**%**
E. coli	329	74.8
Klebsiella	46	10.5
Enterococcus	24	5.5
S. Aureus	17	3.9
Pseudomonas	12	2.7
Acinetobacter	6	1.4
Enterobacter	5	1.1
Proteus	1	0.2
Total	440	100

Table 3**:** Isolated Organisms and Their Susceptibility to Common Antibiotics

ANTIBIOTICS	INFECTIVE AGENTS							
	E.Coli	Klebsiella	Enterococcus	S.Aureus	Pseudomonas	Acinetobacter	Enterobacter	Proteus
Piperacillin	90	93	57	-	90	0	75	100
Cephalexin	-	-	22	93	-	-	0	-
Ceftriaxone	27	18	0	-	67	0	75	100
Gentamicin	52	62	0	50	89	0	50	100
Amikacin	87.8	80	-	-	100	-	-	-
Amoxicillin	28	29.4	47.6	82.3	-	-	50	100
Nitrofurantoin	95.3	90	90	-	16.6	0	50	-
Aztreonam	32.6	34.7	0	-	75	0	100	100
CoTrimoxazole	21.2	85.7	40	-	28.5	0	50	0
Ceftazidime	21.4	50	0	-	0	-	-	-
Ciprofloxacin	32.9	33.3	0	66.6	100	0	50	100
Sulzone	91.1	95	53.8	-	100	0	91	100
Fosfomycin	97.3	100	0	-	100	-	-	-
Meropenim	95.2	96.9	18.1	-	80	25	100	100
Vancomycin	-	-	100	100	-	-	100	-
Imipenem	90	80	0	-	-	0	0	-
Cefepime	54.5	66.6	0	-	87.5	-	100	-
Doxycycline	100	-	20	94.1	-	33.3	50	-

DISCUSSION:

According study findings urinary tract Infection is common in females, mostly caused because of gram negative bacteria. Different kinds of antibiotics are helpful in management of urinary tract.

Results of our study showed most of urinary tract infections were caused by E.coli which is supported by previous study conducted by Muhammad Salman Rasool, Fraz Siddiqui, Munazza Ajaz et. all conducted research in year 2019 on topic "prevalence and antibiotic resistance profiles of Gram negative bacilli associated with urinary tract infections (UTIs) in Karachi, Pakistan" according to results of study E. coli (71%) was the most prevalent Gram negative bacteria causing urinary tract infection. E. coli isolates of indoor patients 77% and for outdoor patients were 59% were found resistant to Cefotaxime. Klebsiella pneumoniae was found to be resistant to Ampicillin. In isolates of indoor patients showed higher resistance in Ps. aeruginosa as compared to outdoor patients, showing susceptibility rate of Nitrofurantoin (81%), Ciprofloxacin (76%), Cefoperazone-sulbactam (60%), Ampicillin (86%), Ceftazidime (59%), Fosfomycin (12%), Imipenem (49%) and Amikacin (39%) Piperacillin-tazobactam(53%). Resistance of lower level was seen in Acinetobacter. Imipenem, Nitrofurantoin, Fosfomycin, Cefoperazone-sulbactam, Piperacillin-tazobactam and Amikacin came out to be most effective in urinary tract infections induced because of gram negative urinary tract infection.(12)

This study concluded females are more affected by urinary tract infections which is in relevance with study "Prevalence and Antimicrobial Susceptibility Patterns of Bacterial Pathogens in Urinary Tract Infections in University Hospital of Campania "Luigi Vanvitelli" between 2017 and 2018" conducted in 2019 by Veronica Folliero, Pina Caputo, Maria Teresa Della Rocca et. all. Results showed 31% were positive and 69% negative for bacterial growth. Out of them 60% were females, while 39.9% were males. Results of study showed that older individual with age above 61 were effected most. Pathogenic strains showed 78.5% were Gram-negative and 19.7% were Gram-positive. Isolated Gram-negative strain Escherichia coli was found to be most frequently consisting of 53.5%. Enterococcus faecalis contributed in 12.9% cases and considered the most frequent Gram-positive strain. Gram-negative bacteria pathogens were highly resistant to antibiotic ampicillin, whereas Gram-positive bacteria pathogens were highly resistant to antibiotic erythromycin.(13)
Our study showed that E.coli from gram negative bacterial pathogen contributed in most cases which is supported by previous study conducted by Heba Takleef Majeed and Ahmed Abduljabbar Jaloob Aljanaby in their study "Antibiotic Susceptibility Patterns and Prevalence of Some Extended Spectrum Beta-Lactamases Genes in Gram-Negative Bacteria Isolated from Patients Infected with Urinary Tract Infections in Al-Najaf City, Iraq" in year 2020 is also in accordance with our study, showing total of 126 isolated strain of gram negative bacterial pathogens. Results showed Escherichia coli (E. coli) was the most prevalent bacterium with 49 isolates, than 35 isolates by Idebsiella pneumonia followed by 18 isolates from Pseudomonas aeruginosa 12 isolates of Citrobacter freundii, 8 isoltes from Enterobocter aerogenes and only 4 isolates from Proteus mirabilis. Study also concluded that all bacterial isolates from Urinary Tract Infection patients with Without Kidney Disease were resistance to antibiotics to some extent.(14)

HJ Ho, MX Tan, MI Chen, TY Tan et all conducted research on topic "Interaction between antibiotic resistance, resistance genes, and treatment response for urinary tract infections in primary care" in year 2019 concluded urinary tract infection occurred 87% in female. Escherichia coli was considered most common pathogen, contributing in 76% of cases. Enterobacteriac were highly susceptible to antibiotic amoxicillin-clavulanate, nitrofurantoin and fosfomycin. Ciprofloxacin and co-trimoxazole showed lower resistance levels. Isolates that were resistant to appropriate indicative antibiotics were further tested, according to which 67% of patients given antibiotics with susceptible isolates reported early resolution. Genitourinary abnormalities such as urinary tract infection were also associated with resistance of ciprofloxacin and co-trimoxazole. Resistance Indian ethnicity and diabetes mellitus were associated with amoxicillin-clavulanate resistance..(15) These results also support results from this study bacterial pathogens causing urinary tract infection and drug resistance developed because of inappropriate antibiotic intake.

CONCLUSION:

Women have higher rate of Urinary tract Infections as compared to men. Urinary tract infections are caused more because of causative gents of Gram-negative bacteria.

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