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ORIGINAL ARTICLE

Frequency of urinary tract infections and antimicrobial susceptibility profile among pregnant females.

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ABSTRACT… Objective: To assess the frequency of UTIs in pregnant females. **Study Design:** Cross-sectional study. **Setting:** Department of Gynae and Obstetric, Akhter Saeed Trust Hospital, Lahore. **Period:** September 2023 to February 2024. **Methods:** The study was conducted on 300 urine samples collected from pregnant females. Firstly, the urine samples were analyzed for routine examination. A urine culture was performed on CLED agar. The antimicrobial susceptibility testing was done by using the modified Kirby-Bauer method. The obtained results were recorded and analyzed by using SPSS 25.0 software. **Results:** The mean age of pregnant females was 26.7±4.510. Among 300 urine samples, 120 samples showed positive growth on CLED agar. The growth of Escherichia coli (38.33%) was the highest among them followed by Pseudomonas aeruginosa (25.00%), Candida species (20.09%), and Klebsiella species (16.66%). **Conclusion:** The overall frequency of UTI in pregnant females was high and, in this study, it was reported to be 40.00%.

Key words: Antimicrobial Susceptibility, Pregnant Females, Urinary Tract Infections.

INTRODUCTION

The most typical bacterial infections contracted in hospitals and by the general public are urinary tract infections (UTIs). UTIs are typically self-limiting in people without anatomical or functional problems, but they tend to return. UTIs are the most common bacterial infections in humans especially in females caused by the presence and growth of microorganisms in the urinary tract. They may involve the lower urinary tract or the bladder during pregnancy.[1] Lower urinary tract infections involve the bladder and urethra, whereas upper urinary tract infections involve the kidney, pelvis, and ureter. The majority of UTIs are caused by ascending infection.[2] UTIs can affect the kidneys (pyelonephritis) or the bladder (cystitis). UTIs can also occur without symptoms (asymptomatic bacteriuria) (ASB). The signs and symptoms of UTIs differ depending on the type. Low socioeconomic status, increasing age, multiparity, sexual behavior, urinary tract anomalies, previous treatment for UTI, other medical conditions such as diabetes and sickle cell disease, and immune-compromised states such as acquired immune deficiency syndrome (AIDS) and spinal cord injuries are all risk factors for ASB.[2,3]

ASB is the detection of bacteria in the urine without any signs or symptoms of a UTI. A urine culture is conducted to confirm the presence of significant growth of pathogens that exceed 105 bacteria/ml in such cases.[4] Pregnancy leads to an increase in plasma volume, which reduces urine concentration. As a result, approximately 70% of pregnant females experience glycosuria, which creates favorable conditions for bacterial growth in the urine. ASB can progress to symptomatic bacteriuria at an accelerated rate during pregnancy, leading to complications such as pyelonephritis, prematurity, low birth weight, and increased fetal mortality rates.[5] UTIs are a common complication during pregnancy, affecting up to 10% of pregnant females. UTIs can be categorized as ASB, where bacteria are present in the urine but without any signs

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of infection, or symptomatic UTIs present with symptoms like pain during urination, frequent urination, and lower abdominal pain. The negative consequences of untreated bacteriuria on both mother and child have prompted researchers to recommend routine culture screening for all pregnant women visiting antenatal clinics to safeguard them against any infection-related complications.[6]

The microorganisms responsible for bacteriuria are similar in pregnant and non-pregnant women, as bacteria from the gastrointestinal tract often inhabit the female urethra. The most common causative agent for both symptomatic and ASB is Escherichia coli, accounting for 70-80% of cases.[7] Other bacteria that can cause bacteriuria include gram-negative bacteria and group B streptococcus.[8] In pregnant females, certain virulence factors present in uropathogenic Escherichia coli strains are linked to invasive infections and pyelonephritis. UTIs can also cause significant discomfort to pregnant females, including pain, burning, and frequent urination. Furthermore, untreated UTIs can lead to more severe infections such as sepsis. The risk of developing UTIs is higher during pregnancy due to various factors, including hormonal changes, reduced immune function, and increased urinary stasis. Bacteria use toxins and adhesions, such as pili or fimbriae, to attach themselves to uroepithelial cells, which impede their entry into the urinary tract. This allows them to multiply and invade the surrounding tissues.[9] So, the present study was designed to assess the frequency of UTIs in pregnant females of different ages.

METHODS

This cross-sectional study was conducted on pregnant females of Akhter Saeed Trust Hospital, Lahore from September 2023 to February 2024. This study was conducted after the approval of the ethical committee (FH/CU/6033/2023). Mid-stream urine samples of 300 pregnant females who were advised by the gynae department as a routine test were collected. The demographic and clinical characteristics were recorded on a pre-designed Performa. Patients with vaginal discharge or bleeding and with underlying chronic renal disease were excluded. Pregnant females who have no history of increased frequency of micturition, dysuria, loin pain, fever and not taking any antibiotics within one month were included.

For routine examination of urine, dipstick Combur 10 (Roche) was used and later urine was assessed microscopically for the presence of pus cells, red blood cells, epithelial cells, crystals, casts, and microorganisms. A urine culture was performed on CLED agar and biochemical tests were performed for the confirmation of positive culture growth. The antimicrobial susceptibility testing was performed on Mueller-Hinton agar by the Kirby Bauer disc diffusion method. The plates were incubated at 37 ^{o}C for 24 hours and interpreted as per CLSI (Clinical and Laboratory Standards Institute 2023) guidelines. The gram-negative rods were tested with amikacin (30ug), amoxicillin-clavulanic acid (30ug), cefipime (30ug), ceftazidime (30ug), ceftriaxone, (30ug), ciprofloxacin (5ug), Fosfomycin (200ug), gentamycin (10ug), imipenem (10ug), levofloxacin (5ug), meropenem (10ug), piperacillin-tazobactam (110ug), tobramycin (10ug), aztreonam (30ug), tetracycline (30ug), nitrofurantoin (300ug), chloramphenicol (30ug) and trimethoprim sulphamethoxazole (25ug) antibiotic discs. Statistical Package for the Social Sciences (SPSS) v.25.0 was used to analyze the data. To determine the percentages and frequencies, descriptive statistics were applied.

RESULTS

The mean age of pregnant females was 26.7$\pm$4.510. Among 300 urine samples, 120 samples showed positive growth on CLED agar as shown in Table-I. The growth of Escherichia coli (38.33%) was the highest among them followed by Pseudomonas aeruginosa (25.00%), Candida species (20.09%), and Klebsiella species (16.66%). The susceptibility pattern of all bacterial isolates was noted and described in Table-II. The overall frequency of UTI in pregnant females was 40.0% (Figure-1).

DISCUSSION

UTI ranked as the second most common infection in the world. In developed countries, UTIs can

easily cured by using antibiotics and easy access to the health care departments so very few patients live with UTIs in those countries. But in developing countries, especially in Pakistan, UTI is still a very common disease. The patients belonging to rural areas of Pakistan report long-lasting UTI symptoms due to limited resources and access to hospitals.[10] The assessment of the frequency of UTIs in pregnant women was the objective of this study.

Growth	Bacterial Isolates n (%)
Escherichia coli	46 (38.33%)
Pseudomonas aeruginosa	30 (25.00%)
Candida species	24 (20.00%)
Klebsiella species	20 (16.66%)

Table-I. Frequency of different bacterial isolates in the urine collected from pregnant females

In the present study, the frequency of UTI (40.0%) was found to be high in pregnant females. A study by Degu Abate[11] also represented that the frequency of UTI in pregnant females (14.1%) was higher as compared to non-pregnant females (8.9%). The same findings were reported from a study conducted in India. They also represented that the frequency of UTI was high in pregnant females (17.5%) when compared with non-pregnant females (5.7%).[12]

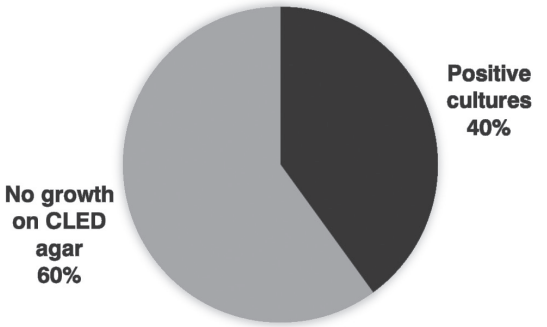

Figure-1. Frequency distribution of urinary tract infections in pregnant females

The frequency of UTI in pregnant females reported in the current study was equal to the frequency reported in a Nigeria study (40%).[13] Urethral dilatation may make pregnant women more susceptible to UTIs, but other factors that may increase the incidence of UTIs include the environment, low socioeconomic level, poor personal cleanliness, and hormonal and physiological changes.[11] Variations in the population and lifestyle might be the cause of the disparity in frequencies.

Antibiotics	Escherichia coli n (%)	Klebsiella Species n (%)	Pseudomonas Aeruginosa n (%)
Amoxicillin / Clavulanic acid	15 (32.60%)	07 (35.00%)	-
Piperacillin / Tazobactam	16 (34.78%)	08 (40.00%)	09 (30.00%)
Ceftriaxone	12 (26.08%)	05 (25.00%)	-
Ceftazidime	12 (26.08%)	05 (25.00%)	08 (26.66%)
Cefepime	12 (26.08%)	05 (25.00%)	24 (80.00%)
Amikacin	37 (80.43%)	14 (70.00%)	19 (63.33%)
Gentamicin	32 (69.56%)	15 (75.00%)	20 (66.66%)
Tobramycin	42 (91.30%)	16 (80.00%)	22 (73.33%)
Ciprofloxacin	12 (26.08%)	06 (30.00%)	09 (30.00%)
Levofloxacin	15 (32.60%)	07 (35.00%)	09 (30.00%)
Imipenem	40 (86.95%)	16 (80.00%)	24 (80.00%)
Meropenem	38 (82.60%)	17 (85.00%)	24 (80.00%)
Aztreonam	32 (69.56%)	08 (40.00%)	18 (60.00%)
Tetracycline	10 (21.73%)	04 (20.00%)	13 (43.33%)
Trimethoprim/Sulfamethoxazole	16 (34.78%)	07 (35.00%)	-
Fosfomycin	32 (69.56%)	11 (55.00%)	14 (46.66%)
Nitrofurantoin	29 (63.04%)	12 (60.00%)	16 (53.33%)
Chloramphenicol	37 (80.43%)	14 (70.00%)	-

Table-II. Antimicrobial Susceptibility of different antibiotics against different isolates from urine samples

The present study showed that the gram-negative organisms were responsible for UTI in pregnant females. The findings of the present were in agreement with other studies conducted elsewhere in the world, like Pakistan[14], Eastern Ethiopia[11], Addis Ababa[15], India[16], and Sudan.[17] The most predominant causative agent of UTIs in this study was Escherichia coli (38.33%) followed by Pseudomonas aeruginosa (25.00%), Candida species (20.09%), and Klebsiella species (16.66%). A study conducted by Sarwar et al.[18] in various regions of Pakistan isolated 370 pathogenic bacterial isolates from 520 pregnant females. They concluded that the most of gynecological infections (71%) were caused by Escherichia coli (41.6%). Another study from Umema Asmat et al.[14], represented that the frequency of UTI in pregnant females was 81% with Escherichia coli (31%), followed by Klebsiella species (23%), Pseudomonas species (16%), Streptococcus species (4%), Enterococcus species (4%), Staphylococcus species (4%), and Proteus species (3%).

According to a recent study by Lee et al.[19], Escherichia coli and Klebsiella species were responsible for 50% of bacteriuria in Bangladeshi pregnant women. Additionally, they detected bacteriuria from Group B streptococcus species (5.3%) and Staphylococcal species (23%). Similar findings were made by Majumder et al.[20], and Haque et al.[21], who found that up to 75% of isolates were Escherichia coli and up to 11% were Klebsiella species. Recurrent UTIs left untreated may have a significant role in the development of harmful consequences in both mothers and fetuses, including pyelonephritis, cystitis, and low birth weight. Uropathogenic bacteria have the potential to infiltrate the urothelium and evade normal clearance during bladder emptying, leading to recurrent UTIs.[14]

An increasing number of people worldwide are becoming resistant to antibiotics, especially in developing countries like Pakistan. The results of this study show that pregnant women had decreased rates of antibiotic sensitivity to common antimicrobial drugs used to treat UTIs. The general patterns of antimicrobial sensitivity against Escherichia coli, Klebsiella species, and Pseudomonas aeruginosa were described (Table-II). According to the World Health Organization (WHO), Escherichia coli (68%) and Klebsiella species (81%) isolates were found to be resistant to third-generation cephalosporin medicines.[22,23] Comparably, other pertinent research on Pseudomonas species, Klebsiella species, Escherichia coli, and other uropathogenic bacteria has also been published.[19,24,25]

CONCLUSION

The chances of UTI in pregnant females are high and 40% of pregnant females acquired UTI. During the early antenatal visit, it was emphasized that a urine complete examination should be performed as routine screening and urine culture in high-risk patients.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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2	Ambreen Mumtaz	Review of the paper.	
3	Qurat ul Aian Munir	Data collection.	
4	Atiqa Arshad	Drafting.	
5	Zainab Yousaf	Statistical analysis, writing.	
6	Raana Akhtar	Literature review.	