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Original Article

PREVALENCE OF ASYMPTOMATIC URINARY TRACT INFECTION IN PREGNANT AND NONPREGNANT WOMEN IN A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Objective: The study's main objective was to isolate and characterize the bacteria that cause asymptomatic UTIs in pregnant and nonpregnant women attending a tertiary care teaching hospital.

Methods: It is a comparative cross-sectional study that was carried out from January 2021 to January 2022. A structured questionnaire was used to gather clinical information (such as parity and the history of UTIs) and sociodemographic data (such as age, marital status, educational level, place of residence, occupation, and income) from eligible participants. A total of 200 urine samples were collected (100 pregnant and 100 nonpregnant) and analyzed using standard microbiological methods for the detection of isolates and their antibiotic sensitivity using the Kirby-Bauer method.

Results: Most patients who participated were aged 21-30 y (50.5%). *E. coli* incidence was more in UTI of pregnant women (42.3%) and nonpregnant women (34.2%). Among the 33 isolates of *E. coli* from pregnant and nonpregnant women, most strains were resistant to amoxicillin+clavulanic acid (57.6%) and cotrimoxazole (54.5%). They were sensitive to other tested antibiotics like norfloxacin, nitrofurantoin, gentamicin, and cefuroxime.

Conclusion: Pregnant women were more likely to get UTIs than nonpregnant women, and the frequency of UTIs among women was more significant. It is recommended that women, especially pregnant women, undergo routine UTI screenings to identify infected cases and receive prompt treatment to prevent urinary problems.

Keywords: Urinary tract infection, Pregnant, Non-pregnant, Prevalence, Antibiotics

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INTRODUCTION

Any urinary system infection is referred to as a urinary tract infection. It involves bladder, ureters, kidneys, and urethra. The lower urinary system, including the bladder and urethra, is where most infections occur [1]. When microorganisms invade the urinary tract, they result in a UTI. While fungi can sporadically infect the urinary system, bacteria are the most frequent cause of UTIs. The most common cause of UTIs is when bacteria enter the urinary tract via the urethra and start to colonize the bladder. The urinary system's architecture keeps bacteria out. But occasionally, the defenses give way, allowing the bacteria to settle in and spread throughout the urinary system, leading to a full-blown infection [1]. The likelihood of developing a urinary tract infection may be boosted by several illnesses, including diabetes, hormonal changes, kidney stones, and spinal cord injuries [2]. Compared to nonpregnant women, pregnant women are more prone to UTIs with uropathogenic bacteria, which can adversely affect the mother and fetus [3]. In nonpregnant women, the uterus is located directly behind and partially above the bladder; however, in pregnant women, the larger uterus affects all the tissues of the urinary system to varying degrees. Growing uteruses gain weight, which prevents urine from draining from the bladder and causes urinary stasis, which in turn causes urinary tract infections [4, 5]. Sexual activity also makes it easier for bacteria to enter the bladder. Asymptomatic bacteriuria (AB) is the presence of bacteria that are actively proliferating in the urinary tract, excluding the distal urethra, in a patient who has no overt symptoms of the urinary system. To diagnose asymptomatic bacteriuria, finding 100,000 or more colony-forming units of a single bacteria per milliliter in two consecutive clean catch urine specimens or a single catheter specimen in the absence of urinary symptoms and signs is necessary. Asymptomatic bacteriuria, which affects 2% to 10% of all pregnancies, is commonly characterized as true bacteriuria without characteristic acute urinary tract infection symptoms [6]. Asymptomatic bacteriuria has been linked to preterm birth and low birth weight. Pregnant and nonpregnant women have similar infection prevalence levels, most strongly correlated with socioeconomic status [7]. A history of recurrent urinary tract infections, urinary tract blockages brought on by kidney stones, diabetes, and anatomical abnormalities of the urinary tract are all recognized as additional risk factors for bacteriuria. At least 80% of isolates with asymptomatic bacteriuria are E. coli, making it the most prevalent pathogen. For around 80% of community-acquired UTIs, Escherichia coli and Staphylococcus saprophyticus are responsible [8]. Other Gram-negative pathogens, including Pseudomonas spp, Enterobacter spp, Citrobacter spp, and Klebsiella spp, are also incriminated in urinary tract infection [6]. Gram-positive bacteria, including Enterococcus spp and Staphylococcus spp [9], can cause nosocomial UTIs due to selective pressure from the antimicrobial agents used in hospitalized patients. Pregnant women should be screened for UTIs due to the relatively high prevalence of these infections, their severe effects on women, and the probable result of the pregnancy [10]. Pregnant women with bacteria in their urine, even if they don't have symptoms, should be treated to lower their risk since they have a 25 to 30% chance of developing acute pyelonephritis. Usually, a brief course of oral antibiotics is adequate. Pyelonephritis was less common in women with asymptomatic bacteriuria who received antibiotic therapy. Typical antibiotics used for treatment include sulfisoxazole, ampicillin, amoxicillin, cephalexin, nitrofurantoin, and trimethoprim/sulfamethoxazole. This study aimed to isolate and identify the bacterial agents causing asymptomatic UTIs in pregnant and nonpregnant women attending a tertiary care teaching hospital.

MATERIALS AND METHODS

It is a comparative cross-sectional study conducted over one year in a Tertiary care teaching hospital from Jan 2021 to Jan 2022 involving 100 pregnant and 100 nonpregnant women. Samples were collected from all pregnant and nonpregnant women who gave their consent without obvious clinical signs of UTI and/or kidney malfunction. The study excluded women who had received any form of antibiotic treatment 15 d before and during the study period. A structured questionnaire was used to gather clinical information (such as parity and the history of UTIs) and sociodemographic data (such as age, marital status, educational level, place of residence, occupation, and income) from eligible participants. Clean-catch midstream urine was collected from each patient into a sterile universal container. Blood agar, Mac Conkey agar, and cysteine lactose electrolyte deficient agar (CLED) were used to culture the samples. For 24 h, plates were incubated aerobically at 37 °C. In order to calculate the number of bacteria per milliliter in the original urine specimen and check for significant bacteriuria, which denotes the existence of UTIs, the colonies were counted, multiplied by 1000, and analyzed. Pure isolates of bacteria 10^5cfu/ml or more were considered significant for infection. The Gram staining procedure was used to identify the isolated organisms from culture plates. The biochemical tests include carbohydrate fermentation tests with glucose, lactose, sucrose, xylose, mannitol, and maltose, etc., tests for the detection of indole, coagulase, urease, oxidase, and catalase production, methyl red test, Voges-Proskauer test, citrate utilization, nitrate reduction test, triple sugar iron agar test, etc. Antibiotic susceptibility patterns of isolates used in the empiric treatment of UTI were studied. Antimicrobial susceptibility tests were performed on bacterial isolates from midstream urine using antimicrobial discs, according to the Clinical and Laboratory Standards Institute (CLSI) on Muller Hinton agar. The antimicrobial disks used to test against Gram-negative bacteria include amoxicillin+clavulanic acid, norfloxacin, nitrofurantoin, gentamicin, cotrimoxazole, and cefuroxime. Disks for Gram-positive bacteria contain the following antimicrobials: penicillin G, cefoxitin, gentamycin, amoxicillin+clavulanic acid, nitrofurantoin, and Cotrimoxazole. After incubation at 37 °C for 18 to 24 h, the zone diameter of inhibition was measured to the nearest milliliter and interpreted as sensitive (S), intermediate (I), or resistance (R) per the Clinical and Laboratory Standards Institute (CLSI) guideline.

RESULTS

200 women (100 pregnant and 100 nonpregnant) participated in this study, with a response rate of 100%. Table 1 depicts the sociodemographic variables of the study. Most of the patients who participated were aged 21-30 (50.5%). Most of them completed school and high school studies (37%). Most of the patients reported were belonged to low-middle income (61.5%). Rural patients (67.5%) were reported more than the urban population. Most of the patients reported were daily laborers (45.5%). Table 2 shows the prevalence of microorganisms isolated from the urine samples of both pregnant and nonpregnant women. *E. coli* incidence was more in UTI of pregnant women (42.3%) and nonpregnant women (34.2%). This was followed by *S. aureus* in both pregnant (26.7%) and nonpregnant women (22.1%). Table 3 depicts the antimicrobial susceptibility pattern of Gram-negative bacteria isolated from pregnant and nonpregnant women. Among the 33 isolates of *E. coli* from pregnant and nonpregnant women, most strains were resistant to amoxicillin+clavulanic acid (57.6%) and cotrimoxazole (54.5%). They were sensitive to other tested antibiotics like norfloxacin, nitrofurantoin, gentamicin, and cefuroxime. Similarly, Klebsiella strains and Proteus species were also resistant to amoxicillin+clavulanic acid and co-trimoxazole. Pseudomonas aeruginosa showed equal susceptibility to nitrofurantoin and cefuroxime (42.8%) and resistance to amoxicillin+clavulanic acid and cotrimoxazole. Table 4 shows the antimicrobial susceptibility pattern of Gram-positive bacteria isolated from pregnant and nonpregnant women. Among the Gram-positive microorganisms isolated, *S. aureus* and CONS showed maximum susceptibility to nitrofurantoin, gentamicin, cotrimoxazole, and cefoxitin and resistant to amoxicillin+clavulanic acid (52.3%), (62.5%) and penicillin-G (85.8%), (62.5%). In contrast, Enterococci strains showed equal susceptibility to amoxicillin+clavulanic acid (50%), more resistance to penicillin-G and 100% sensitivity to nitrofurantoin, gentamicin, cotrimaxazole, and cefoxitin.

Table 1: Sociodemographic variables of the study

Variables	Pregnant number	Nonpregnant number	Total number
Age (years)			
>40	2	8	10
31-40	35	39	74
21-30	59	42	101
<21	4	11	15
Educational status			
No education	10	19	29
Graduation	14	12	26
High school	37	34	71
School	39	35	74
Economic status			
Lower middle-income	62	61	123
Upper middle-income	38	39	77
Residence			
Urban	29	36	65
Rural	71	64	135
Occupation			
House-wife	25	15	40
Employee	35	34	69
Daily labor	40	51	91

Table 2: Microorganisms isolated

Microorganism	Pregnant n (%)	Nonpregnant n (%)	Total
E. coli	19 (42.3%)	14 (34.2%)	33
S. aureus	12 (26.7%)	9 (22.1%)	21
Klebsiella species	1 (2.2%)	2 (4.9%)	3
Pseudomonas aeruginosa	3 (6.6%)	4 (9.7%)	7
Proteus species	5 (11.2%)	5 (12.1%)	10
CONS	4 (8.8%)	4 (9.7%)	8
Enterococci	1 (2.2%)	3 (7.3%)	4
Total	45 (100%)	41 (100%)	86

Table 3: Antimicrobial susceptibility pattern of gram-negative bacteria isolated from pregnant and nonpregnant women

Bacterial isolates	Number	Pattern	Amoxicillin+clavulanic acid	Norfloxacin	Nitrofurantoin	Gentamicin	Cotrimoxazole	Cefuroxime
E. coli	33	S	12 (36.3%)	19 (57.6%)	20(60.6%)	18(54.5%)	14 (42.4%)	21(63.6%)
		I	2 (6.06%)	0	2 (6.06%)	2(6.06%)	1(3.03%)	1(3.03%)
		R	19 (57.6%)	14 (42.4%)	11(33.3%	13(39.4%)	18(54.5%)	11(33.3%)
Klebsiella species	3	S	1 (33.3%)	2(66.6%)	2(66.6%)	2(66.6%)	1(33.3%)	3(100%)
		I	0	0	0	0	0	0
		R	2 (66.6%)	1(33.3%)	1(33.3%)	1(33.3%)	2(66.6%)	0
Pseudomonas aeruginosa	7	S	2 (28.6%)	5(71.4%)	3(42.8%)	4(57.2%)	3(42.8%)	3(42.8%)
		I	1 (14.2%)	1(14.2%)	1(14.2%)	0	0	1(14.2%)
		R	4 (57.2%)	1(14.2%)	3(42.8%)	3(42.8%)	4(57.2%)	3(42.8%)
Proteus species	10	S	4 (40%)	7 (70%)	7 (70%)	5(50%)	4(40%)	7(70%)
		I	0	0	1 (10%)	2(20%)	1(10%)	0
		R	6 (60%)	3 (30%)	2(20%)	3(30%)	5(50%)	3(30%)

Table 4: Antimicrobial susceptibility pattern of gram-positive bacteria isolated from pregnant and nonpregnant women

Bacterial isolates	Number	Pattern	Amoxicillin+clavulanic acid	Penicillin-G	Nitrofurantoin	Gentamicin	Cotrimoxazole	Cefoxitin
S. aureus	21	S	9(42.8%)	3 (14.2%)	18(85.8%)	17 (80.9%)	15 (71.4%)	17(80.9%)
		I	1 (4.76%)	0	0	0	1 (4.76%)	0
		R	11(52.3%)	18(85.8%)	3(14.2%)	4(9.1%)	5 (23.8%)	4(9.1%)
CONS	8	S	3(37.5%)	3(37.5%)	7(87.5%)	6(75%)	7(87.5%)	7(87.5%)
		I	0	0	0	1(12.5%)	0	0
		R	5(62.5%)	5(62.5%)	1(12.5%)	1(12.5%)	1(12.5%)	1(12.5%)
Enterococci	4	S	2 (50%)	1 (25%)	4 (100%)	4(100%)	4(100%)	4(100%)
		I	0	0	0	0	0	0
		R	2 (50%)	3 (75%)	0	0	0	0

DISCUSSION

In the present study, the prevalence of UTIs among pregnant and nonpregnant women was 45% and 41%. The fact that the prevalence of UTIs was lower in nonpregnant women than in pregnant women indicates that this condition is more prevalent during pregnancy and highlights the need for adequate care. Similar findings were reported by Bachchan and Sen Ramanujan (2016) [12] and Degu Abate *et al.* (2020) [13]. The environment, low socioeconomic position, poor personal cleanliness, hormonal and physiological changes, and urethral dilatation may cause an increased risk of UTIs during pregnancy [14, 15]. In the current investigation, Gram-negative bacteria (61.6%) outnumbered Gram-positive bacteria (38.4%) in frequency. Similar reports were shown by Lone *et al.* [16] and Degu Abate *et al.* [13]. The predominance of Gram-negative bacteria may be caused by adhesions, which aid in the attachment of bacteria to uroepithelial cells and prevent them from flushing in the urine, allowing for bacterial proliferation and tissue penetration that results in pyelonephritis in pregnancy [14]. The most predominant causative agent of UTIs in this study was E. coli (38.3%), followed by S. aureus (24.4%), which was similar in etiology but different in magnitude from previous findings of Degu Abate *et al.* [13]. The increased frequency of E. coli isolations could be explained by various virulence factors, including P-fimbriae and S-fimbriae adhesions for invasion and colonization of the urinary epithelium and persistence in the vagina [17]. E. coli was highly sensitive to cefuroxime in the present study and can be recommended for treating UTI.

Similarly, Degu Abate *et al.* reported the same results, and Niranjan and Malini (2014) [17] showed contradictory results compared to the current study and showed higher resistance to cefuroxime by the E. coli strains. Degu Abati showed S. aureus high sensitivity to the antibiotics like cefoxitin (85.7%), ciprofloxacin (85.7), and gentamicin (71.4%) which was in accordance with the current study 80.9% sensitivity to cefoxitin and gentamicin. The frequent use of broad-spectrum antibiotics in human and animal feeds, the inappropriate and incorrect administration of antibiotics during empiric therapies, and a lack of effective infection control measures may all contribute to the development of bacterial resistance. These factors can result in the spread of resistant organisms in both the hospital and the community.

CONCLUSION

Pregnant women were more likely to get UTIs than nonpregnant women, and the frequency of UTIs among women was more significant. E. coli and S. aureus were the two most typical bacteria responsible for UTIs. It is advised that women, especially pregnant women, undergo routine UTI screenings to identify infected cases and receive prompt treatment to prevent urinary problems. The management of UTIs requires the development of local guidelines that consider local factors, such as the susceptibility patterns of the bacteria that cause UTIs in the local population and the necessity to monitor antimicrobial usage to encourage responsible drug use.

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Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

All authors declared No conflict of interest

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