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ORIGINAL

Multidrug Resistant Bacteria Isolated from Urinary Tract Infections in Pregnancy Association with C -Reactive Protein

Bacterias multirresistentes aisladas de infecciones urinarias en el embarazo: asociación con la proteína C reactiva

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ABSTRACT

Objectives: this study investigates the identification of bacteria that cause urinary tract infections (UTIs) in order to evaluate their resistance to multiple drugs (MDR) and the occurrence of C-reactive protein in UTIs during pregnancy.
Methods: in this study, analyzed urine and blood samples from 120 pregnant women in Al Samawa City to identify bacteria causing urinary tract infections (UTIs) during pregnancy. Escherichia coli is the most common pathogenic bacterium, responsible for UTIs connected to pregnancy. C-reactive protein is a highly responsive protein that is used to detect infectious or inflammatory disorders.
Results: out of the total sample, 102 (85 %) were positive for different types of bacteria, including Escherichia coli, Staphylococcus aureus, Enterococcus faecalis, Coagulase negative staphylococci, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus mirabilis, Enterobacter cloacae complex, Kocuria rhizophila, Staphylococcus epidermidis, and Staphylococcus saprophyticus.
Conclusion: the study found that nitrofurantoin is effective against both gram-positive and gram-negative bacteria, while cephalexin is ineffective against them. This study recorded the highest CRP concentration above normal range in pregnant women infected with K. pneumonia, followed by pregnant women infected with P. aeruginosa and E. faecalis, in contrast lowest CRP within normal range in non-pregnant women 44 specimens (control), at p. value < 0,05.

Keywords: C. Reactive Protein; Cephalexin; Nitrofurantoin; Pregnant, Urinary Tract Infections.

RESUMEN

Introducción: este estudio investiga la identificación de bacterias causantes de infecciones del tracto urinario (ITU) para evaluar su resistencia a múltiples fármacos (MDR) y la aparición de proteína C reactiva en ITU durante el embarazo.
Métodos: en este estudio se analizaron muestras de orina y sangre de 120 mujeres embarazadas de la ciudad de Al Samawa para identificar las bacterias causantes de infecciones del tracto urinario (ITU) durante el embarazo. Escherichia coli es la bacteria patógena más común, responsable de las ITU relacionadas con el embarazo. La proteína C reactiva es una proteína altamente reactiva que se utiliza para detectar trastornos infecciosos o inflamatorios.
Resultados: del total de la muestra, 102 (85 %) resultaron positivos para distintos tipos de bacterias, entre ellas Escherichia coli, Staphylococcus aureus, Enterococcus faecalis, estafilococos coagulasa negativos, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus mirabilis, Enterobacter cloacae complex, Kocuria rhizophila, Staphylococcus epidermidis y Staphylococcus saprophyticus.
Conclusiones: el estudio reveló que la nitrofurantoína es eficaz contra las bacterias grampositivas y gramnegativas, mientras que la cefalexina es ineficaz contra ellas. Este estudio registró la mayor concentración de PCR por encima del rango normal en las embarazadas infectadas por K. pneumonia, seguidas de las embarazadas infectadas por P. aeruginosa y E. faecalis, en contraste con la PCR más baja dentro del rango normal en las mujeres no embarazadas 44 muestras (control), con un valor de p. < 0,05.

Palabras clave: Proteína C. Reactiva; Cefalexina; Nitrofurantoína; Embarazadas, Infecciones Urinarias.

INTRODUCTION

Urinary tract infections (UTIs) impact approximately 150 million individuals globally each year and are one of the most common bacterial diseases.[1] Infections induced by bacteria that affect even a certain portion of the urinary tract are a major cause of UTI. These include increased urinary frequency, pain, and cloudiness in the urine.[2] UTI typically accompanies vaginal infections and is usually caused by bacteria that originate in the digestive system.[3] UTIs are divided into three types: (a) asymptomatic bacteriuria (ASB); (b) lower UTI, which is characterized by vaginal mucosa inflammation and irritative urinary tract symptoms; and (c) acute pyelonephritis or upper UTI, which is a systemic disease. UTIs may also be classed as simple or complex based on the presence of kidney and ureter involvement.[4] Smooth muscle relaxation and the mechanical element brought on by enlarged uterine compression result in less ureter peristalsis and more bladder volume, induced stasis in the bladder, altered urine pH and osmolality, and perhaps increased bacterial growth due to pregnancy-induced glycosuria.[5] Pregnant women's urinary tract infections are caused by the same pathogens as non-pregnant people Escherichia coli (E. coli) causes 80 to 90 percent of illnesses. Other organisms include Proteus mirabilis, Klebsiella pneumoniae (K. pneumoniae), Group B streptococcus (GBS), and Staphylococcus saprophyticus. However, less frequent species such as Enterococci, Gardnerella vaginalis, and Ureaplasma ureolyticum may cause UTI.[5] Urinary tract obstruction, bladder catheter use, and immune system suppression are significant risk factors for recurrent UTIs[6] Antibiotic resistance in pathogenic organisms has grown to be a global issue that has major effects on the control of infectious diseases.[7] The C-reactive protein (CRP) is a plasma protein produced by the liver. It is a member of the pentraxin family and plays a significant role in any inflammatory response.[8] Microbial cultures can be utilized to detect severe bacterial infections. However, they frequently yield inaccurate adverse outcomes, particularly following the administration of antibiotics to the mother, and may also produce false positive outcomes due to contamination in the sample. Furthermore, there is a temporal lag of 2-3 days in collecting findings from microbial cultures. Hence, newborns displaying symptoms of sepsis or having variables that increase the likelihood of serious bacterial infections are administered antibiotics as a precautionary measure until microbiology testing results have been obtained. [9,10] This study investigates the identification of bacteria responsible for urinary tract infections (UTIs) to assess their resistance to multiple medications (MDR) and the presence of C-reactive protein in UTIs during pregnancy.

METHOD

Sample collection

A total of 120 urine specimens were collected from pregnant women aged 18 to 41 years at both Children's Hospital and a specialized health clinic in Al Samawa City, during a period ranging from September 2023 until March 2024, using sterile urine caps and transport swabs with amies medium. The specimens were transported to the laboratory and cultured within 2 hours. The urine specimens were analysed using a dipstick, which measured ten different parameters including pH, specific density, red blood cells, nitrite, Leukocytes, urobilinogen, glucose, protein, bilirubin, and ketone bodies. Additionally, microscopic examination of the urine sediment was conducted as an essential component of the urine analysis utilized a (×10) initially followed by a.[40] Urine samples with a minimum of five pus cells per high-power field (HPF) were inoculated onto Blood agar, MacConkey agar, HiCrome UTI agar mannitol salt agar, Eosin methylene blue agar, and Columbia agar medium. The specimens were then incubated aerobically overnight at a temperature of 37°C and Columbia Blood agar plates were incubated in a candle jar to achieve a CO2 concentration of 5-10 %. The plates were placed in an incubator at a temperature of 35±2 °C for 24 hours.

Urine culture

A 1 µl loop was used to quantitatively inoculate urine on blood agar, MacConkey Agar, 5 % sheep blood supplemented Columbia Blood Agar Eosin methylene blue agar, and Mannitol salt agar, as well as on UTI agar. MacConkey plates were incubated under aerobic conditions, whereas Columbia Blood agar plates were incubated in a candle jar to achieve a CO2 concentration of 5-10 %. The plates were placed in an incubator at a temperature of 35±2 °C for 24 hours. The plates were analysed for the presence of growth, the shape of colonies, and the features shown on a culture medium. Bacterial pathogens were identified by conventional biochemical methods according to the microbiological technique. Gram stain staining was then done. catalase, Coagulase, Oxidase, Indole test, Methyl Red test, Voges-Proskauer test, citrate test, and Urease test were among the biochemical tests that were carried out. The chosen colonies were identified using the Vitek® 2 Compact automated identification of microbial.

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Identification of bacteria

The bacteria isolated were identified based on their culture, morphology, and biochemical characteristics. Regarding the cultural properties, distinct colonies were detected on the agar surface. The observable characteristics include shape, size, consistency, and colour. The cellular morphology of the isolate was studied by examining Gram-stained slides microscopically. The biochemical tests conducted included catalase, oxidase and Novobiocin test. The IMVIC test, which includes (indole synthesis, methyl red, Voges-Proskauer, and citrate consumption), urea utilization, is performed. The bacterial growth was presumptively identified on HiCrome UTI agar based on the colony shape and colour provided by the manufacturer. Biochemical reactions of the isolates were tested IMVIC test and the VITEk2 system (bioMérieux) following the manufacturer instructions.

Antibiotic susceptibility test by Disk diffusion Agar

Following guidelines provided by the Clinical and Laboratory Standards Institute (CLSI) (2022), antibiotic susceptibility was measured using the disc diffusion method. Using nutritional broth, the isolates were activated for eighteen hours at 37°C. The growth was then adjusted to 0,5 McFarland's standard (1,5 X 108 CFU/ml), and the mixture was spread out onto Mueller-Hinton agar (MHA) using a sterile cotton swab. After carefully pressing the antibiotic discs into full contact with the bacterially inoculated agar on MHA, they were incubated for 24 hours at 37°C, after which the inhibition zone diameter in millimetres was measured. The results were interpreted as either resistive or sensitive. The size of the zones of inhibition was determined using a meter rule. The measurements were recorded in millimetres. In this investigation, thirteen antibiotic discs (Tobramycin, Imipenem, Cephalexin, Ceftriaxone, Trimethoprim, vancomycin, Nitrofurantoin, Ciprofloxacin, Nalidixic acid, Levofloxacin, Trimethoprim-sulfamethoxazole, Tetracycline, penicillin G) were used. The results of the present study were established in compliance with the standards specified by the Clinical and Laboratory Standards Institute (CLSI, 2022).[11]

Measurement of C. reactive protein by AFIAS-6

The study specimens include 120 pregnant women diagnosed with urinary tract infections and 44 healthy non-pregnant persons functioning as controls. Three ml of blood was obtained and placed in a plastic tube. The tube was left undisturbed at room temperature for roughly 30 minutes to allow the blood to clot. The blood was centrifugated at an average speed of 3000 revolutions per minute (rpm) for 5 minutes to isolate the serum. The serum was subsequently utilized to quantify C-reactive protein using the AFIAS-6 automated fluorescence immunoassay system kit developed by Boditech Med Inc. in South Korea. The fluorescence immunoassay (FIA) is employed to quantitatively detect C-reactive protein (CRP) in serum, plasma, and whole blood samples. The low-maintenance test uses a simple two-step procedure, obviating the need for highly qualified personnel to execute the protocol.

RESULTS

The specimen of urine was cultivated on Blood Agar, MacConkey agar, and Columbia agar, resulting in an identification of bacterial species 102(85 %). 18(15 %) specimens of urine were cultivated on blood agar, MacConkey agar, and Columbia agar, yielding negative results.

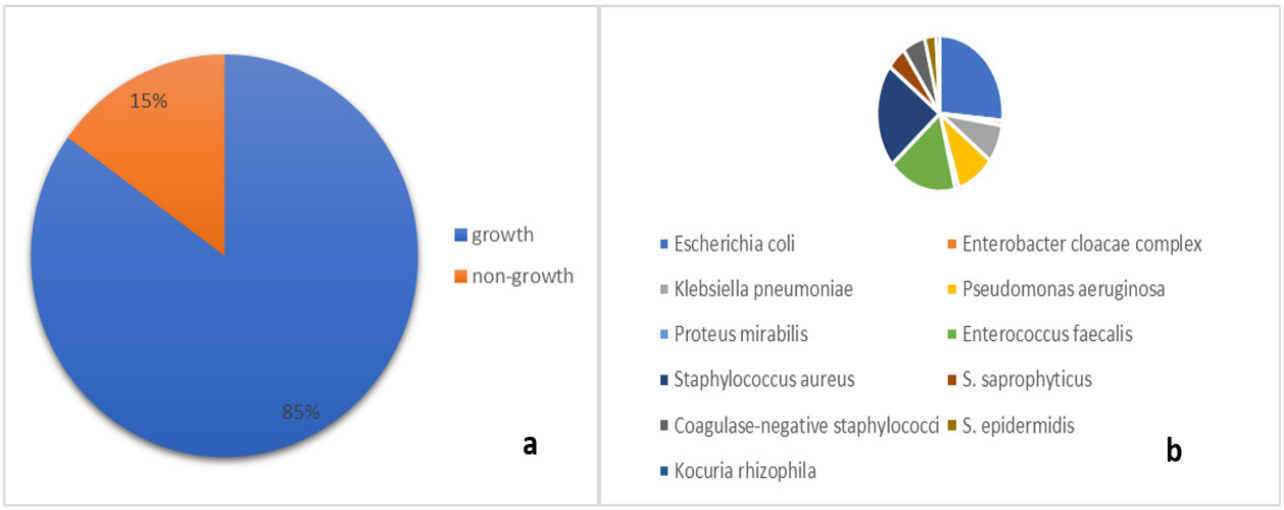

Figure 1: a) The growth rate between cultures that undergo growth versus those that do not. b) The frequency of the bacterial isolates has been established

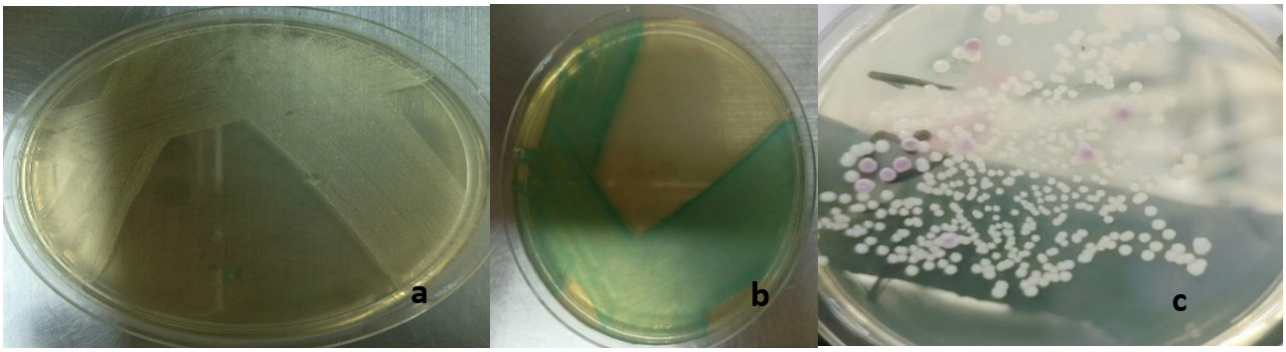

Figure 2. Gram positive bacteria on HiCrome UTI Agar a: staphylococcus aureus, b: Enterobacter faecalis, c: staphylococcus saprophyticus and candida spp

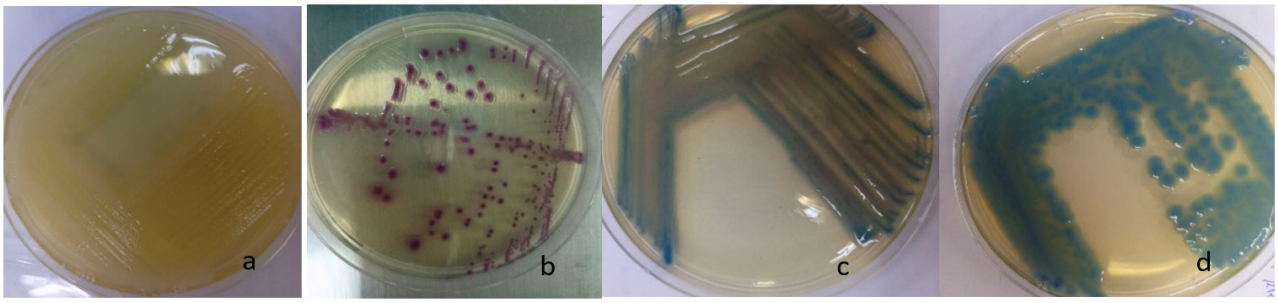

Figure 3. Gram negative bacteria on HiCrome UTI Agar a: Proteus mirabilis, b Escherichia coli, c: Enterobacter cloacae, d: Klebsiella pneumoniae.

Table 1. Prevalence rate of Bacteria species and colour colonies in HiCrome UTIs

Bacteria species	NO.	%	Colony color
Escherichia coli	27	26,47	dark pink to reddish
Enterobacter cloacae	1	0,98	metallic blue
Klebsiella pneumoniae	8	7,84	metallic blue
Pseudomonas aeruginosa	10	9,82	cream to blue.
Proteus mirabilis	1	0,98	a brown halo.
Enterococcus faecalis	18	17,64	turquoise blue
Staphylococcus aureus	22	21,56	golden, opaque.
S. saprophyticus	5	4,91	pink, opaque, and tiny
S. sciuri	1	0,98	
S. xylosus	1	0,98	
S. lugdunensis	1	0,98	White color
S. haemoiyticus	1	0,98	
S. hominis	2	1,96	
S. epidermidis	3	2,94	
Kocuria rhizophila	1	0,98	

The 30 – 35-year-olds reported the most significant infection incidence (90,2 %). Age groups 24-29 (88,8 %) and 18-23 (83,3 %) came next. On the other hand, the age range of 36–41 years had the lowest infection incidence (61,5 %).

The second trimester 43 (42,15 %) had the largest percentage of pregnant women with UTIs, followed by the first trimester 42 (41,17 %) and the third trimester 17 (16,66 %).

Recurrent urinary tract infections occur in around 4 % - 5 % of pregnancies in people with structural abnormalities of the renal system. Administering a single dosage of cephalexin or nitrofurantoin after sexual intercourse, or taking these medications regularly, is an effective way to avoid these infections.[20] The current

investigation reveals that E. coli had a high sensitivity towards a wide range of medications, including levofloxacin (85,2 %), nitrofurantoin (76,1 %), and ciprofloxacin (85,2 %). Resistance rates were high for cephalexin (100 %), trimethoprim (51,8 %), trimethoprim and sulfamethoxazole (51,8 %), ceftriaxone (52,9 %), and imipenem (70,5 %) its resistance due to its lipopolysaccharide.[21] The current study found that E. faecalis exhibited significant resistance to penicillin, contradicting the findings, who reported sensitivity 100 % to penicillin.[23] The majority of this investigation consists of gram-positive bacteria. S. aureus demonstrated complete susceptibility to nitrofurantoin.

Table 2. The prevalence of infection for pregnant women in relation to age groups

Age groups(years)	Tested (%)	Positive (%)	Negative (%)
(18-23)	30(25 %)	25(83,3 %)	5(16,7 %)
(24-29)	36(30 %)	32(88,8 %)	4(11,2 %)
(30-35)	41(34,16 %)	37(90,2 %)	4(9,8 %)
(36-41)	13(10,8 %)	8(61,5 %)	5(38,5 %)
Total	120(100 %)	102(85 %)	18(15 %)

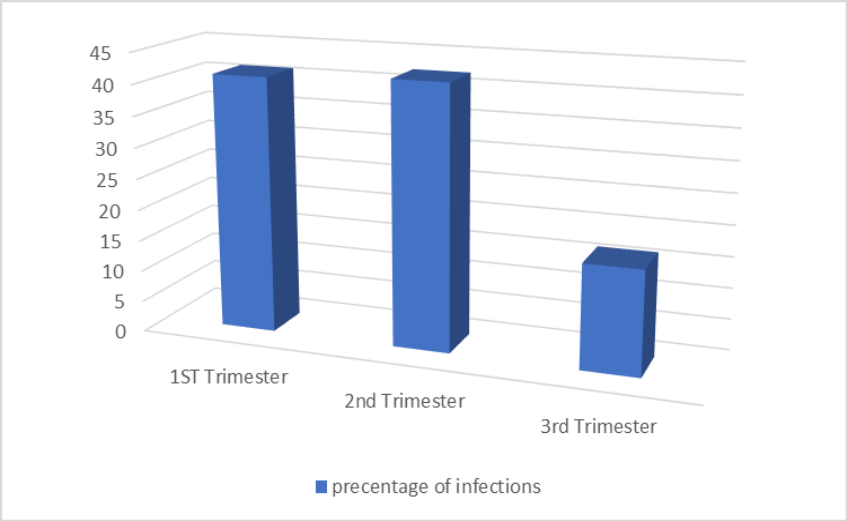

Figure 4. Relationship between the percentage of infections and the trimesters of pregnancy

Table 3. Susceptibility of gram-negative bacteria to antibiotics % (R: Resistance, I: Intermediate, S: Sensitive)

Isolation		Tob	IMI	CL	CRO	TM	F	Cip	NA	LEV	SXT	TE
E. coli	R	14,8	70,30	100	51,81	51,81	18,5	14,8	25,91	14,8	51,8	70,3
N=27	I	0	29,6	0	8,5	8,5	7,4	0	8,6	0	0	7,4
	S	85.2	0	0	29,7	29,7	74,1	85,2	55,5	85,2	48,2	22,3
Pseudomonas	R	50	100	100	60	50	30	50	100	50	50	50
N=10	I	10	0	0	0	0	50	0	0	20	0	0
	S	40	0	0	40	50	20	50	0	30	50	50
Proteus	R	100	100	100	100	100	100	0	0	0	100	100
N=1	I	0	0	0	0	0	0	0	0	0	0	0
	S	0	0	0	0	0	0	100	100	100	0	0
Klebsiella	R	25	62,5	100	37,5	100	0	0	0	0	100	100
N=8	I	25	0	0	12,5	0	0	0	62,5	0	0	0
	S	50	37,5	0	50	0	100	100	37,5	100	0	0
Enterobacter	R	100	100	100	100	100	0	0	0	0	100	100
N=1	I	0	0	0	0	0	0	0	0	0	0	0
	S	0	0	0	0	0	100	100	100	100	0	0
Total %	R	27,7	76,5	100	53,2	61,7	19,2	19,2	36,2	19,2	61,7	72,3
	I	6,4	0	0	12,7	10,7	14,9	0	21,3	4,3	0	4,3
	S	65,9	23,5	0	34,1	27,6	65,9	80,8	42,5	76,5	38,3	23,4
Total	R	13	36	47	25	29	9	9	17	9	29	34
N=47	I	3	0	0	6	5	7	0	10	2	0	2
	S	31	11	0	16	13	31	38	20	36	18	11

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Table 4. Susceptibility of gram-positive bacteria to antibiotics % (R: Resistance, I: Intermediate, S: Sensitive)

Isolation		Tob	IMI	CL	CRO	TM	F	Cip	P	LEV	SXT	TE	VA
S. aureus	R	50,0	54,6	59,1	45,5	59,1	0	50	100	50	13,6	50	0
N=22	I	50	4,5	40,9	18,18	0	0	0	0	0	22,8	4,5	0
	S		40,9	0	36,4	40,9	100	50	0	50	63,6	45,5	100
Enterococcus	R	11,2	55,7	100	55,7	50	50	0	100	0	50	100	5,5
N=18	I	44,4	5,5	0	16,6	0	0	0	0	0	0	0	33,4
	S	44,4	38,8	0	27,7	50	50	100	0	100	50	0	61,1
S. saprophyticus	R	20	100	100	40	60	20	20	100	20	60	100	20
N=5	I	40	0	0	0	0	0	0	0	0	0	0	0
	S	40	0	0	60	40	80	80	0	80	40	0	80
K. rhizophila	R	0	100	100	100	100	0	0	100	0	100	100	100
N=1	I	0	0	0	0	0	0	0	0	0	0	0	0
	S	100	0	0	0	0	100	100	0	100	0	0	0
S. sciuri	R	0	100	100	0	100	0	0	100	0	100	100	100
N=1	I	0	0	0	0	0	0	0	0	0	0	0	0
	S	100	0	0	100	0	100	100	0	100	0	0	0
S. lugdunensis	R	100	100	100	100	100	0	100	100	100	100	100	100
N=1	I	0	0	0	0	0	0	0	0	0	0	0	0
	S	0	0	0	0	0	100	0	0	0	0	0	0
S. xylosus	R	100	0	0	0	0	0	100	100	100	100	100	0
N=1	I	0	0	0	0	0	0	0	0	0	0	0	0
	S	0	100	100	100	100	100	0	0	0	0	0	100
S. haemolyticus	R	0	100	100	100	100	0	0	100	0	0	0	0
N=1	I	0	0	0	0	0	0	0	0	0	100	0	0
	S	100	0	0	0	0	100	100	0	100	0	100	100
S. hominis	R	50	100	50	50	50	50	0	50	100	0	50	50
N=2	I	0	0	0	0	0	0	0	0	0	0	0	0
	S	50	0	50	50	50	50	100	50	0	100	50	50
Total	R	34,6	63,4	78,9	50	57,7	21,1	28,9	100	21,1	38,5	75	9,7
%	I	19,2	3,9	17,3	13,5	0	0	0	0	0	11,5	1,9	11,5
	S	46,2	32,7	3,8	36,5	42,3	78,9	71,1	0	71,1	50	23,1	78,8

Table 5. Antibiotic resistance pattern in bacteria species against various antimicrobial drugs

Bacteria	Tob	IMI	CL	CRO	TM	F	Cip	NA	LEV	SXT	TE	VA	p
E. coli	14,8	70,3	100	51,8	51,8	18,5	14,8	25,9	14,8	51,8	70,3	-	-
E. cloacae	100	100	100	100	100	0	0	0	0	100	100	-	-
K. pneumoniae	25	62,5	100	37,5	100	0	0	0	0	100	100	-	-
P. aeruginosa	50	100	100	60	50	30	50	100	50	50	50	-	-
P. mirabilis	100	100	100	100	100	100	0	0	0	100	100	-	-
E. faecalis	11,2	55,7	100	55,7	50	50	0	-	0	50	100	5,5	100
S. aureus	50	54,6	59,1	45,5	59,1	0	50	-	50	13,6	50	0	100
S. saprophyticus	20	100	100	40	60	20	20	-	20	60	100	20	100
S. sciuri	0	100	100	0	100	0	0	-	0	100	100	100	100
S. xylosus	100	0	0	0	0	0	100	-	100	100	100	0	100
S. lugdunensis	100	100	100	100	100	0	100	-	100	100	100	100	100
S. haemoiyticus	0	100	100	100	100	0	0	-	0	0	0	0	100
S. hominis	50	100	50	50	50	0	50	-	0	50	50	0	100
K. rhizophila	0	100	100	100	100	100	0	-	0	100	100	100	100

Key: TOB Tobramycin, IMI Imipenem, CL Cephalexin, CRO ceftriaxone, TM Trimethoprim, VA vancomycin, F Nitrofurantoin, P Penicillin G, Cip Ciprofloxacin NA Nalidixic acid, LEV Levofloxacin, SXT Trimethoprim-sulfamethoxazole, TE Tetracycline

This study recorded the highest C. reactive protein (CRP) concentration above normal range in pregnant women infected with K. pneumonia, followed by pregnant women infected with P. aeruginosa and E. faecalis, in contrast lowest CRP within normal range in non-pregnant women, at p. value < 0,05, as in table 7.

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Table 6. The prevalence of MDR bacteria among uropathogens isolated from the study group

Isolate	Number (%)	MDR (%)
E. coli	27(26,47 %)	14(51,85 %)
E. cloacae	1(0,98 %)	1(100 %)
K. pneumoniae	8(7,84 %)	8(100 %)
P. aeruginosa	10(9,82 %)	5(50 %)
P. mirabilis	1(0,98 %)	1(100 %)
E. faecalis	18(17,64 %)	10(55,55 %)
S. aureus	22(21,56 %)	12(54,54 %)
S. saprophyticus	5(4,91 %)	5(100 %)
S. sciuri	1(0,98 %)	1(100 %)
S. xylosus	1(0,98 %)	1(100 %)
S. lugdunensis	1(0,98 %)	1(100 %)
S. haemoiyticus	1(0,98 %)	1(100 %)
S. hominis	2(1,96 %)	1(50 %)
K. rhizophila	1(0,98 %)	1(100 %)

MDR: multidrug-resistant

Table 7. Correlation between CRP levels and various pathogen species in pregnant women with UTIs compared to non-pregnant women in the control group.

	Cases No.	CRP Mean ± S. D	ANOVA p. value < 0,001
E. coli	27	7,56 ± 2,85^{c}	
S. saprophyticus	4	7,37 ± 2,55^{c}	
E. faecalis	18	5,75 ± 1,76^{d}	
K. pneumonia	8	17,5 ± 4,47^{a}	
P. aeruginosa	9	11,8 ± 2,68^{b}	
S. aureus	22	7,55 ± 3,06^{c}	
Control	44	5,87 ± 2,33^{d}	

Similar small letters above the means indicate the non-significant differences, while different letters indicate the significant differences

Pregnancy enhances the likelihood of experiencing several bacterial and viral infections by weakening the immune system. Consequently, this increased susceptibility may result in miscarriages triggered by infections or congenital abnormalities in the developing fetus.[29] The present study discovered a significant difference in CRP levels between pregnant women with UTIs and non-pregnant women, contradicting previous findings. Additionally, the levels of CRP were higher in pregnant women compared to non-pregnant women, although this difference was not statistically significant (p = 0,421). These immune system cells are engaged in the body's defense against foreign invaders and infectious illnesses.[30] Thus, this study will consist of a control population of normal non-pregnant women who do not have urinary tract infections.

DISCUSSION

In a study in Nasiriya City 2023, which found a 44,2 % positive rate in urine samples and a 55,8 % incidence ratio of negative urine culture, our study contradicts their findings.[12] Another recent study in the Babylon governorate in 2018 found that pregnant women had a greater prevalence of UTI, reaching about 64,6 %, or two thirds of the patients.[13]The observed difference between the current study and the previously mentioned studies, however, may be explained by the fact that distinct counts of specimens were cultured, indicating that pregnant women are more likely than nonpregnant women to experience UTIs. The total occurrence rate of Escherichia Coli in pregnant women. According to study in southern Ethiopia 2020, the current study's results indicate that the majority of the sample obtained an E.coli infection,[14] in contrast to study in South-western Uganda. 2020 ,who reported a high infection rate with Klebsiella pneumoniae.[15]

The prevalence of Gram-positive bacterial isolates was higher than that of Gram-negative bacterial isolates in this study, with a distribution of 53,92 % and 46,08 % respectively. These findings correspond with a prior study conducted that the proportion of gram-negative bacteria identified was 22,64 %, while the proportion of gram-positive bacteria was 77,4 %. However, the findings contradict the study in in Shiraz, Southwest Iran 2020, The researcher's investigation revealed that the predominant type of bacteria present was gram-negative bacteria, accounting for 89,5 % of the total, while gram-positive bacteria constituted 10,5 %.[16]

The present data presented in our study contradicts the findings of a prior study conducted in Karnataka region 2013 which reported that the highest prevalence of pregnancy-specific conditions was observed among women aged 36-40 (53,3 %), while the lowest prevalence was found among women aged 31-35 (44,4 %).[17] The current data presented in our study contradicts the findings of a previous study conducted in South-Western Nigeria 2010 , which indicated that the highest occurrence of pregnancy-specific conditions was observed among women aged 36-40 (77,8 %), while the lowest occurrence was found among women aged 26-30 (37,1 %).[18]

The second trimester 43 (42,15 %) had the largest percentage of pregnant women with UTIs, followed by the first trimester 42 (41,17 %) and the third trimester 17 (16,66 %). These results contrast with those of a prior study which found that the incidence was higher in the second and third trimesters—54,1 % and 43,3 %, respectively—than in the first trimester—25 %.[18] In the study conducted in Nigeria 2022, reported that the findings of the present investigation suggest that the lowest results occurred during the third trimester.[19]

The current investigation reveals that E. coli had a high sensitivity towards a wide range of medications, including levofloxacin (85,2 %), nitrofurantoin (76,1 %), and ciprofloxacin (85,2 %). Resistance rates were high for cephalexin (100 %), trimethoprim (51,8 %), trimethoprim and sulfamethoxazole (51,8 %), ceftriaxone (52,9 %), and imipenem (70,5 %) its resistance due to its lipopolysaccharide.[21] This finding contradicts the study conducted in Al-Baha region, Saudi Arabia 2020, in which they reported, the susceptibility pattern of E. coli was studied, and it exhibited a high sensitivity towards a wide range of antibiotics, including levofloxacin (100 %), imipenem (98,78 %), nitrofurantoin (90,18 %), ceftriaxone (53,85 %), and ciprofloxacin (50,82 %). Cephalexin exhibited a resistance rate of (95,45 %), whereas Trimethoprim and sulfamethoxazole (TMP-SMX) demonstrated a resistance rate of 57,01 %.[22] According to their study, K. pneumoniae exhibited strong susceptibility to ciprofloxacin, imipenem, and levofloxacin (100 %), followed by nitrofurantoin and ceftriaxone (66,67 %). However, K. pneumoniae showed significant resistance to tobramycin (100 %). sulfamethoxazole/trimethoprim had a sensitivity pattern of 63,64 %. Klebsiella pneumoniae strains have been observed to show the highest levels of resistance against ceftriaxone (37,5 %), imipenem (62,5 %), and trimethoprim-sulphamethoxazole (100 %). The current study found that E. faecalis exhibited significant resistance to penicillin, contradicting the findings, who reported sensitivity 100 % to penicillin.[23] The majority of this investigation consists of gram-positive bacteria. S. aureus demonstrated complete susceptibility to nitrofurantoin, as reported in 2023. However, there was a discrepancy in the findings regarding the susceptibility to vancomycin. That study reported a 96,29 % susceptibility, while this study demonstrated a susceptibility rate of 100 % for vancomycin.[24]The improper utilization of antibiotics is considered to be one of the primary factors leading to the establishment of antibiotic resistance. Misuse of antibiotics refers to the inappropriate and frequently unnecessary use of these drugs. It encompasses overuse, inappropriate prescribing, self-medication, careless administration, and inaccurate dosage or treatment length.[25] E. coli et al.[26,27] were investigated against antibiotic in other infection as eye infection in human and also in animal infection. The number of bacterial strains that are resistant to treatment has heighten. MDR is defined as resistance of the microorganism and insusceptible to more than three classes of antibiotics during the period of infection treatment exposure.[28]

CONCLUSION

The study revealed that *Escherichia coli* was the predominant pathogenic bacterium in the urinary tract systems of the pregnant women examined. Nitrofurantoin exhibited the highest efficacy against bacterial species. To reduce the global problem of antimicrobial resistance, it is essential that all clinical microbiology laboratories initiate early detection and careful monitoring of MDR (multidrug-resistant) bacterial strains. Pregnant women experiencing urinary tract infections (UTIs) exhibit heightened levels of C-reactive protein, indicating the presence of systemic inflammation. Additional research is necessary to analyze the impact of these inflammatory alterations during pregnancy.

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HUMAN AND ANIMAL RIGHTS

The authors assert that the present study take agreement for human participants. The authors additionally affirm that this paper is an authentic piece of work that has not been previously presented in any form or language.

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FINANCING

None.

CONFLICT OF INTEREST

None.

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