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Original Research Article

Antimicrobial susceptibility patterns of uropathogens among pregnant women in Mogadishu, Somalia

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ABSTRACT

Background: Urinary tract infections (UTIs) are common in pregnancy and pose serious health risks, yet data on uropathogens and antimicrobial resistance (AMR) in Somali pregnant women are limited. This study was carried out to investigate the causative uropathogens, their resistance patterns, and associated factors to multidrug resistance (MDR) among pregnant women at Banadir Maternal and Child Hospital in Mogadishu.
Methods: A cross-sectional study was conducted from August to December 2024 involving 200 pregnant women. Clean-catch midstream urine samples were cultured and tested using standard microbiological methods and antimicrobial susceptibility testing per CLSI 2024 guidelines. Statistical analysis including chi-square and logistic regression was performed to identify predictors of MDR.
Results: Among participants, 38.5% were illiterate, and half were aged between 21 and 25 years. *Escherichia coli* (59.5%) and *Klebsiella spp.* (15.5%) were the predominant pathogens. Ciprofloxacin was highly effective against *E. coli* (94.1%), while nitrofurantoin showed complete efficacy. *Klebsiella spp.* exhibited high resistance to meropenem (83.8%), gentamicin (80.0%), ceftriaxone (75.0%) and nitrofurantoin (100%). Gram-positive bacteria showed notable β-lactam resistance. UTIs were most common in the second trimester (40%). MDR was observed in 80% of isolates. Primigravida status was strongly associated with MDR, with nearly all primigravida (86.9%) versus few multigravida (3.6%) having MDR infections (AOR=318.25; 95% CI: 27.25-3716.52; p<0.001).
Conclusions: The study underscores the need for routine urine culture, tailored antibiotic therapy, and enhanced surveillance to inform antenatal care and antimicrobial stewardship in Somalia.

Keywords: Antimicrobial resistance, Multidrug resistance, Pregnant women, Somalia, Urinary tract infection, Uropathogens

INTRODUCTION

Urinary tract infection (UTI) is the most prevalent bacterial illness during pregnancy, affecting 10-15% of women globally.[1] Physiological changes during pregnancy, such as hormonal shifts, ureteral distension, and urine stasis, predispose pregnant women to UTIs and put them two to four times more at risk of infection than nonpregnant women.[2] Furthermore, untreated UTI can cause severe maternal and neonatal morbidity in the form of pyelonephritis.[3] *Escherichia coli* is the most commonly isolated uropathogen, responsible for 70-95% of community-acquired UTIs.[3,4] Other common pathogens include *Klebsiella pneumoniae, Proteus mirabilis, Staphylococcus aureus, Pseudomonas aeruginosa, Group B Streptococcus, and Enterococcus faecalis.*[5] Recently, an increasing trend of antimicrobial resistance (AMR) among these pathogens has been identified worldwide, emphasizing the importance of antimicrobial surveillance.[6]

Antimicrobial resistance (AMR) is recognized as a critical public health problem worldwide.[7] Sub-Saharan Africa is particularly vulnerable because of its high burden of communicable diseases and limited robust surveillance systems.[8] Studies in countries such as South Africa and Uganda have found that poor adherence to treatment guidelines, use of one drug, and limited access to antibiotics are drivers of AMR. Alarmingly, high resistance rates to antibiotics generally specified for UTIs have been reported, including ciprofloxacin and third-generation cephalosporins drugs.[9-11] For Example, resistance to ceftriaxone was reported as 70.7%, 57.2%, and 48.8% in Sudan, Ethiopia, and Libya, respectively.[12-14] Although AMR is rising in sub-Saharan Africa, the limited availability of localized data hinders the development of effective public health interventions. A global report from the World Health Organization (WHO) on the surveillance of antimicrobial resistance points out the substantial lack of country-specific data regarding antibiotic resistance patterns and pathogen frequency in numerous low-resource settings.[15] This data gap not only affects clinical decision-making but also contributes to the ongoing emergence and spread of resistant bacterial strains.

In Somalia, AMR is a public health issue compounded by several systemic factors, including inadequate healthcare infrastructure, limited access to essential antibiotics, and a fragile healthcare delivery system.[16] A study among Somali rehabilitants found that *E. coli* showed high resistance to ceftriaxone and cefixime, but remained moderately susceptible to ciprofloxacin and highly susceptible to nitrofurantoin.[17] Despite the reported resistance rates, data specific to pregnant women, one of the most vulnerable groups, remain scarce in Somalia. Although some studies have examined UTIs in this population, they provide limited evidence necessary to inform clinical protocols and antimicrobial stewardship strategies for this population. This gap raises several important research questions: i) What are the predominant uropathogens causing UTIs among pregnant women in Mogadishu, Somalia? ii) What are the antimicrobial resistance patterns of these uropathogens? iii) What are the factors associated with multidrug-resistant infections?

This study, therefore, seeks to address these critical knowledge gaps by identifying the uropathogens responsible for UTIs in pregnant women at Banadir Maternal and Child Hospital in Mogadishu, assessing their antimicrobial susceptibility patterns, and investigating the factors associated with multidrug resistance.

METHODS

Study setting

The study was carried out at Banadir Maternal and Child Hospital, a major public health facility in Mogadishu, Somalia. Established in 1976, the hospital is one of the largest teaching and referral institutions in the country, comprising over 700 beds and nearly 400 healthcare workers. It provides a wide range of inpatient and outpatient services, with an average monthly admission rate of 2,500-3,000 patients.[18]

Study design

A cross-sectional study was conducted at Banadir Maternal and Child Hospital in Mogadishu, Somalia, from August to December 2024. All pregnant women attending antenatal care (ANC) visits during this period, regardless of gestational age, were screened for urinary tract infections (UTIs). Women presenting with either UTI symptoms or asymptomatic bacteriuria were asked to provide midstream urine samples for bacterial culture and antimicrobial resistance testing. Structured forms were used to collect sociodemographic and clinical information, including age, education level, occupation, gestational age, and history of UTIs. Pregnant women aged of 18 years and older who provided written informed consent and diagnosed with symptomatic UTI or asymptomatic bacteriuria were included in the study. Women were excluded if they had taken antibiotics within the two weeks prior to sample collection or declined to provide informed consent. All microbiological analyses, including antimicrobial susceptibility testing using the Kirby-Bauer disc diffusion method, were performed at the Diagnostic and Research Center of Jaamacadda Jazeera University.

Sample size determination and sampling technique

The sample size for this study was determined using Cochran’s formula, based on a previously reported UTI prevalence of 78.6% among pregnant women at Banadir Hospital.[19] A sample size of 263 was required at a 95% confidence level with a 5% margin of error. However, due to logistical constraints and unwillingness of some women to participate, only 200 participants were enrolled. Participants were systematically selected once they attended the hospital during the study period and agreed to participate in the study.

Data and sample collection procedure

Sociodemographic and clinical data including age, education level, occupation, gestational age, history of UTIs, and recent antibiotic use were collected using structured interviews. Clean-catch midstream urine samples were collected in sterile containers to minimize contamination. Samples were stored at 4°C and transported to the Diagnostic and Research Center of Jaamacadda Jazeera University, where they were processed within one hour to ensure accurate microbiological analysis.

Bacterial isolation and identification

Uropathogens were isolated based on their colony morphology on selective and differential media. *Escherichia coli*, for example, was identified by its pink mucoid appearance on MacConkey agar, while Proteus species were noted for their swarming pattern on blood agar. Suspected colonies were subcultured onto fresh media and identified at the species level using standard biochemical methods. Gram-negative bacteria were tested using the sulfur indole motility (SIM) test, citrate test, oxidase test, urease test, and catalase test. Gram-positive bacteria were identified using catalase and coagulase tests according to standard microbiological protocols. Quantification was performed using cystine-lactose-electrolyte-deficient (CLED) agar, and bacterial concentrations were calculated in colony-forming units per milliliter (CFU/mL) in accordance with Clinical and Laboratory Standards Institute (CLSI) guidelines.[20]

Antimicrobial Susceptibility Testing (AST)

Antimicrobial susceptibility testing was performed using the Kirby–Bauer disk diffusion method, following CLSI 2024 guidelines.[21] Bacterial isolates were tested against commonly used antibiotics, including ciprofloxacin (CIP), gentamicin (GENT), and nitrofurantoin (NIT). After 18-24 hours of incubation at 37°C, inhibition zones were measured to classify bacterial sensitivity or resistance. Extended-spectrum beta-lactamase (ESBL) production was assessed by using cefotaxime or ceftazidime in combination with clavulanate. An increase in the inhibition zone of ≥5 mm indicated ESBL activity. Multidrug resistance (MDR) was defined as resistance to three or more classes of antibiotics. Quality control procedures were applied to all reagents, antibiotic discs, and culture media. Items were checked for expiration dates, integrity, and proper storage conditions. Media were sterilized by autoclaving at 121°C for 15 minutes. Routine sterility tests were conducted on 5% of each media batch to ensure absence of contamination and validate test accuracy.

Ethical considerations

Ethical approval was obtained from the Joint Ethics Review Committees of Banadir Maternal and Child Hospital in Mogadishu, Somalia, and the University College Hospital of the University of Ibadan in Nigeria (Ref: UI/EC/24/0303). All ethical standards were upheld, including respect for participant confidentiality, autonomy, and safety. Informed consent was obtained from each participant following a detailed explanation of the study's objectives, procedures, potential risks, and benefits in both English and Somali. Participants were allowed to withdraw at any time without consequence. All sample collection procedures were noninvasive and conducted by trained personnel. Ethical oversight was maintained throughout the study.

Data analysis

Data were analyzed using Stata version 13. Descriptive statistics were used to summarize participant characteristics, bacterial isolates, and antimicrobial susceptibility patterns. Descriptive analyses were performed and presented as figures and tables containing frequencies and percentages. The dependent variable was antimicrobial resistance, defined as the presence of multidrug resistance (MDR). This binary outcome (resistant vs. sensitive) was chosen due to its clinical relevance in guiding treatment decisions. The independent variables included age group, educational status, occupation, gestational age, gravidity (primigravida or multigravida), and history of urinary tract infection (UTI). These variables were selected based on previous research and their relevance to the population and clinical setting.

Bivariate analysis was conducted using chi-square tests for categorical variables to identify variables associated with antimicrobial resistance. All variables used in the bivariate analysis were included in a multivariate logistic regression model. Results were reported as adjusted odds ratios (AORs) with 95% confidence intervals (CIs), and statistical significance was set at $p<0.05$. In cases where quasi-complete separation was detected (extreme associations between predictors and outcome), we reported the logistic regression estimates with their wide confidence intervals, acknowledging the statistical instability while preserving the methodological approach used in the primary analysis.

RESULTS

Sociodemographic and reproductive health characteristics of the participants

Most of the study participants were young adults, with half (50%) aged between 21 and 25 years old. A significant proportion had little or no formal education; only 28% completed secondary school, and 38.5% had no formal education at all. In terms of employment, unemployment (25.5%) was the most common, followed by unskilled workers (30%).

Socioeconomic data showed that 43.5% of the participants came from middle-income families, while nearly half (49%) came from low-income households. A high level of reproductive experience was indicated by the fact that 70.5% were multiparous, and a sizable majority (78.5%) were married. A considerable percentage (78%) also stated that they had previously experienced UTIs (Table 1).

Table 1: Sociodemographic and reproductive health characteristics of the study participants.

Variables	Characteri-stics of patient	Frequency (N)	Percentage (%)
Age in years	18-20	25	12.5
	21-25	100	50.0
	26-30	39	19.5
	31-35	15	7.5
	36-40	20	10.0
	> 41	1	0.5
Educational status	No formal education	77	38.5
	Primary education	28	14.0
	Secondary education	56	28.0
	Tertiary education	39	19.0
Marital status	Single	2	1.0
	Married	157	78.5
	Separated	6	3.0
	Divorced	23	11.5
	Widowed	12	6.0
Occupation status	Student	3	1.5
	Housewife	12	6.0
	Unemployed	51	25.5
	Unskilled	60	30.0
	Semiskilled	30	15.0
	Skilled	27	13.0
	Professional	17	8.5
Socioeconomic Status	$200	98	49.0
	$200 - $400	87	43.5
	> $400	15	7.50
Gestational age	First trimester	64	32.0
	Second trimester	80	40.0
	Third trimester	56	28.0
Gravidity	Primigravida	61	30.5
	Multigravida	139	69.5
History of UTI	Yes	156	78.0
	No	44	22.0

Spectrum of uropathogens among pregnant women attending antenatal care at Banadir Maternal and Child Hospital in Mogadishu

The result indicates that gram-negative bacteria are the primary causative agents of UTIs in this population (Figure 1). *Klebsiella spp.* was isolated in 15.5% of the analysed urine samples, while *Escherichia coli* was detected in 59.5% of the samples. Moreover, uncommon gram-positive bacteria such as Group B *Streptococcus* (6.5%) and Staphylococcus saprophyticus (7.5%) highlight the importance of comprehensive laboratory diagnostics. Others uropathogens including *Staphyloccocus aureus* and *Acinetobacter spp.* were also isolated in 5% and 0.5% of the urine samples respectively.

The distribution of uropathogens varied across the gestational age among the pregnant women during the study period. *Escherichia coli* was the leading uropathogen, accounting for 59.5% of all bacterial isolates. The second trimester had the highest number of *E. coli* cases, with 52 of 119 cases identified during this period. The *Klebsiella spp*. isolates accounted for 15.5% of the samples, the majority of which were present in the first trimester (15 samples). *Staphylococcus saprophyticus* appeared most frequently in the third trimester, accounting for eight of the 15 cases (7.5%). Among all the isolates, the second trimester had the greatest proportion (40%) of uropathogens isolates (Figure 2).

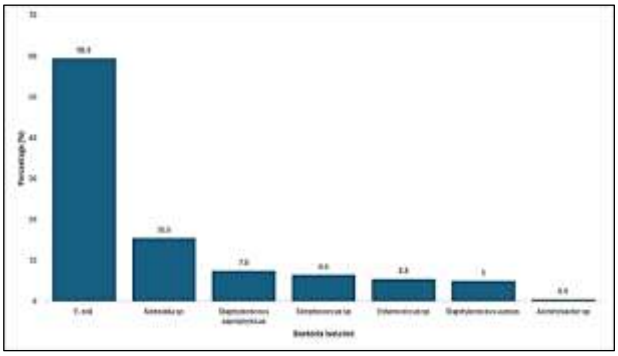

Figure 1: Distribution of uropathogens among pregnant women with UTI attending antenatal care and child hospital in Mogadishu, Somalia (2024).

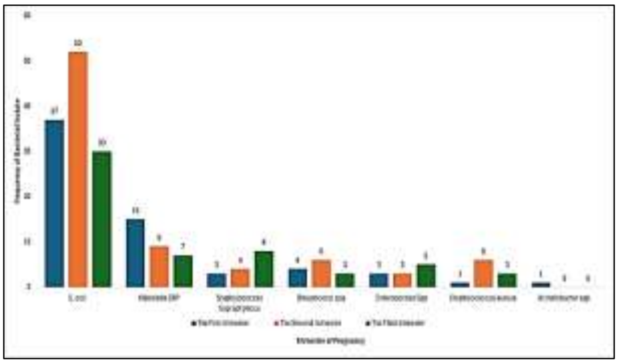

Figure 2: Distribution of uropathogenic bacteria across pregnancy trimesters in pregnant women with UTIs attending Banadir Maternal and Child Hospital in Mogadishu, Somalia (2024).

Analysis of uropathogen distribution by gravidity revealed notable differences (Figure 3). *Escherichia coli* was the predominant uropathogen, accounting for 119 isolates (59.5%), with 80 cases (58.0%) in primigravida and 39 cases (62.9%) in multigravida women. *Klebsiella spp.* comprised 31 isolates (15.5%), predominantly found in primigravida women (23 cases; 16.7%) compared to multigravida (8 cases; 12.9%). *Staphylococcus saprophyticus* was identified in 15 cases (7.5%), with 11 cases (8.0%) in primigravida and 4 cases (6.5%) in multigravida. *Beta-hemolytic Streptococci* were isolated in 13 cases (6.5%), with a strong predominance among primigravida women (12 cases; 8.7%) compared to multigravida (1 case; 1.6%). *Enterococcus spp.* were detected in 11 cases (5.5%), nearly equally distributed between primigravida (6 cases; 4.3%) and multigravida (5 cases; 8.1%). *Staphylococcus aureus* (SA spp.) accounted for 10 cases (5.0%), with 6 cases (4.3%) in primigravida and 4 cases (6.5%) in multigravida. *Acinetobacter spp.* was rare, isolated in only 1 case (0.5%), and was found exclusively in a multigravida woman.

Table 2: Antimicrobial susceptibility patterns of uropathogens isolated from pregnant women with UTIs at Banadir Maternal and Child Hospital in Mogadishu, Somalia (2024).

Bacterial isolates identified	RXN	Antimicrobial agents (%)							
		CIP	*GENT*	*CRO*	*COTRO*	*NITRO*	*AMP*	*AMC*	*MEM*
E. coli	S	97 (81.55)	112 (94.1)	7 (5.8)	104 (87.3)	119 (100)	18 (15.1)	9 (7.5)	88 (73.9)
	R	22 (18.5)	7 (5.8)	112 (94.1)	15 (12.6)	-	101 (84.9)	110 (92.4)	31 (26.1)
Klebsiella spp.	S	24 (77.4)	26 (83.8)	1 (3.2)	12 (38.7)	-	-	31 (100)	23 (74.2)
	R	7 (22.6)	5 (16.1)	30 (96.7)	19 (61.3)	31 (100)	31 (100.)	-	8 (25.8)
Staphylococcus saprophyticus	S	10 (66.6)	13 (86.6)	15 (100)	3 (20.0)	15 (100)	1 (6.67)	15 (100)	11 (73.3)
	R	5 (33.3)	2 (13.3)	-	12 (80.0)	-	14 (93.3)	-	4 (26.8)
Beta Hemolytic Streptococci	S	8 (61.5)	13 (100.0)	13 (100)	13 (100)	-	13 (100.0)	13 (100.0)	11 (84.6)
	R	5 (38.5)	-	-	-	13 (100)	-	-	2 (15.4)
Enterococcus Spp.	S	4 (36.4)	6 (54.5)	7 (63.6)	1 (9.09)	10 (90.9)	1 (9.09)	11 (100)	6 (54.6)
	R	7 (63.64)	5 (45.4)	4 (36.4)	10 (90.9)	1 (9.1)	10 (90.9)	-	5 (45.5)
Staphylococcus aureus	S	3 (30.0)	9 (90.0)	7 (70.0)	5 (50.0)	10 (100)	-	8 (80.0)	2 (20.0)
	R	7 (70.0)	1 (10.0)	3 (30.0)	5 (50.0)	-	10 (100.0)	2 (20.0)	8 (80.0)
Acinetobacter species	S	1 (100.0)	1 (100.0)	-	-	1 (100)	-	-	1 (100.0)
	R	-	-	1 (100.0)	1 (100.0)	-	1 (100)	1 (100.)	-
Total (n=200)	S	147 (73.5)	180(90.0)	50 (25.0)	138 (69.0)	155 (77.5)	33 (16.5)	87 (43.5)	142 (71.0)
	R	53 (26.5)	20 (10.0)	150 (75)	62 (31.0)	45 (22.5)	167 (83.5)	113 (56.5)	58 (29.0)

S: Sensitive; R: Resistant; -: No result; CIP: Ciprofloxacin; GENT: Gentamicin; CRO: Ceftriaxone; COTRO: Cotrimoxazole; NITRO: Nitrofurantoin; AMP: Ampicillin; AMC: Amoxicillin-clavulanate; MEM: Meropenem;

Antimicrobial susceptibility of uropathogens isolated from pregnant women attending antenatal care at Banadir Maternal and Child Hospital in Mogadishu

The antimicrobial susceptibility test revealed that there was heterogeneity of the levels of resistance among uropathogens from pregnant women that attended the antenatal care at Banadir Maternal and Child Hospital during the study period (Table 2). *Escherichia coli* and *Klebsiella spp* were most sensitive to gentamicin, with sensitivity levels of 94.1% and 83.8%, respectively. The two were moderately sensitive to ciprofloxacin (81.6% for *E. coli* and 77.4% for *Klebsiella spp.*) and meropenem (73.9% and 74.2%, respectively). Notably was *E. coli* was maximally sensitive to nitrofurantoin (100%) while all the *Klebsiella Spp.* isolates were resistant to this antimicrobial agent. *Staphylococcus saprophyticus* and *beta-hemolytic Streptococci* were most sensitive to gentamicin and amoxicillin-clavulanate but showed clear resistance to other beta-lactam agents, namely ampicillin. Overall, the highest sensitivity across all isolates was observed for gentamicin (90.0%), nitrofurantoin (77.5%), and meropenem (71.0%), while the greatest resistance was seen with ampicillin (83.5%), ceftriaxone (75.0%), and amoxicillin-clavulanate (56.5%). Overall, 80% of isolates mainly *E. coli, Klebsiella spp.*, and *S. saprophyticus* were resistant to one or more antibiotics.

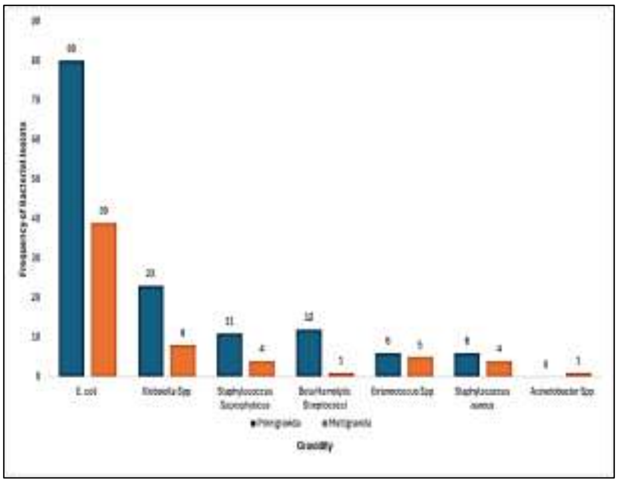

Figure 3: Distribution of bacterial isolates by gravidity among pregnant women with UTIs attending Banadir Maternal and Child Hospital in Mogadishu, Somalia (2024).

Factors associated with antimicrobial resistance among pregnant women attending antenatal care at Banadir Maternal and Child Hospital in Mogadishu

Among the uropathogens isolated from pregnant women, the bivariate analysis showed significant correlations between a variety of factors and multidrug resistance (MDR) (Table 3). MDR and age were significantly correlated (χ^2=8.36, p=0.0038), with the 18 to 20 years old and 31 to 35 years old groups showing the highest resistance. Housewives exhibited the highest resistance, and occupational status also demonstrated a significant association (χ^2=4.68, p=0.0305). Primigravida women had a significantly higher resistance rate than multigravida women, and gravidity was strongly linked to MDR (χ^2=150.39, p<0.0001). Another significant factor was a history of UTI (χ^2=111.51, p<0.0001), with resistance being significantly higher in those without a history. However, there was no significant correlation between MDR and gestational age (χ^2=2.18, p=0.1400) or educational status (χ^2=1.28, p=0.2588).

Table 3: Bivariate analysis of factors associated of multidrug resistance of uropathogens isolated from pregnant women with UTIs at Banadir Maternal and Child Hospital in Mogadishu, Somalia (2024).

Variables	Characteristics	Susceptibility pattern		χ^2	P value
		Sensitive %	Resistant %		
Age (in the year)	18-20	13 (52.0)	12 (48.0)	8.36	0.0038*
	21-25	65 (65.0)	35 (35.0)		
	26-30	38 (97.4)	1 (2.56)		
	31-35	7 (46.7)	8 (53.3)		
	36-40	18 (90.0)	2 (10.0)		
	> 41	1			
Educational status	No formal education	56 (72.73)	21 (27.27)	1.28	0.2588
	Primary education	25 (89.29)	3 (10.71)		
	Secondary education	34 (60.71)	22 (39.29)		
	Tertiary education	27 (69.23)	12 (30.77)		
Occupation status	Student	3 (100.0)	0.00	4.68	0.0305*
	House-wife	5 (41.67)	7 (58.33)		
	Unemployed	39 (76.47)	12 (23.53)		
	Unskilled worker	45 (75.00)	15 (25.00)		
	Semi-skilled worker	18 (60.00)	12 (40.0)		
	Skilled worker	20 (74.07)	7 (25.93)		
	Professional	12 (70.59)	5 (29.41)		
Gravidity	Primigravida	8 (13.11)	53 (86.89)	150.39	0.0000*
	Multigravida	134 (96.4)	5 (53.60)		
Gestational age	First trimester	49 (76.56)	15 (23.44)	2.18	0.1400
	Second trimester	57 (71.25)	23 (28.75)		
	Third trimester	36 (64.29)	20 (35.71)		
History of UTI	Yes	139 (89.10)	17 (10.90)	111.51	0.0000*
	No	3 (6.82)	41 (93.18)		

* = Statistically significant results (p<0.05)

Table 4: Multivariate analysis of predictors of multidrug resistance of uropathogens isolated from pregnant women with UTIs at Banadir Maternal and Child Hospital in Mogadishu, Somalia (2024).

Variables	Characteristics	OR	95% CI		P value
			Lower limit	Upper limit	
Age (in the year)	18-20	Ref	-	-	-
	21-25	0.328	0.034	3.119	0.332
	26-30	0.213	0.006	7.260	0.390
	31-35	0.588	0.033	10.432	0.717
	36-40	2.007	0.140	28.759	0.608
	> 41	-	-	-	-
Educational status	No formal education	Ref	-	-	-
	Primary education	0.909	0.084	9.875	0.937

Continued.

Variables	Characteristics	OR	95% CI		P value
			Lower limit	Upper limit	
	Secondary education	1.001	0.135	7.399	0.999
	Tertiary education	2.193	0.152	31.666	0.564
Occupation status	Student	1	-	-	-
	House-wife	Ref	-	-	-
	Unemployed	0.474	0.032	7.005	0.587
	Unskilled worker	0.101	0.006	1.597	0.104
	Semi-skilled worker	0.212	0.006	8.022	0.402
	Skilled worker	0.017	0.0005	0.645	0.028 **
	Professional	0.023	0.0003	1.586	0.081
Gravidity	Primigravida	318.255	27.253	3716.518	0.000*
	Multigravida	Ref	-	-	-
Gestational age	First trimester	Ref		-	-
	Second trimester	0.970	0.162	5.807	0.973
	Third trimester	1.053	0.155	7.141	0.958
History of UTI	Yes	0.202	0.032	1.299	0.000*
	No	Ref	-	-	-

* = Statistically significant results (p<0.05); † Extreme odds ratio indicates quasi-complete separation: 86.9% of primigravida vs 3.6% of multigravida had MDR.

Multidrug resistance (MDR) among pregnant women had a significant association with gravidity, occupation, and history of UTIs, according to the multivariable logistic regression analysis (Table 4). Primigravida women had extremely high odds of MDR compared to multigravida women (AOR=318.25; 95% CI: 27.25-3716.52; p<0.001). This extreme odds ratio reflects the near-perfect separation in the data, with 86.9% (53/61) of primigravida versus 3.6% (5/139) of multigravida women having MDR infections. The odds of MDR were significantly lower for skilled workers than for housewives among occupational groups (AOR=0.017; 95% CI: 0.0005-0.645; p=0.028). Furthermore, the odds of MDR were lower for women with a history of UTI (AOR = 0.202; 95% CI: 0.032-1.299; p<0.001). Age, educational attainment, and gestational age were among the other variables that did not significantly correlate with MDR (all p>0.05).

DISCUSSION

The study investigated the occurrence of urinary tract infection in pregnant women attending antenatal care at Banadir Maternal and Child Hospital during the period of August to December 2024. Urine cultures are not part of the usual diagnostic protocols, even if routine ANC visits are conducted. Dipstick urinalysis and empirical treatment are employed by clinicians, which may lead to misdiagnosis and inappropriate therapy, potentially posing risk to both maternal and fetal health.

In this study, *Escherichia coli* was the most commonly grown Uropathogen, followed by *Klebsiella* species and *Staphylococcus saprophyticus*. The *E. coli* prevalence in this study is in line with findings from previous studies.[3,4] Gram-positive isolates made up 24.5% of the total isolates, whereas 75.5% were gram-negative. This result correlates findings of studies in Ethiopia, Bangladesh as well as in Somalia, where gram-negative bacteria were shown to be responsible for almost 71% of the cases.[22-24] The high rates of single- and multi-drug resistance found in this underscore the critical need for continuous antibiotic resistance surveillance.

In our study, pregnant women aged between 21 and 25 years old were the most frequently affected by urinary tract infections (UTIs), accounting for 50%. This findings corroborates similar research studies done in Nigeria (61.5%) and Ethiopia (45.2%).[25,26] This susceptibility of Women aged between 21 and 25 years old to UTIs is likely due to alterations in hormone levels, higher frequency of sexual activity, and higher tendency for urinary retention which increased the occurrence of infection when compared with other ages.

Multigravida women experienced a higher frequency of UTIs, potentially due to anatomical changes from multiple pregnancies. Conversely, primigravida women were more likely to present with resistant infections, suggesting possible differences in microbial exposure or immune response. The extremely high odds ratio for primigravida status (AOR=318.25) indicates near-perfect prediction of MDR in our sample, with 86.9% of primigravida versus only 3.6% of multigravida women having MDR infections. While this extreme estimate reflects statistical separation in our data, the strong association suggests primigravidity is an important risk factor for antimicrobial resistance in this population. Physiological changes during pregnancy such as uterine enlargement, reduced bladder tone, and increased plasma volume contribute to urine stasis and elevate UTI risk, particularly during the second trimester when these changes are most prominent.[2]

Interestingly, a history of prior UTI, reported by 78% of participants, was associated with lower resistance, possibly indicating that such patients receive more timely or targeted treatment, reducing the development of resistance. This finding contrasts with previous studies that identified prior antibiotic use and recurrent UTIs as consistent risk factors for antibiotic resistance.[27] The high proportion of multigravida women in this study may have influenced the precision of the statistical analysis leading to this result. However, despite nearly half of the participants coming from low-income households, socioeconomic status did not emerge as a significant risk factor, consistent with findings of a study conducted in Kenya.[28]

Overall, the rise in antibiotic resistance among uropathogens is evident in this study, where Gram-negative bacteria were the predominant isolates consistent with studies from Northern Ethiopia and Karamara Hospital in Jigjiga.[29,30] This trend reinforces the need to update local treatment guidelines and implement targeted antimicrobial strategies, as previously suggested by research from Somalia Hospital in Hargeisa.[24]

Klebsiella pneumoniae was a major isolate, showing maximal resistance (100%) to nitrofurantoin. These results contrast regional findings by Worku et al in Northwest Ethiopia and Naqid et al in Kurdistan Region of Iraq, where nitrofurantoin resistance is rising likely due to regional differences in antibiotic use, stewardship practices, and resistance gene spread.[29,31]

Among gram-positive organisms, *Staphylococcus saprophyticus* and *Enterococcus* species showed distinct resistance patterns. *Enterococcus* demonstrated complete sensitivity to amoxicillin-clavulanate and high sensitivity to nitrofurantoin (90.9%), aligning with findings from previous studies conducted in in Eastern Uganda.[3,32]

Overall, 80% of isolates mainly *E. coli, Klebsiella spp.,* and *S. saprophyticus* were resistant to one or more antibiotics. This resistance rate exceeds those reported in Eastern Uganda (77.41%) and Northern Ethiopia (54%), though it is comparable to rates in North Somalia (85.5%).[33,34,24] These variations likely reflect differences in national infection control protocols, diagnostic capabilities, and antibiotic prescribing practices.

This study has few limitations. The study was conducted at a single hospital Banadir Maternal and Child Hospital in Mogadishu limiting the generalizability of the findings to other healthcare settings and the entirely country. The absence of molecular diagnostic tools restricted the ability to assess genetic mechanisms of antimicrobial resistance, such as resistance genes or virulence factors.

CONCLUSION

This study identified *Escherichia coli* as the most common uropathogen among pregnant women at Banadir Maternal and Child Hospital, accounting for the majority of infections. Gram-negative bacteria were responsible for 75.5% of cases, and 80% of isolates were multidrug resistant, especially to ampicillin, amoxicillin-clavulanate, and cotrimoxazole. Resistance was more common in primigravida women, while infections were most frequent in multigravida and second-trimester women. These findings highlight the importance of incorporating routine urine culture and antibiotic susceptibility testing into antenatal care, particularly during the second trimester. Treatment protocols should be adjusted to reflect local resistance trends, and primigravida women should receive special attention due to their higher likelihood of harboring resistant strains. Strengthening diagnostic services and integrating microbiology-supported screening into prenatal care are critical to improving maternal health and combating antibiotic resistance.

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