



## Bacteriological Study of Urine Samples from Obstetric Patients in Onitsha Metropolis: Public Health Implications

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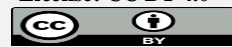
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Abstract	Article History
<p>The decline in immunity among obstetric populations may promote the growth of bacteria, leading to urinary tract infections (UTIs). This study aimed to investigate the bacteriological profile of urine samples from obstetric patients in Onitsha Metropolis. A total of 395 urine samples from pregnant (287) and non-pregnant (98) females were analyzed for UTI. Bacterial isolates were characterized and identified using colonial description, Gram staining, and biochemical reactions. The predominant isolates were subjected to sensitivity testing against conventional antibiotics and medicinal plants. The study revealed a 70.6% prevalence of UTI, with 79.9% of positive samples from pregnant females. <i>Escherichia coli</i> was the most common isolate. The isolates showed sensitivity to conventional antibiotics, with ciprofloxacin exhibiting the highest activity. Medicinal plant extracts also showed antimicrobial activity. The study highlights the need for periodic testing and treatment of UTI in obstetric patients to prevent complications. Ciprofloxacin was found to be an effective antibiotic against the isolated bacteria.</p> <p><b>Keywords:</b> Urinary tract infection, obstetric patients, <i>Escherichia coli</i>, antibiotic sensitivity, Onitsha Metropolis</p>	<p>Received: 27 Apr 2025 Accepted: 24 May 2025 Published: 26 Jun 2025</p>  <p>Scan QR Code to view<sup>1</sup></p> <p>License: CC BY 4.0<sup>24</sup></p>  <p>Open Access article.</p>
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### 1. Introduction

Urinary tract infection (UTIs) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. It is perhaps the most common bacterial infection of mankind (Morgan and Mckenzie, 1993; Ebie *et al.*, 2001). Urinary tract infection is microbiologically defined as where there are 10<sup>5</sup> or more of microorganisms or of a single strain of bacterium per milliliter of midstream urine samples (Davidson *et al.*, 1989; Bloomberg *et al.*, 2005). The presence of bacteria without symptoms is termed

asymptomatic bacteriuria. Common pathogens associated with UTI include *E. coli*, *Proteus species*, *Klebsiella species* although the distribution of pathogens that cause UTI is changing (Obirikoranget *al.*, 2012).

Pregnant women are at increased risk of UTIs with incidence rates being as high as 8% in the United States (Delzell and Lefevre, 2000). UTI in pregnant women has been attributed to increase in urinary stasis, ureteric relaxation and other anatomical changes (Obirikoranget *al.*, 2012). These

pathological conditions begin in the week and peak during the 22<sup>nd</sup> to 4<sup>th</sup> weeks and this presents easy passage of urine (Delzell and Lefevre, 2000).

Urinary tract infection (UTIs) may be divided clinically into symptomatic and asymptomatic infections. The infection is called symptomatic if there is significant bacteriuria (> 100,000 CFU/ml) accompanied by clinical symptoms, such as dysuria, frequent micturition, and strangury, with or without fever and lower back pain.

The infection is called asymptomatic if significant bacteriuria is found in apparently healthy children or adults without symptoms pointing to UTI (Boekitwetan *et al.*, 2009). There are several ways to diagnose UTI, but urine culture still remains the most reliable tool for this diagnosis. Urine culture has shown *E. coli* to be the most common bacterial isolate of UTI during pregnancy (Ebie *et al.*, 2001, Bloomberg *et al.*, 2005). Other studies have also reported *Klebsiella Spp* and *Staphylococcus aureus* as the commonest isolates. Group B streptococci are uncommon pathogen in UTI in young healthy women, but require treatment in pregnant women.

The cases of UTI in obstetric women historically have been treated with longer (7-10 days) courses of antibiotics. More recent studies have found shorter courses (3-5 days) of oral antibiotics to be as effective as traditional courses. The advantages of shorter course therapy include decreased cost of antibiotics, improved patient compliance and decreased adverse effects of antibiotic treatment. The uses of medicinal plants have shown that the red pigments in most plants are as the result of tannins (or proanthocyanadins) which prevent *E. coli* from adhering to cells in the urinary tract. Also, important research has targeted probiotics, which may protect against infections in the genital and urinary tracts. The most well-known probiotics are the *Lactobacillus* strains, *Bifidobacterium* species, *Enterococcus faecium* and *Streptococcus thermophiles* (Boekitwetan *et al.*, 2009).

However, variations have been noted to exist in the incidence of bacteriuria and subsequent UTI in different countries and this has been attributed to differences in definition, methods of screening and associated risk factors such as age, parity and pregnancy. Despite different researches and write-ups on urinary tract infections, no work has been published on bacteria isolates associated with the urine samples collected from those obstetric patients within Onitsha metropolis. Thus research work focused on the bacteriological study of urine samples from obstetric patients in Onitsha metropolis.

## 2. Materials and Methods

### Study Site

This study was conducted in different hospitals found in Onitsha Metropolis. The study was carried out among the obstetric patients attending different hospitals within this area. The prospective study was conducted from the period of 4<sup>th</sup> March, 2011 until 19<sup>th</sup> December 2013.

### Study Population

In all, total of 395 urine samples were collected from both obstetric females, with ages ranging from 18 to 51 years attending the studied hospitals for treatments, check-ups or antenatal. The collections were randomly selected on every day basis within the periods of 8.00am to 11.00am. Pregnant women who were on antibiotic treatment two weeks prior to their initial visit and those at 38 weeks gestation or more were excluded from the study. The samples collected were classified based on age, occupation, level of education and marital status.

### Sample Collection

The obstetric females were properly educated to collect clean catch midstream urine samples wide mouthed sterile capped containers after proper cleaning of the external genitalia. Urine samples were labeled and immediately sent to the laboratory in cold boxes and cultured on appropriate media.

### Culturing of the Samples

The Petri dishes used for this work were disposable plates, sterilized using 70% ethanol. The glass wares were sterilized using electric oven at 160° c for 3 h. The prepared media were sterilized using an autoclave at 121° c for 15 psi at 15min. The urine samples were cultured using pour plating method on blood agar and Macconkey agar. Inoculated plates were incubated inverted at 37° c aerobically for 24 h. After incubation, the total heterotrophic aerobic bacterial counts were carried out, and then the plates were sub-cultured for further identification.

### Colony counts

Colonies were counted on blood agar using electric colony counter. A bacterial count of  $1 \times 10^5$  per ml was considered significant for urinary tract infection (UTI) and counts of  $10^2 - 10^4$  per ml were considered as suspected bacteriuria while counts less than  $10^2$  per ml were considered no significant bacterial growth (Obirikorang *et al.*, 2012).

### Characterization and Identification of the Isolates

The growth on the mixed cultured plates were sub-cultured on nutrient agar (oxid) and incubated aerobically at 37° c for 24 h. Growth on the culture media were identified using their colonial description, Gram staining reactions, biochemical reactions and sugar fermentation tests (Obirikorang *et al.*, 2012; Iheukwumere *et al.*, 2025a and Iheukwumere *et al.*, 2025b).

### Inoculum preparation

The isolates were grown on nutrient broth at 37° c for 24 h. After incubation, the optical density of broth culture was measured using a spectrophotometer at 540 nm to ascertain the growth of the organisms on the medium (Nweze and Okafor, 2010). Also, the organisms used were the most predominated ones from the study.

### Laboratory animals

The laboratory animals used for this were albino mice weighed between 24-29 g, bred in Faculty of Medical Laboratory Science, University of Nigeria, Nsukka. They were housed in metal cages and fed prior to the analysis.

### Animal inoculation

This was carried out using modified method of Nweze and Okafor (2010), Abiodun *et al.* (2024a) and Abiodun *et al.* (2024c). An aliquot of 0.2 ml of the broth culture of each test organism was inoculated intra peritoneally into each of the albino mice. Similarly, 0.2 ml of normal saline was inoculated into another group as control. The inoculated animals were housed in different cages and well labeled and allowed to stay for 2 weeks.

### Histological examination and pathology test

After two weeks, the laboratory animal animals were autopsied. Their liver, kidney and spleen tissues were removed, portion of this tissues were homogenized and cultured on nutrient agar to ensure the presence of the test organism in the tissues. The remaining tissue materials were stored in formalin for histopathological test (Nweze and Okafor, 2010; Abiodun *et al.*, 2024a; and Abiodun *et al.*, 2024c). The main purpose of this test was to examine the cases of abortion and physical deformities among fetuses. Also, some mice died before the period of two weeks and their organs were harvested and examined.

### Sensitivity Tests

The antimicrobial susceptibility test was performed using agar well diffusion method. Conventional antibiotics and medicinal plants were used for this study.

### Preparation of conventional antibiotics

This was carried out using the modified method of Bint and Hill (1994). About 250 mg / ml of the test antibiotics was prepared by dissolving 0.5 g of the antibiotic into 2.0 ml of distilled water.

### Preparation of leaves samples for extraction

The leaves samples of *Ocimum gratissimum* (Scent leaf) and *Vernia amygdalina* (bitter leaf) were used. The leaves were collected, washed and dried under room temperature for 14 days (Nwobu *et al.* 2010; Ekesiobi *et al.*, 2017; Ekesiobi, 2025 and Abiodun *et al.*, 2024c)

### Extraction of the leaf samples

The leaf samples were ground into powdered form using a sterilized electric blender, 20 g of each was dissolved in 200 ml of ethanol and aqueous solvents and allowed for 3 days with mechanical shaking. The solution was filtered using No. 1 Whatman filter paper at room temperature, and the extracts were then concentrated for further analysis. This is a modified method of Iheukwumere *et al.* (2012) and Iheukwumere *et al.* (2025d).

### Preparation of test extracts

This was carried out using the modified method of Iheukwumere *et al.* (2012), Iheukwumere *et al.* (2025e). About 5 g of the extract was dissolved in 20 ml of extracting solvents to form 250 mg/ ml.

### Preparation of the test organisms

The test organisms were prepared by inoculating the pure culture into the nutrient broth and incubating at 37° c for 24 h. The 24 h broth culture was centrifuged, and the sediment

was washed and used it for this study. (Iheukwumere *et al.* 2012).

### Agar-welled diffusion technique

Here, the modified method of Iheukwumere *et al.* (2012) was used. The organism was seeded on Muller Hinton Agar (MHA) using pour plate method and allowed to solidify. A sterile cork borer (5 mm diameter) was used to make wells on the medium. About 0.1 ml of the test antimicrobial substance was dropped in the well and incubated at 37° c for 24 h. The diameter zones of inhibition were measured using meter rule after 24 h incubation.

### Statistical Analysis

The results of the data generated were expressed as mean, percentage and Table; Data were analyzed by two-way Analysis of Variance (ANOVA) to determine the significance of the main effects and interactions at 95 % confidence level. Pair wise comparison of mean was done by Student “t” test as described in the study published by Iheukwumere *et al.* (2018), Iheukwumere *et al.* (2025b), and Abiodun *et al.* (2024a).

## 3. Results

Out of 395 samples collected from pregnant (287 samples) and non-pregnant (98 samples) females visiting different hospitals in Onitsha Metropolis, 279 samples were significant for UTI (10<sup>5</sup> CFU/ ml) while 116 samples were not significant for UTI ( Tables 1, 2, 3, 4 and 5). Out of 279 positive samples, 223 samples were collected from pregnant females while 56 samples were collected from non-pregnant females (Tables 1, 2, 3, 4 and 5).

In Anaechebe specialist hospital, 74 urine samples were collected, 46 samples from pregnant females while 28 samples from non-pregnant females. Among the 45 positive samples, 38 samples were collected from pregnant females while 7 samples were collected from non-pregnant females (Table 4). In Bethsida hospital, 109 samples were collected; 86 samples from pregnant females while 23 samples from non-pregnant females. Among the 67 positive samples, 57 samples were collected from pregnant females while 10 samples were collected from non-pregnant females (Table 4). A total of 115 samples were collected from Boromi hospital, 75 samples were collected from pregnant females while 40 from non-pregnant females. Among the 91 UTI significant samples, 64 were from pregnant females while 27 from non-pregnant females (Table 4). Out of 97 samples collected from Pieta hospital, 80 samples were collected from pregnant females while 17 from non-pregnant females. Among the 76 positive samples, 64 samples were gotten from pregnant females while 12 from non-pregnant females (Table 4).

Out of 395 samples collected, 110 samples were gotten within the range of 1-20 years, 86 samples from pregnant females while 24 from non-pregnant females. Among 89 (80%) positive samples, 73 were from pregnant females while 16 from non-pregnant females (Table 2 and 4). A total of 234 samples were collected within the range of 21- 40 years, 166 from pregnant females while 68 from non-

pregnant females. Among 161 (68.8%) positive samples, 127 were collected from pregnant females while 34 from non-pregnant females (Tables 2 and 4). A total of 51 samples were collected within the range of 40-60 years, 35 were from pregnant females while 16 from non-pregnant females. Among 29 positive samples, 23 samples were from pregnant females while 6 from non-pregnant females (Table 2 and 4). Out of 395 samples collected, 80 samples were collected from single females, 13 from single pregnant females while 67 from non-pregnant. Among 62 (77.5%) positive samples, 9 were from pregnant females and 53 from non-pregnant females (Tables 3 and 5). A total of 309 samples were collected from married females, 216 from married pregnant females and 93 from married non pregnant females. Among 211 (68.3%) positive samples, 162 were from married pregnant females and 49 from married non pregnant females (Tables 3 and 5). A total of 6 samples were collected from the divorced females, nil from divorce pregnant females and 6 from divorce non pregnant females. The 6 (100%) positive samples were all from divorce non pregnant females (Table 3 and 5).

The following bacteria were isolated from the urine samples; *E. coli*, *S. aureus*, *P. mirabilis*, *K. pneumoniae*, *Citrobacter freundii*, *P. vulgaris*, *Enterobacter aerogenes*, *K. oxytoca*, *Citrobacterkoseri*, *S. saprophyticus*, *Pseudomonas aeruginosa*, *Providencia rettgeri*, *Serratia marcescens*, *Enterobacter sakazakii* and *Enterobacter cloacae*. These organisms were characterized and identified based on their colonial description, Gram reactions, and biochemical

reactions and *E. coli* was the most prevalent (Table 6). The result of abortive and physical deformity of the foetus after 14 days exposure to the predominate bacteria isolated from the urine samples are shown in table 7. The study revealed that there were no cases of abortion and physical deformity seen among the pregnant mice and foetus after 14 days exposure.

The results of the histopathological test are shown in figure 1-30. The study revealed that the ability of this pathogenic organisms to invade the kidney, liver and spleen results to different deformities to these organs such as necrosis, hemorrhage, hyperplasia, enlargement of glomeruli, fibrosis, cholestasis, hypertrophy of kuffer cells, deposition of amyloids, clogging of blood vessels. These led to progressive deterioration of these organs and their functions. The result of the sensitivity patterns of the predominated isolates against conventional antibiotics (tetracycline, Gentamicin, Ciprofloxacin, Ampicillin, Nalidixic acid) and medicinal plants (*Ociniumgratissimum* and *Veroniaamygdalina* are shown in tables 8 and 9). The study showed that both the conventional antibiotics and medicinal plants had pronounced activity against the tested isolates. The Ciproflxacin showed most activity among the conventional antibiotics, mainly on *Proteus mirabilis* while ampicillin was the least. Ethanolic extract exhibited more activity than the aqueous extracts. The activities of the two plants were slightly the same against the tested organisms and most on *E. coli*.

Table 1: Samples collected for the analysis

Hospital	pregnant Patients (%)	Non pregnant patients (%)	Total (%)
Anaachebe	46 (16 .02)	18 (18 .37)	74(18.73)
Bethsida	86 (29.97)	23 (23.47)	109(27.59)
Boromi	75 (26.14)	40 (40.82)	115(29.11)
Pieta	80 (27.87)	17 (17.35)	97(24.56)
Total	287 (100)	98 (100)	395 (100)

Table 2: Classification of samples based on the subject's age

Age (Year)	AN		BE		BO		PI	
	P	N	P	N	P	N	P	N
1 – 20	13	5	19	6	30	10	24	3
21-40	26	21	58	13	34	23	48	11
41-60	7	2	9	4	11	7	8	3
	46	28	86	23	75	40	80	17
	74		109		115		97	

P = Pregnant

N = Non pregnant

AN = Anaachebe specialist hospital

BE = Bethsida hospital

BO = Boromi hospital

PI = Pieta hospital

Table 3: Classification of samples based on the marital status

Marital Status	AN		BE		BO		PI	
	P	N	P	N	P	N	P	N
Single	2	11	1	17	3	18	7	21
Married	39	19	69	22	67	26	41	26
Divorced	-	3	-	-	-	1	-	2
	41	43	70	39	70	45	48	49
	74		109		115		97	

P = Pregnant

N = Non pregnant

AN = Anaachebe specialist hospital

BE = Bethesda hospital

BO = Boromi hospital

PI = Pieta hospital

Table 4: Ratio of pregnant positive to non-pregnant positive based on the age

Age (year)	AN		BE		BO		PI	
	P	N	P	N	P	N	P	N
1 – 20	10	2	17	1	26	10	20	3
21 -40	23	5	36	7	30	14	38	8
41 -60	5	-	4	2	8	3	6	1
	38	7	57	10	64	27	64	12
	45		67		91		76	

P = Pregnant

N = Non pregnant

AN = Anaachebe specialist hospital

BE = Bethesda hospital

BO = Boromi hospital

PI = Pieta hospital

Positive =  $10^5$  CFU/ mlSuspected =  $10^2$  -  $10^4$ Negative =  $< 10^2$ 

Table 5: Ratio of pregnant positive to non-pregnant positive based on marital status

Marital Status	AN		BE		BO		PI	
	P	N	P	N	P	N	P	N
Single	2	9	-	12	2	15	5	17
Married	23	8	45	10	58	15	36	16
Divorced	-	3	-	-	-	1	-	2
	25	20	45	22	60	31	41	34
	45		67		91		75	

P = Pregnant

N = Non pregnant

AN = Anaachebe specialist hospital

BE = Bethesda hospital

BO = Boromi hospital

PI = Pieta hospital

Table 6: Bacterial organisms isolated from the urine samples and their frequency

Isolate	Number/ 395 samples	percentage
<i>E. coli</i>	132	28.76
<i>S. aureus</i>	61	13.29
<i>Proteus mirabilis</i>	50	10.89
<i>Klebsiellapneumoniae</i>	41	8.93
<i>Citobacterfreundii</i>	38	8.28
<i>Proteus vulgaricus</i>	32	6.97
<i>Enterobacteraerogenes</i>	28	6.10
<i>Klebsiellaoxytoxa</i>	23	5.01
<i>Citrobacterkoseri</i>	17	3.70
<i>S. saprophyticus</i>	13	2.83
<i>Pseudomonas auroginosa</i>	8	1.74
<i>Providenciarettgeri</i>	6	1.31
<i>Serratiamarcescens</i>	4	0.87
<i>Enterobactersakazakii</i>	4	0.87
<i>Enterobacter cloacae</i>	2	0.44

Table 7: Abortive and physical deformities of pregnant mice with foetus

Isolate	After 14 days		
	Abortion	physical deformation of foetus	
<i>Escherichia coli</i>	-	-	-
<i>Klebsiellapneumoniae</i>	-	-	-
<i>Proteus mirabilis</i>	-	-	-
<i>Proteus vulgaricus</i>	-	-	-
<i>Staphylococcus aureus</i>	-	-	-

+ = positive  
- = Negative/ nil

Table 8: Diameter zones of inhibition of the conventional antibiotics against the predominate isolates

Inhibitory Substance	<i>E. coli</i> (mm)	<i>S. aureus</i> (mm)	<i>P. mirabilis</i> (mm)	<i>K. pneumoniae</i> (mm)
Tetracycline (250 mg/ ml)	13.60	10.10	14.10	13.10
Gentamycin (250 mg/ ml)	19.90	10.40	21.10	20.05
Ciprofloxacin (250 mg/ ml)	21.10	9.70	22.00	19.80
Ampicillin (250 mg/ ml)	10.30	10.70	12.10	11.10
Nalidixic acid (250 mg/ ml)	11.80	10.60	13.40	15.70

Table 9: Diameter zones of inhibition of the leaves extracts against the predominate isolates

Inhibitory Substance	<i>E. coli</i> (mm)	<i>S. aureus</i> (mm)	<i>P. mirabilis</i> (mm)	<i>K. pneumoniae</i> (mm)
EEO (250 mg/ml)	8.20	7.10	10.30	9.10
EEV (250 mg/ml)	7.70	7.50	10.90	8.70
AEO (250 mg/ml)	5.90	-	6.40	6.10
AEV (250 mg/ml)	5.70	-	6.60	5.70

E E O = Ethanolic Extract of *Ocimumgratissimum*

E E V = Ethanolic Extract of *Veroniaamygdalina*

A E O = Aqueous Extract of *Ocimumgratissimum*

A E V = Aqueous Extract of *Veroniaamygdalina*

#### 4. Discussion

Uropathogenic organisms have virulence factors, such as fimbriae, that promote binding to the epithelium of the vagina and urethra and enhance their ability to cause UTI (Rosen *et al.*, 2007). Other factors include increased resistance to serum bactericidal activity and host defence mechanisms and invasive factors (Rosen *et al.*, 2007). The main causative pathogen involved in UTI in women is *E.coli*, which is responsible for approximately 80% of all episodes of infection. Other significant pathogens include *S. saprophyticus*, *S. aureus*, *K.pneumonia* and *P. mirabilis*, which each cause approximately 4% of all episodes of UTI. Infection with organisms that do not usually cause UTIs may be an indicator of underlying structural abnormalities of renal calculi (American College of Obstetricians and Gynaecologists, 2008).

The present study evaluates the bacteriological study of urine samples from obstetric patients in Onitsha Metropolis. Out of 395 samples collected from pregnant (287) and non-pregnant (98) females visiting different hospitals in Onitsha Metropolis, 279 (70.6%) samples were positive for UTI ( $10^5$  CFU/ ml) while 116 samples were not significant. The study also revealed that 223 (79.9%) samples out of the positive samples were collected from pregnant females. This shows that the cases of UTI occurred more in pregnant females than in non-pregnant females. The reason for this trend could be due to the apparent decline in immunity among pregnant females, which promotes the growth of both commensal bacteria. Similar conclusions were drawn by different researchers Bloomberg *et al.*, 2005., Boekitwetan *et al.*, 2009; Obirikorang *et al.*, 2012). Also, Bint and Hill (1994) in a study in bacteriuria in pregnancy reported that the prevalence of bacteriuria in pregnancy ranges from 4% to 7% depending on the population being studied.

The study showed that 80.9%, 68.8% and 76.5% of the samples collected within the age distribution 1-20 years, 21-40 years and 41-60 years, respectively, were positive for UTI.

This shows that the causes of UTI were most among 1-20 years, followed by 41-60 years while 21-40 years were the least. The highest cases of UTI among 1-20 years could be because most females in this age group are young, highly sexually active females. Some engage in sexual intercourse more than required, changes of sexual partners and use of spermicides (Bint and Hill (1994). Also biological and physical factors could contribute to the increase cases of UTI such as having shorter distance between urethra and anus, deficient of human beta-defensive-1(HBD-1); a natural occurring antibiotic and presence of sialosylgalactosylgloboside (SGG) on the surface of kidney cells, which is a highly powerful receptor of *E.coli* (American college of Obstetricians and Gynecologists, 2008).

The study further revealed that 77.5%, 68.3% and 100% of divorce females respectively were positive for UTI. This shows that the cases of UTI were most among divorce females visiting the hospitals. The reason for this trend could be because divorce females always expose themselves to multiple sexual partners, and this encourages cases of UTI (Delzell and Leferre, 2000).

The study revealed that the following organisms were present in the samples; *E. coli*, *S. aureus*, *P.mirabilis*, *K.pneumoniae*, *C.frundii*, *P. vulgaris*, *E. aerogenes*, *K. oxytoca*, *C. koseri*, *S. saprophyticus*, *P. aeruginosa*, *P. rettgeri*, *S. marscens*, *E. sakazakii*, and *E. cloacae*.

This showed that *E. coli* occurred most among these isolates. A similar trend was reported by Ansbach *et al.* (2005) that *E. coli* was the predominant pathogen in uncomplicated UTI in women, and associated with more than 80% of cases. Similar conclusions were drawn by other researchers (Bloomberg *et al.*, 2005; Boekitwet *et al.*, 2012).

The study showed that there were no cases of abortion and physical deformity seen among the pregnant mice and fetuses after exposing the pregnant mice to the various predominant pathogens for 14 days. This could be because the organisms were not able to invade the foetal membrane as a result of immunosuppressant factors made by the foetus, placenta and mother, such as mucoproteins produced by parents' plasma, placental giant cells, alpha-fetoproteins and B1-glycoproteins (Arora and Arora, 2008).

The histopathological study of the predominated bacteria revealed some significant damages to the implicated organs. In the kidney, the organisms caused proliferation and swelling of endothelial and mesangial cells which lead to enlargement of glomeruli. There were also the presence of renal amyloidosis which widened the  $Mg^{2+}$  and enlarged the tubules, induces hemorrhagic conditions due to toxins. The hyperplasia of renal tubules and necrosis of renal cells led to progressive deterioration of renal functions. In the spleen, the organisms caused necrosis of the white pulp at the posterior region, deposition of amyloid in the red pulp and hemorrhage with fibrotic areas primarily localized at the red pulp. In the lines, the organisms caused clogging of blood vessels, hyperplasia of hepatocytes, necrosis, fibrosis, hypertrophy of kuffer cells, the wall of the distended bile ducts which led to leakage of bile into the connective tissues mainly around the portal vein of the liver, thus resulting to cholestasis due to extravasation of bile. Similar findings were found by (Arora and Arora, 2008).

The study further revealed that the conventional antibodies and medicinal plants used for this study were active against the tested bacteria. Ciprofloxacin showed most activity against the test bacteria due to its wider spectrum of activity and ability to inhibit the predominant bacteria more than other conventional antibiotics (Arora and Arora, 2008). The ethanolic extracts exhibited more activity than the aqueous extracts due to the ability of the phytochemicals to dissolve more in ethanol than the aqueous solvent, thereby making ethanolic extract to contain more of the phytochemical constituents than the aqueous extracts (Iheukwumere *et al.*, 2012).

## 5. Conclusion

This study highlights the prevalence of urinary tract infections (UTIs) among specific demographic groups, particularly pregnant females, divorced females, and young, sexually active females. *Escherichia coli* (*E. coli*) was identified as the primary causative agent. While the isolated *E. coli* strain did not induce abortions or fetal deformities in pregnant mice, it caused notable pathological changes in the visceral organs. Both conventional antibiotics and medicinal plants exhibited significant antibacterial activity against the *E. coli* isolates, with ciprofloxacin demonstrating the highest

efficacy. These findings underscore the importance of regular UTI screening and targeted antibiotic treatment, such as ciprofloxacin, to prevent complications and ensure optimal patient outcomes.

## Conflicts of Interest

Authors declare that there is no conflict of interest

## References

- Abiodun, M. O., Ekesiobi, A. O., Onyenweife, L. C., and Bankole, O. T. (2024c). Hepatotoxicity effect of Gongronemalatifollium aqueous leave extract on some biomarker liver enzyme of albino Wister rats. *Dutse Journal of Pure and Applied Sciences*, 10(4a): 343-348.
- Abiodun, M. O., Ekesiobi, A. O., and Onyenweife, L. C. (2024a). Anti-Trypanosoma Activities, Histological and Kidney Function Effect of Garcinia kola Seed Extract and Standard Drug (Diaminizene Acetate) in Trypanosomiasis Disease Induced Albino Wister rat. *Adeleke University Journal of Science*, 3(1): 238-259.
- Abiodun, M. O., Onyenweife, L. C., and Ekesiobi, A. O. (2024b). Exploring the in-vitro and in-vivo trapanosomal Activities of Gacinia kola (Bitter kola) Seed Aqueous Extract using Animal Models: Trypsnosomal. *ABUAD International Journal of Natural and Applied Sciences*, 4(2): 113-120.
- American College of Obstetricians and Gynecologists. Treatment of urinary tract infection in non pregnant women. ACOG practice Bulletin No. 91, March, 2008. *Obstetric Gynecology* 11:785-794.
- Ansbach, R. K., Dybus, K., & Bergeson, R. (2005). Uncomplicated *E coli* Urinary Tract Infection in College Women: A Follow-up Study of *E coli* Sensitivities to Commonly Prescribed Antibiotics. *Journal of American College Health*, 54(2), 81-84. <https://doi.org/10.3200/JACH.54.2.81-84>
- Arora, D.R. and Arora, B. (2008). Text book of Microbiology, third edition. CBS publishers, New Delhi, India, Pp. 437-441.
- Bint, A.J. and Hill, D. (1994). Bacteriuria of pregnancy- an update on significance, diagnosis and management. *Journal of Antimicrobial Chemotherapy* 33: 93-97
- Bloomberg, G. R., Banister, C., Sterkel, R., & DeBaun, M. R. (2005). Predictors and outcome of urinary tract infections in sickle cell disease. *Pediatric Blood & Cancer*, 44(6), 567-573.
- Boekitwetan, P., Siagian, S. N., & Amandito, R. (2009). The role of probiotics in the prevention of urinary tract infection. *Paediatrica Indonesiana*, 49(3), 176-182.
- Davidson, S., Passmore, R., Brock, J. F., & Truswell, A. S. (1989). *Human nutrition and dietetics* (6th ed.). Churchill Livingstone.
- Delzell, J. E., & Lefevre, M. L. (2000). Urinary tract infections during pregnancy. *American Family Physician*, 61(3), 713-721.
- Ebie, M. Y., Kandakai-Olukemi, Y. T., Ayanbadejo, J., & Tanyigna, K. B. (2001). Urinary tract infections in a Nigerian Military Hospital. *Nigerian Journal of Microbiology*, 15(1), 31-37.
- Ekesiobi, A. O., Anene, C. C., Igbodika, M. C., Nwigwe, H. C., Emmy-Egbe, I. O., and Orji, N. M. (2017). Evaluation of Repellent and Larvicidal Activity of Cymbopogon Citratus (Lemon Grass) Against Filarial Vector, Culex

- Quinquefasciatus. *African Journal of Education, Science and Technology (AJEST)*, 3(4): 25-32.
- Ekesiobi, A. O. (2025). Evaluation of the Aqueous Leaf Extract of *Ocimum gratissimum* (Scent Leaf) against Larvae of *Musca domestica*. *IPS Journal of Drug Discovery Research and Reviews*, 3(1): 15–22. <https://doi.org/10.54117/ijddr.v3i1.26>
- Iheukwumere, I. H., Iheukwumere, C. M., Obianom, A. O., Nnadozie, C. H., Okereke, F. O., Onwuasoanya, U. F., Udeagbara, O. E., Unaeze, B. C., Obiefuna, O. H., Ike, V. E., Onyemekara, N. N., and Ihenatuoha, U. A. (2025a). Quotidian of Substantial Strain of *Shigella dysenteriae* among Ready To-Eat Fruit Salad Sold in Uli Community. *Journal of Pollution Monitoring, Evaluation Studies and Control*, 4(1): 95–99. <https://doi.org/10.54117/jpmesc.v4i1.17>
- Iheukwumere, I. H., Iheukwumere, C. M., Obianom, A. O., Nnadozie, C. H., Okereke, F. O., Onwuasoanya, U. F., and Ihenatuoha, U. A. (2025b). Cross-Sectional Study of Different Strains of *Bacillus cereus* among Pap Sold in Major Towns in Ihiala LGA, Anambra State. *IPS Journal of Public Health*, 5(2): 199–204. <https://doi.org/10.54117/ijph.v5i2.39>
- Iheukwumere, I. H., Iheukwumere, C. M., Ikunna, A. E., Obiefuna, O. H., Unaeze, C. B., Obianom, A. A., Onyemekara, N. N., Ike, V. E., Udeagbara, O. E., and Nnadozie, C. H. (2025c). Assessment of Quality and In Vitro Activities of Essential Oils Extracted from Some Selected Nigeria Dignifying Plants against Dematiaceous Fungi. *IPS Journal of Drug Discovery Research and Reviews*, 3(1): 23–31. <https://doi.org/10.54117/ijddr.v3i1.27>
- Iheukwumere, I. H., Ajeh, J. C., Iheukwumere, C. M., Ike, V. E., Obianom, A. O., Ihenatuoha, U. A., Igboanugo, E. U., Onwuasoanya, U. F., Okereke, F. O., Nnadozie, C. H., Agbaugo, C. F., Nwike, M. I., Nwakoby, N. E., and Ilechukwu, C. C. (2025). Exploring the Phytochemical and Antimicrobial Properties of Fruit Vinegar: A Study on *Phoenix Dactylifera* and *Malus Sylvestris*. *IPS Journal of Applied Microbiology and Biotechnology*, 4(1): 115–122. <https://doi.org/10.54117/ijamb.v4i1.48>
- Iheukwumere, I. H., Iheukwumere, C. M., Obianom, A. O., Nnadozie, C. H., Onwuasoanya, U. F., Oduoye, O. T., Ike, V. E., Obiefuna, O. H., Igboanugo, E. U., Ejike, C. C., Udeagbara, O. E., Ochibulu, S. C., Onyemekara, N. N., Ihenatuoha, U. A., Nwakoby, N. E., and Ilechukwu, C. C. (2025d). Structural Elucidation and Antibacterial Evaluation of Natural Products from the Nigric Section of *Aspergillus* Species against Sorbitol-Positive and -Negative *Escherichia coli*. *IPS Journal of Natural Products*, 1(1): 1–12. <https://doi.org/10.54117/ijnp.v1i1.29>
- Iheukwumere, I.H., Uba, B.O. and Ubajekwe, C.C. (2012). Antibacterial activity of *Anonamuricata* and *Persea americana* leaves extracts against Ampicillin resistant *Staphylococcus aureus*. *Journal of Science, Engineering and Technology*.19: 10786-10798.
- Morgan, R. W., & McKenzie, H. (1993). Urinary tract infection. In R. M. Cooke (Ed.), *General Practice: A textbook for undergraduates* (pp. 345–350). Churchill Livingstone.
- Morgan, M.G. and Mckenzie, H. (1993). Controversies in the laboratory diagnosis of community acquired urinary tract infections. *European Journal of Clinical Microbiology* 2 : 234- 237.
- Nwobu, R.A.U., Uzochukwu, I.C. and Okoye, E.L. (2010). Phytochemical analysis and microbial activity of *Hyptissuaveolens*. *Medicinal Plants, Phytochemistry, Pharmacology and Therapeutics* 1 : 390-396.
- Obirikorang, C., Quaye, L., Acheampong, I., & Addo, K. (2012). Asymptomatic bacteriuria among pregnant women attending antenatal clinic at the University Hospital, Kumasi, Ghana. *Journal of Medical and Biomedical Sciences*, 1(1), 38–44.
- Rosen, D. A., Hooton, T. M., Stamm, W. E., Humphrey, P. A., Hultgren, S. J. (2007). Detection of intracellular bacterial communities in human urinary tract infection. *PLoS Medicine*, 4(12), e329. <https://doi.org/10.1371/journal.pmed.0040329>.



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This study found that adding banana peel flour to wheat flour can improve the nutritional value of noodles, such as increasing dietary fiber and antioxidant content, while reducing glycemic index.

DOI: <https://doi.org/10.54117/ijnfs.v2i2.24>

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