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Prevalence of Uropathogens among Pregnant Women Attending Antenatal Care at Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria

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Abstract

Background: Urinary tract infections (UTIs) are common among pregnant women, due to the morphological and physiological changes that take place in the genito-urinary tract during pregnancy. The study was aimed at determining the prevalence of UTI among pregnant women attending antenatal care at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Ebonyi State, between February to April, 2023, and identify the uropathogenic bacterial isolates associated with symptomatic and asymptomatic bacteria among them. **Methodology:** Midstream urine samples were obtained from 100 pregnant women. With well-structured questionnaire, the age of the pregnant women, pregnancy trimesters, socioeconomic status, occupation, educational level and nature of toilet used were obtained. The urine samples were cultured, and isolates were phenotypically identified and evaluated for multiple drug resistance (MDR) patterns against various antibiotics. **Results:** Of the 100 pregnant women, 28(28%) were significantly positive, while 72(72%) were non-significant (negative). The study showed that *Escherichia coli* was the most prevalent, followed by *Staphylococcus* spp, *Klebsiella* spp and *Proteus* spp. Ninety five percent (95%) of all the isolates were susceptible to ciprofloxacin and gentamycin, with 66.7% for Ofloxacin and Perfloxacin. Ampicillin, Augmentin, Chloramphenicol and Spectinomycin have susceptibility of 10-15.0% and resistance of 85-90%. From the present study, pregnant women in age group 15-19 years recorded the highest number of infection as well as those in their third trimester and unskilled pregnant women. Pregnant women of low/lower socio-economic state, as well as those that have primary educational level, and the group that uses bush method for easing themselves were mostly infected in this study. **Conclusions:** Screening for UTI should be on weekly basis to detect infection that may lead to preterm labour or still birth. Treatment should be encouraged for the safety of the fetus and pregnant women.

Key word: Prevalence, Uropathogens, Pregnant-women, Urinary-tract, infections, Antenatal-Care

1. Introduction

Urinary tract infections UTIs are one of the most common medical complications of pregnancy. Increased incidence of UTI during pregnancy is due to the morphological and physiological changes that take place in the genito-urinary tract during pregnancy. Pregnancy causes numerous hormonal and mechanical changes in the body. Beginning in the 6th week, with peak incidence during 22nd–24th weeks of gestation, 90% of the pregnant women develop ureteric dilatation, thereby increasing the risk of urinary stasis, glycosuria and aminoaciduria during pregnancy and vesicoureteric reflux (Kant *et al.*,2022).

These changes, along with already short urethra and difficulty with hygiene due to the distended pregnant belly increase the frequency of UTI in pregnant women. UTI occur more frequently in women than men, due to the shortness of the female urethra (Oladeinde *et al*., 2015; Bischoff *et al*., 2022). Symptomatic and asymptomatic UTI is common in pregnancy, and undetected untreated asymptomatic bacteriuria can lead to pyelonephritis later in pregnancy (Asmat *et al*., 2020; Bello *et al*., 2021). UTI during pregnancy, leads to various complications that may risk the fetus or the life of the pregnant woman. The main subject of concern to date, has been the treatment of UTI, and whether it could decrease maternal or neonatal complications (Al-Zubaidi, 2020; Sawar *et al*., 2020). The challenge of constant use of antibiotics in and outside the hospital, has led to Multidrug resistance among pathogens. Antibiotic resistance occurs when bacteria have acquired or developed ability to circumvent the mechanism drugs against them (Dashtizadi *et al*., 2020). The resistance of uropathogenic bacteria against antimicrobials, is rising globally over time, and it is directly dependent on the use and misuse of antimicrobial drugs, and the ability to acquire resistant genes, among some other factors (Karam *et al*., 2019; Nasiri *et al*., 2019).

The study was aimed at determining the prevalence of UTI among pregnant women attending antenatal care at Alex Ekwueme Federal University Teaching Hospital Abakaliki, Ebonyi State, between February to April, 2023., to identify the uropathogenic bacterial isolates associated with symptomatic and asymptomatic bacteria among them.

2. Materials and Methods

2.1 Study area

The study was conducted in Abakaliki the capital of Ebonyi State, South-East Nigeria. Abakaliki is located at Latitude 6.32485 and Longitude 8.11368. It is part of Africa and in the Northern hemisphere. The study was conducted from February to April, 2023 at the Microbiology laboratory of Alex Ekwueme Federal University Ndufu Alike, Ebonyi State, Nigeria.

2.2 Study design and distribution of questionnaire

Questionnaire were distributed to 100 pregnant women attending antenatal care in Alex Ekwueme Federal University Teaching Hospital, Abakaliki Ebonyi State, Nigeria. In order to obtain their age, gestational period, level of education, socio-economic status, type of toilet system used, and their occupation.

2.3 Samples collection

A total of 100 samples of mid-stream urine from pregnant women attending antenatal care in Alex Ekwueme Federal University Teaching Hospital, Abakaliki Ebonyi State, Nigeria, were randomly collected from February to April, 2023. The samples were transported to the microbiology laboratory in an insulating icebox, as soon as possible, for examination.

2.4 Culture techniques

A loopful of urine samples were inoculated unto the surface of Cysteine-Lactose-Electrolyte-Deficient (CLED) agar, and incubated at 37^0C for 18-24 hrs. Colonies were manually counted to determine the colony-forming units (CFUs) of bacteria in the urine samples. Distinctly different

morphological colonies were purified via sub-culturing and preserved for identification and sensitivity

2.5 Identification of Isolates

All isolates were gram stained to determine if they were gram-negative or positive. Suspected bacterial pathogens were stored on nutrient agar and identified by inoculation unto tubes or plates of different biochemical test media such as: Motility Indole Urea (MIU) agar, Simmon Citrate Agar (SCA), Triple sugar iron (TSI), Mannitol Salt Agar (MSA), and incubated for 24hrs at 37^0C.

2.6 Sensitivity/ Multi Drug Resistance Assay

The Multi Drug Resistance Assay of Uropathogenic bacterial strains was performed, using the disk diffusion method. All identified isolates were tested for Multi Drug Resistance on Mueller-Hinton (MH) agar plates (90-mm diameter). A total of 10 commercially-available antibiotic disks including Septrin (SXT) 30 µg, Chloramphenicol (CH) 30 µg, Sparfloxacin (SP) 10 µg, Ciprofloxacin (CPX) 30 µg, Amoxacillin (AM) 30 µg, Augmentin (AU) 10 µg, Gentamycin (CN) 30 µg, Pefloxacin (PEF), Tarivid (TD) Ofloxacin (OFX) 10 µg and Streptomycin (S) 30 µg were placed on Muller-Hinton agar and incubated aerobically at 37^oC for 24 hrs. The zones of inhibition were measured and interpreted as Sensitive (S), Intermediate or Resistance using the Clinical and Laboratory Standards Institute (CLSI) criteria (CLSI, 2021).

3. Results

The identification of uropathogenic bacteria isolates in the 100 urine samples, showed the presence of the following bacteria; *Staphylococcus* spp, *Klebsiella* spp, *Escherichia coli* and *Proteus* spp. The distribution of uropathogens showed that *E. coli* was the most prevalent pathogenic bacteria, followed *by Staphyloccus* spp. The least in the study was *Proteus* spp. **(Table 1)**.

Table 1: Biochemical Characteristics and Distribution of Bacterial Isolates in the Urine Samples of Pregnant women

Microorganisms		**Gram staining**	**Various Biochemical Tests**				**TSIAgar**				**CLEDAgar**
No of Isolates			**Motility**	**Urease**	**Indole**	**Citrate**	**Slant**	**Butt**	**H_2S**	**Gas**	
Escherichia coli	30	-	+	-	+	-	Yellow (Acid)	Yellow (Acid)	-	+	Opaque colony
Staphylococcus spp.	25	+	-	+	-	-	Red (Alkaline)	Yellow (Acid)	+	-	Yellow colony
Proteus spp	15	-	+	+	+	+	Red (Alkaline)	Yellow (Acid)	+	+	Blue grey colony

The prevalence of UTI among pregnant women attending antenatal care in Alex Ekwueme Federal University Teaching Hospital, Abakaliki was 28 out of 100 (28%) of them. Pregnant

women with primary education level were mostly affected, followed by pregnant women with non-formal education. The least was pregnant women with secondary education. The result showed that level of education had nothing to do with UTI, but level of individual hygiene **(Table 2)**.

Table 2: Prevalence of Uropathogens based on the Level of Education of Sampled Pregnant Women

Level of Education	No of Sample	Positive	Negative	Significance of Positive samples	Non-significance of Positive samples
Tertiary	20	17	03	02	15
Secondary	15	15	00	04	11
Primary	35	33	02	10	23
Non-formal	30	25	05	12	13
Total	100	90	10	28	62

Socio-economic status of pregnant women in our study had it that low class pregnant women were mostly infected, while the upper class were least infected **(Table 3)**.

Table 3 Prevalence of Uropathogens based on Socio-economic state

Class	No. Of Samples	Positive	Negative
Lower	45	41	04
Average	30	25	05
Upper	25	24	01
Total	100	90	10

Pregnant women within the age group 15-19 years were mostly affected, while pregnant women within the age group 40-45years, had the least infection **(Table 4)**. **Table 4: Prevalence of Uropathogens based on age group of pregnant women**

Age group	No. Of Samples	Positive	Negative
15-19	35	33	02
20-29	25	25	00
30-39	25	19	06
40-45	15	13	02
Total	100	90	10

Pregnant women in their third trimester were mostly infected, followed by second trimester,while those in their first trimester were least infected **(Table 5)**.

Table 5: Prevalence of Uropathogens based on Trimester of Sampled pregnant women

Trimester	No. Of Samples	Positive	Negative
First	30	27	03
Second	25	24	01
Third	45	39	06
Total	100	90	10

Pregnant women that use bush method as means of easing themselves were mostly affected, closely followed by pregnant women using water cistern,while the least were pregnant women using personal bucket method as toilet **(Table 6)**.

Table 6: Prevalence of Uropathogens based on Toilet system used by sampled pregnant women

Toilet system	No. Of Samples	Positive	Negative
Water cistern	40	33	07
Pit latrine	15	14	01
Bucket Method	10	9	01
Bush-Method	35	34	01
Total	100	90	10

The least occupational group infected were semi-skilled workers, while the unskilled and skilled were mostly affected **(Fig.1)**. Ciprofloxacin (CPX) and Gentamycin (CN) were the most effective antibiotics against the pathogens, while Chloramphenicol (CH), Amoxacillin (AM) and Streptomycin (S) were the most resisted **(Table 7)**.

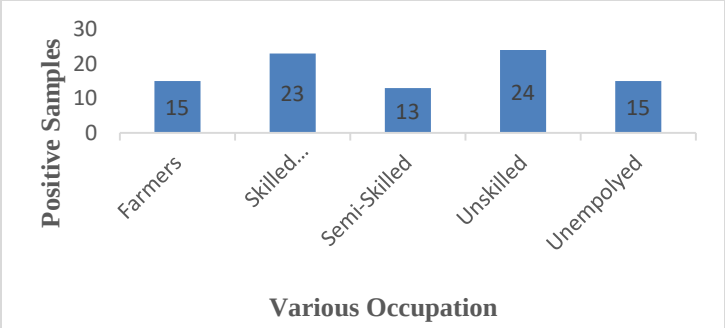

Table 7: Antibiotic susceptibility profile of uropathogenic bacteria isolates

ISOLATES	CPX	AM	AU	CN	PEF	OFX	S	SXT	CH	SP
E. coli	S	R	R	S	R	S	S	S	R	I
Klebsiella spp.	S	R	R	S	S	R	I	R	R	R
Proteus spp	S	I	S	I	I	S	R	I	I	R
Staphylococcus spp	S	I	R	S	S	S	I	R	R	R

Key: S= Susceptible, I= Intermediate, R= Resistant, CPX: Ciprofloxacin, AM: Ampicillin, AU: Augmentin, CN: Gentamycin, PEF: Perfloxacin, OFX: Ofloxacin, S: Streptomycin, SXT: Trimethoprim-Sulfamethaxazole, CH: Chloramphenicol, SP: Spectinomycin.

4. Discussion

In this study,the prevalence of UTI among pregnant women attending antenatal clinic at Alex Ekwueme Federal University Teaching Hospital, Abakaliki, Ebonyi State, Nigeria, was 28% in a population of 100 pregnant women. This level of prevalence was in contrast with the result of the study carried out on 407 pregnant women at Mother and Child Hospital, Ondo town, Nigeria (Wilkie *et al*., 2021), which recorded as 36.4%, and also with that in India Secondary Hospital, among1253 pregnant women, that reported 33.3% prevalence (Kant *et al.,* 2017). It was also in contrast with the result of the study carried out in Buea Health District, at Cameroon, among 287 participants, that recorded prevalence of 31.0% (Ngong *et al*., 2021), with report from Benin City, Nigeria, that recorded 55.0% prevalence among 220 pregnant women (Oladeinde *et al*., 2015). The variance and contrast could be due to difference in the number of participants (Pregnant women) and/or hygiene practice at different locations. *E. coli* was mostly isolated, with total number of isolates of 33 occurrence, which was in contrast with the report from Ondo town, Nigeria (Wilkie *et al*., 2021), that recorded *Pseudomonas aeruginosa* as the most frequently occurred isolates with 48% occurrence. The report on the occurrence of *E. coli* , agreed with the following studies; study from Benin City in Nigeria (Oladeinde *et al*., 2015); Cameroon (Ngong *et al*., 2021); South Africa (Zwane *et al.*, 2021), and Thi-Qar providence in Iraq (Al-Hashmay *et al*., 2021), that reported *E. coli* to be the most frequent occurred bacterial pathogen in UTI.

The present study showed that pregnant women in their third trimester were mostly infected. Irrespective of the variation in the population of the study (number of pregnant women involved), our study agreed with studies carried out at Ondo town, Nigeria (Wilkie *et al*., 2021), and in secondary level Hospital in Northern India (Kant *et al*., 2017), that reported that pregnant women in their third trimester were mostly infected. This could be due to difficulty in washing and cleaning up their body at this stage of pregnancy. The present study reported that pregnant women who were unskilled were mostly infected. The study disagreed with the result of the study from Ondo town, in Nigeria that the most infected pregnant women, in terms of occupation, were farmers/Artisans/traders (Wilkie *et al*., 2021). This differences could be due to

difference in location/area or due to difference in sample population. Our study showed that pregnant women in age group 15-19 years were mostly infected, which disagreed with the study in Ondo town in Nigeria which reported age group 20-29 years as the most infected age group (Wilkie *et al*., 2021). This could be due to difference in number of sampled pregnant women and difference in location. The pregnant women of low/lower socio-economic state were mostly infected, as well as pregnant women with primary educational level. This report agrees with the rport of the study from Pakistan, among 80 pregnant women, that pregnant women of poor socio-economic status were the mostly infected group,and that pregnant women that attained primary to intermediate educational levels were also mostly infected (Asmat *et al*., 2020). In the present study, ninety five percent (95%) of all the isolates were susceptible to ciprofloxacin and gentamicin, with 5% resistant, and 66.7% susceptible to ofloxacin, with 33.4% resistant.

The report is in contrast with the study carried out at Baghdad city, Iraq that reported 73% resistance to gentamicin (Sameer and Aziz, 2020), and from Lagos, Nigeria, that reported ofloxacin 57.1% (Fowora *et al.* , 2021). In this study, over 70% of the antibiotics were resisted by uropathogens.

Conclusion and Recommendations

Due to uropathogenic strains of bacteria prevalent among pregnant women in the teaching hospital, early screening and treatment should be encouraged, for the safety of the foetus and pregnant women. Indiscriminate use of antibiotics should be avoided during pregnancy. Our study suggests that raising awareness of the proper and adequate use of antibiotics is essential to limiting the increase in resistance levels.

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Ethical approval

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Conflict of interest

Authors declares no conflicts of interest.