**Original Research Article**

# Impact of Host age, Gestational week and Parity on Susceptibility to Urinary Tract Infections


## ABSTRACT

**Background: Urinary tract infections are inflammatory responses of the urothelium to non-flora microorganisms. Aim: This study aims at identifying the urinary tract pathogens in association with other risk factors in pregnant women residing in the rural community of Okada, Edo State. Methods: The study entails a cross sectional study involving pregnant women at various gestational age, a mid stream, non-repetitive urine samples were collected in sterile bottles and cultured on bacteriological media at 37℃ overnight, isolates were identified using standard conventional procedures. Results: The organisms isolated include Staphylococcus aureus, Escherichia coli, Candida albicans with prevalence of 35.7%, 5.1% and 27.1% respectively, the age range 26-31 have a prevalence of 37.7% with a p-value of 0.006, the distribution of UTI in relation to other risk factors such as parity, haemoglobin genotype and level of education had p-value of 0.179, 0.067 and 0.0001 respectively.Conclusion:The relationship between UTI and parity is not statistically significant, but statistically significant with level of education**




## Background to the Study

Urinary tract infections (UTIs) are inflammatory responses of the urothelium to bacterial invasion by non-flora microorganisms. It is one of the most common medical issues associated with pregnancy and may involve the reproductive organs if not well managed (Brook *et al*., 2001. Despite major progress in the management of urinary tract infections in

pregnancy, they are still linked to negative feto-maternal outcomes (Ezugwu *et al*., 2021). According to Ali and Abdallah, (2019), urinary tract infection describes microbial colonization or inflammation of the bladder (cystitis), urethra (urethritis), or renal pelvis and kidneys (pyelonephritis) with growth of up to $10^6$ organisms per µl of urine in an asymptomatic presentation (Emilie *et al*., 2011). The presence and growth of these microorganisms in the urinary tract can lead to these infections, irrespective of age and mostly in pregnancy in association with other risk factors can be life threatening (Tamalli *et al*., 2013).

Culturing of urine specimens is the gold standard for diagnosing urinary pathogen, as well as allowing for quantitative bacteriuria quantification (Ezugwu *et al*., 2021). According to Nwachukwu et al (2018), the common etiologic agents of UTI are *Escherichia coli, Klebsiella spp, Staphylococcus aureus, Pseudomonas spp,* and *Streptococcus.* These organisms can be found in the external genitalia, vagina, rectum, genital tract, and gastrointestinal tract and can infect cells in the urinary tract by attachment and eventual ascension, causing bacteremia, due to the renal cells being compromised. Advanced age, number of parturitions, number of coitus per week, recessive sickle cell anemia, and diabetes, previous history of UTI, immunodeficiency, and urinary tract abnormalities are conditions that can increase the risk of UTI in pregnant women (Giraldo *et al*, 2012).

Pregnancy changes including anatomical, physiological and hormonal increases susceptibility to the development of UTI. These changes can be due to heightened levels of progesterone and estrogen but also due to pressure created by the growing uterus (Taye *et al.*, 2018). About 70% of women during pregnancy develop glycosuria, which supports bacterial growth in the urine (Kant *et al.*, 2017). UTIs are may also be associated with premature delivery, low-birth-weight infants, cesarean delivery, morphological abnormalities, and infant mortality (Nabbugodi *et al*., 2015). Early diagnosis, administering of adequate treatment using

antibiotics has been shown to helped reduced these risks by 80% (Nicolle, 2015).In this rural community there is paucity of UTI in relation to other associated risk factors such gestational age, parity and haemoglobinopathy . This study aims at identifying the urinary tract pathogens in association with other risk factors in pregnant women residing in the rural community of Okada, Edo State, Nigeria.

**Materials and methods**

**The study area**

The study was carried out in Igbinedion University Teaching Hospital, Okada in Edo State using the facilities of the Medical Microbiology Laboratory.

**Study design**

This is a cross sectional study involving pregnant women visiting the antenatal clinic and general outpatient clinic. The study comprised of 150 women who were pregnant at various gestational age, a mid- stream non repetitive urine was collected from each participant following administration of questionnaire after informed written consent. Urine samples were collected for urine microscopy, culture and sensitivity. Furthermore, those currently on antibiotics were excluded from the study.

**Ethical Approval**

This study was approved by the ethical committee of Igbinedion University Teaching Hospital, Okada Edo state. The purpose of this study was well explained to the pregnant women and strict adherence to confidentiality maintained.

**Screening of urine bacteria:**

Culture method described by Chesbrough, (2010) was used for the isolation of bacteria.

Briefly, mid-stream urine was cultured on Cysteine lactose electrolyte deficient agar (CLED) and Sabouraud dextrose agar. At 37°C, all cultures were incubated aerobically for 18-24hrs.

**Identification of Isolates**

All bacterial isolates were subjected to taxonomic analysis by the determination of their morphological, physiological and biochemical characteristics as adopted by (Fawole and Oso, 1988; Holt et al., 1994; Cowan and Steel, 2003; Cheesbrough, 2010).

## RESULTS

150 urine samples were collected from pregnant women attending Igbinedion University Teaching Hospital (IUTH). The age ranges of the subjects were between 20-47 years as shown in Table 1. The age ranges 20-25, 26-31, 32-37 and 38-43 had 17.1%, 37.7%, 32% and 15.4% prevalence for urinary tract infections respectively and is statistically significant with P- value 0.006. Table 2 shows the distribution of urinary tract infections in pregnant women in relation to gestational age, the week, (1- 12), (13- 25) and (26-40) had 13.6%. 17.9% and 56.8% prevalence rate of infection and are statistically significant with p- value 0.0001. The distribution of UTI in relation to other factors such as marital status, level of education, past history of infection, sexual activity and haemoglobin genotype is shown in Table 3; the level of Education with respect to UTI is statistically significant with p-value of 0.0001. The distribution of UTI in pregnancy in relation to parity is shown in Table 4, parity of 0, 1, 2, 3, and > 4 had UTI prevalence of 31.3%, 21.1%, 15.4%, 22.2% and 43.8% respectively and is not statistically significant with respect to UTI.

Table 5 shows the microbial distribution; *Staphylococcus aureus, Candida albicans,* and *Escherichia coli* had occurrence rate of 35.7%, 27.1% and 5.1% respectively.

Table 1: Prevalence of urinary tract infections in pregnant women in relation to Age

| AGE GROUP | FREQUENCY | NUMBER POSITIVE | (%) | P-value |
|---|---|---|---|---|
| 20-25 | 41 | 7 | 17.1 | 0.006 |
| 26-31 | 69 | 26 | 37.7 | |
| 32-37 | 25 | 8 | 32 | |
| 38-43 | 13 | 2 | 15.4 | |
| 44-47 | 2 | 0 | 0 | |
| TOTAL | 150 | 43 | | |

Table 2: Distribution of urinary tract infections in pregnant women in relation to gestational period

| GESTATION (WEEK) | FREQUENCY | NUMBER POSITIVE | (%) | p- value |
|---|---|---|---|---|
| 1-12 | 22 | 3 | 13.6 | < 0.0001 |
| 13-25 | 84 | 15 | 17.9 | |
| 26-40 | 44 | 25 | 56.8 | |
| TOTAL | 150 | 43 | 100 | |

Table 3: Distribution of urinary tract infections in relation to other factors

| FACTORS | | N | NOS POS | (%) | p value |
|---|---|---|---|---|---|
| STATUS | MARRIED | 139 | 35 | 25.2 | |
| | UNMARRIED | 11 | 8 | 72.7 | |
| EDUCATION | PRIMARY | 9 | 8 | 88.9 | |
| | SECONDARY | 72 | 15 | 20.8 | |
| | TERTIARY | 69 | 20 | 28.9 | |
| PAST HISTORY OF UTI | PRESENT | 101 | 33 | 32.7 | |
| | ABSENT | 49 | 10 | 20.4 | |
| SEXUAL ACTIVITY | ACTIVE | 135 | 42 | 31.1 | |
| | NON-ACTIVE | 15 | 1 | 6.7 | |
| HAEMOGLOBIN GENOTYPE | AA | 114 | 38 | 33.3 | |
| | AS | 33 | 5 | 15.2 | |
| | AC | 3 | 0 | 0 | |

STATUS P = 0.126

EDUCATION = 0.0001

PAST HISTORY OF UTI P= 129

SEXUAL ACTIVITY P= 0.067

HB GENTOTYPE P= 0.683

TABLE 4: DISTRIBUTION OF UTI IN PRENANT WOMEN IN RELATION TO PARITY

| PARITY | NOS EXAMINED | NOS WITH UTI | (%) | P-value |
|---|---|---|---|---|
| 0 | 32 | 10 | 31.3 | 0.179 |
| 1 | 57 | 12 | 21.1 | |
| 2 | 39 | 6 | 15.4 | |
| 3 | 36 | 8 | 22.2 | |
| >4 | 16 | 7 | 43.8 | |
| TOTAL | 150 | 43 | | |

**TABLE 5: DISTRIBUTION OF ISOLATES FROM PREGNANT WOMEN**

| ISOLATES | NUMBER ISOLATED | (%) |
|---|---|---|
| Bacillus specie | 11 | 8.5 |
| **S.** epidermidis | 11 | 8.5 |
| Escherichia coli | 7 | 5.4 |
| Enterobacter specie | 7 | 5.4 |
| S. aureus | 46 | 35.7 |
| Lactobacillus specie | 3 | 2.3 |
| Candida albicans | 35 | 27.1 |
| Klebsiella aerogenes | 9 | 6.9 |
| TOTAL | 129 | |

## DISCUSSION

Infection of the urinary tract (UTI) represents the most common medical complication of pregnancy especially in asymptomatic bacteruria. Pregnant women are at greater risk of UTIs, particularly because of the physiologic, hormonal and anatomic changes that occur in normal pregnancy.

In this research, about 150 urine samples of pregnant women were collected of which the overall prevalence of UTI among pregnant women in this study was 43(28.7%). This is less than the prevalence reported in Saudi Arabia 53.5% (El-Kashif *et al*., 2019), but within the range obtained in Ambo Central Ethiopia 18.7%, Ismailia, Egypt 29%, Benin city, Nigeria 21% and in Nepal 37.8% respectively (Thakur *et al*., 2020). These variations in prevalence might be as a result of differences in social habits, religious affiliation, and personal hygiene of participants. However, spirituality has a way of making people play down on personal and environmental hygiene.

The age range in this research with high prevalence was between 26-31years with 26(37.7%) which agrees with a study carried out in Onitsha, Nigeria (Nwachukwu *et al*., 2018). This may be as a result of sexual activity which increases the risk of UTI and the women of such age group are mostly sexually active.

With respect to parity; Parity greater than 4 has the highest prevalence with 4(43.8%). however, in a study conducted by in Gorgan, the highest rate of infections was after the third pregnancies (4.73%) (Mobbasheri *et al*., 2001).The results from the studies of Mobbasheri et al. were consistent with the results from the study in America (Gibbs *et al*., 1994).

The gestational period of the participants showed that those in their 2$^{nd}$ trimester have the highest prevalence with 25(56.8%). This is consistent with the result reported by Okonko, 2009. This difference may be as a result of either change in urinary stasis and vesicoureteral

reflux or decrease in urinary progesterones and oestrogens in the various trimester of pregnancy.

Based on level of education, the highest prevalence was among those who attained primary level of education with 8(88.9%), while those with tertiary education had 28.9%, difference could be attributed to awareness and hygiene. Also based on marital status of participants, the unmarried status had a distributions of 8(72.7%), while the married status had 35 (25.2%) with UTI. This could be due to the level of socioeconomic tendencies of the participants.

Among isolated pathogens, *Staphyloccocus aureus* was the most predominant bacteria with 46(35.7%).This is in contrast to other results gotten in other studies conducted in Babol city, *E. coli* was indicated to be the cause of 83% of UTIs in pregnant women (Yaghobi *et al*., 2006) and Moreover, in studies conducted by Masinde in Tanzania, Al- Haddad in Yemen, Hamdan in Sudan and Totsika in Australlia (Totsika *et al*., 2012), *E. coli* was the main cause of UTIs among women of those areas and the prevalence in those regions were 47.2%, 41.5%, 42.4%, respectively.

### 5.1 Conclusion

This study concludes that relationship between UTI and parity is not statistically significant. However, education status and gestational growth are statistically significant in relation to UTI among pregnant women, regardless of other associated risk factors such as haemoglobin genotype, past history of UTI and marital status.



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