Prevalence and Common Microbial Isolates of Urinary Tract Infection in Pregnancy; A Four Year Review in a Tertiary Health Institution in Abakaliki, South-East Nigeria

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Abstract **Background:** Urinary tract infection is one of the most frequently seen medical complications of pregnancy. Despite significant advances in managing urinary tract infection in pregnancy, its occurrence is still associated with adverse feto-maternal complications. **Objective:** To determine the prevalence and common microbial isolates of urinary tract infections in pregnancy at the Federal Teaching Hospital Abakaliki. **Methodology:** This was a four year retrospective study of cases of urinary tract infection in pregnancy (from 1st January 2012 to 31st December 2015). A total of 111cases of urinary tract infection we reviewed under the 4 year period. Information were obtained from the medical records of participants and analysed with Epi info Version 7. The process involved descriptive statistics. **Results: The prevalence** of UTI in this study was 2.0%. The mean age of patients was 26.2±5.6years. Majority of the patients 58.6% (65) fell within the age range of 20-29 years and 30-39 years age group were 31(27.9%). Sixty two women (55.9%) had between 2 and 4 children while primiparas were 33.3% of the population. Second trimester presentation was highest 78(70.3%) and first trimester was 6(5.4%).The commonest symptoms where frequency 27%, dysuria 25.2%, fever 10.8% and supra-pubic pain with 8.1%. The predominant organism was Escherichia coli making up 70.3%(78). Stapylococcus aureus and Klebsiella pneumonia respectively were 13.5 and 11.7%. Levofloxacin had the highest level of sensitivity with 98(88.3%) isolates being sensitive to levofloxacin. This was closely followed by Ofloxacin 90(81.1%), Ceftriaxone 78(70.3%), Ceftazidime 70(63.1%), Nitrofurantoin 70(63.1) and Gentamycin 60(54.1%) amongst others. Penicillin and Co-Amoxiclav had the least organism sensitivity with 28(25.2%) and 36(32.4%) respectively. **Conclusion:** Screening of pregnant women during the antenatal period should be considered an essential component of antenatal care in the communities to avoid the undesirable negative impact of undiagnosed and/or untreated urinary tract infections in pregnancy.

Keywords: prevalence, urinary Tract Infection, Pregnancy, uropathogens, antibiotic sensitivity

1. Introduction

Urinary tract infections (UTI) are the most common bacterial infections during pregnancy and untreated urinary tract infection can be associated with significant obstetric complications. [1,2,3] UTI is defined as the presence and multiplication of micro-organisms in any of the tissues of the urinary tract extending from the renal cortex to the urethral meatus. [1,4,5,6] UTI can be described based on the part of the tract affected; for the upper tract it is pyelonephritis, while for the lower tract it is cystitis or urethritis. [4,5,7] Infection of these sites may be symptomatic or asymptomatic. [7,8] Urinary tract infection is commoner in women due to a short urethra and its close proximity to the anus and vagina. Urinary stasis due to progesterone relaxing effect on the urinary tract and the mechanical pressure from the gravid uterus makes it common during pregnancies [8,9,10,11].

The prevalence of urinary tract infection varies depending on the population being studied. [8,12] The highest incidence is reported in the African-American multiparas, while the lowest incidence is found among the wealthy white women of lower parity. [8] Symptomatic urinary tract infection occurs in 1-2% of pregnancies, while asymptomatic bacteriuria has been reported in 2-13% of pregnant women [2,13,14,15].

The combination of mechanical, hormonal and physiologic changes during pregnancy contributes to significant changes in the urinary tract and this has profound impact on the acquisition and natural history of urinary tract infection in pregnancy. [2] In pregnancy, the bladder volume increases and detrusor tone decreases. Additionally there is ureteric dilatation as a result of combination progestogenic relaxation of the ureteric

smooth muscles and pressure from the expanding uterus, all these lead to increased urine stasis, vesico-ureteric reflux and hence potential focus for colonization by micro-organisms. [1,16] Other predisposing factors to urinary tract infection are poor socioeconomic status with up to a five-fold increased risk, sickle cell anaemia, advanced maternal age, high parity, poor perineal hygiene, spermicidal contraceptive use, urethral instrumentation, recurrent UTI, diabetes mellitus, anatomic or functional urinary tract abnormality, increased frequency of sexual activity, renal transplant patients etc [1,14,17,18].

Significant bacteriuria is generally defined as the presence of positive culture of at least 10 [5] colony forming units of bacteria in 1ml of a clean-catch midstream urine sample. [5] Counts less than this or with two or more organisms indicate contamination rather than infection. [19] The presence of significant bacteriuria in the absence of symptoms of UTI is asymptomatic bacteriuria, while infection of the renal calyces and pevis indicate pyelonephritis. [19,20] Classical symptoms of UTI include dysuria, frequency of urination, urgency, suprapubic pain, loin pain and systemic symptoms such as fever, nausea and vomitting. [5,21,22] The commonest mode of infection is by ascending infection following bacteria colonization of the perineal and anal region by common flora and its subsequent ascension into the urethra, bladder and then to the kidneys. [4,6,8] The organisms that cause UTI in pregnancy are same as those found in non-pregnant state and they include Escherichia coli (in 80% of cases), staphylococcus aureus, Klebsiella spp, Proteus spp, Pseudomonas spp etc [23,24].

UTI can present as an acute infection in which case empiric antibiotics treatment is commenced using broad spectrum antibiotics based on local sensitivity pattern, while waiting for culture and sensitivity result especially in a low resource setting like ours. [8] The preference for a best-guess therapy seem to be a choice between cephalosporins and amoxicillin-clavulanic acid. [22] Even though the quinolones have been shown to have excellent activity against the common UTI organisms, its use is best reserved for treatment failures due to safety issues in pregnancy [22].

Prevention of UTI is by screening using urine culture, this is considered the gold standard for screening and diagnosis of asymptomatic and symptomatic UTI respectively. [4,25] It is recommended at the first antenatal visit or between 12-16weeks gestation. [26] This is even more important since untreated UTI is associated with prematurity, intra-uterine growth restriction, low birth weight and perinatal mortality, while it can lead to chronic infection and renal failure in the mother. [26] Thirty-40% of untreated asymptomatic bacteriuria leads to acute pyelonephritis with its gamut of complications [5,26].

We decided to evaluate the prevalence, symptoms and common microbial isolates of UTI in pregnancy in our institution over the past four years, to establish common presentation, causative organisms and antibiotic sensitivity pattern and provide evidence-based options of improved management of UTI in pregnancy.

2. Materials and Methods.

This was a retrospective study of all cases of confirmed Urinary tract infection managed at The Federal Teaching Hospital Abakaliki, South-East Nigeria from 1st January, 2012 to 31st December, 2015. (A 4-year period). FETHA is a tertiary health institution, it receives referrals from the general hospitals, mission hospitals and primary health centres as well as privately owned hospitals and clinics around Abakaliki. It also receives referral from neighboring states of Benue, Enugu, Cross-River and Abia. Records of the antenatal clinic, emergency unit and antenatal ward were reviewed and their case files retrieved from the medical records department. Relevant information including socio-demographic data, mode of presentation, risk factors, culture result, sensitivity pattern, treatment modality and complications were retrieved with a data entry proforma. Ethical approval was obtained from the ethics committee of FETHA before embarking on this study. Descriptive statistics was used in calculating percentages, mean, and standard deviation. Data processing and analysis were carried out using Epi info statistical software version 7.

3. Results

A total of 111 patients had laboratory confirmed cases of Urinary tract infection out of a total of 5540 patients seen during the study period giving a prevalence of 2.0%.

Table 1 shows the socio-demographic characteristics of the patients. The age range was between 16 to 40 years with a mean age of 26.2±5.6years. The majority of the patients 65(58.6%) were within the age range of 20-29 years, followed by 30-39 years age group. Majority of the participants 88(79.3) were booked, while 23(20.7%) were unbooked. Ninety two (82.8%) patients had formal education, while 19(17.2%) had no formal education. Majority of our patients were married 93(83.8). More women had delivered between two to four children 62(55.9%), while the primiparas constituted 33.3% of the participants. Majority of the women presented in the second trimester 78(70.3%), while the least time of presentation was in the first trimester 6(5.4%).

Table 1. Socio-demographic characteristics of the participants

Characteristics	Frequency (n)	Percentage (%)
Age (Years)		
<20	14	12.6
20-29	65	58.6
30-39	31	27.9
≥40	1	0.9
Booking status		
Booked	88	79.3
Unbooked	23	20.7
Level of Education		
None	19	17.2
Primary	40	36
Secondary	30	27
Tertiary	22	19.8
Marital status		
Married	93	83.8
Single	17	15.3
Separated	1	0.9
Parity		
1	37	33.3
2-4	62	55.9
≥5	12	10.8
Gestational Age (Weeks)		
<13	6	5.4
13-28	78	70.3
≥29	27	24.3

Table 2 shows the symptom profile of the patients. The commonest presentations were frequency 27%, dysuria 25.2%, fever (10.8%) and supra-pubic pain (8.1%). Four women had preterm contractions.

Table 2. Symptom Profile

Symptoms	Frequency (n)	Percentage (%)
Frequency	30	27
Dysuria	28	25.2
Nausea/Vomiting	20	18
Fever	12	10.8
Supra-pubic pain	9	8.1
Renal angle tenderness	8	7.2
Pre-term contractions and labour	4	3.6

Table 3 shows the uropathogens isolated from culture investigation. The predominant organism was Escherichia coli in 70.3% (78) of the isolates. This was followed by Stapylococcus aureus and Klebsiella pneumonia contributing 13.5 and 11.7% respectively. The least commonly identified organism was Pseudomonas aeruginosa with 3(2.7%) isolates.

Table 3. Common microbial isolates

Organism	Frequency (n)	Percentage (%)
Escherichia coli	69	62.2
Staphylococcus aureus	15	13.5
Klebsiella pneumonia	13	11.7
Proteus mirabilis	6	5.4
Streptococcus spp.	5	4.5
Pseudomonas spp.	3	2.7
	111	100

Table 4 shows the sensitivity pattern of the antibiotics used with respect to the predominant organisms isolated. Levofloxacin had the highest level of sensitivity with 98(88.3%) isolates being sensitive to levofloxacin. This was closely followed by Ofloxacin 90(81.1%), Ceftriaxone 78(70.3%), Ceftazidime 70(63.1%), Nitrofurantoin 70(63.1) and Gentamycin 60(54.1%) amongst others. Penicillin and Co-Amoxiclav had the least organism sensitivity with 28(25.2%) and 36(32.4%) respectively.

Table 4. Antimicrobial sensitivity of the isolates to the various antibiotics

Drugs	Frequency (n)	Percentage (%)
Levofloxacin	98	88.3
Ofloxacin	90	81.1
Ceftriaxone	78	70.3
Ceftazidime	70	63.1
Nitrofurantoin	70	63.1
Gentamycin	60	54.1
Ciprofloxacin	48	43.1
Erythromycin	45	40.5
Co-Amoxiclav	36	32.4
Tetracycline	43	38.7
Ampicillin	28	25.2

4. Discussion

Urinary tract infections (UTI), especially of the upper tract is associated with adverse maternal and perinatal effects, while untreated asymptomatic bateriuria is a significant risk factor for Pyelonephritis, which is a harbinger of adverse feto-maternal outcome as alluded to by the findings of the present study [12].

The prevalence of symptomatic UTI in this study was 2.0%. This is comparable to the 3% [8] and 5.8% [7] respectively, reported in other Nigerian Centers. but less than 46.1% obtained by Akobi et al in Bida [6], 47.5% by Okonko in Ibadan [10], 49.4% by Math et al in Karnataka [14] and 54% by Obiogbolu in Awka metropolis. [4] The low prevalence in this study maybe related to the fact that our study was based on pregnant women with symptoms of capital UTI, hence asymptomatic patients would have been missed. Also majority of our study participants were elite members of the society, mainly urban dwellers.

This study showed that women aged 20-29 years accounted for 58.6% of cases of UTI. This is similar to the findings from other studies. [1,6,8,10] The reason for its preponderance in this group could be because many women in this age group are likely to be multiparous, engage in regular sexual activity and could be using one form or contraceptive or another, these are positive risk factors for Urinary tract infection. [1,11,14] It is therefore not surprising that a high incidence of UTI with respect to parity was observed amongst patients of one or more parity. They made up 89.2% of the cases. This is not different from reports of other studies [1,10,11,14,15].

In this study, we also noted that the highest incidence of UTI occurred in the second and third trimesters contributing 70.3% and 24.3% respectively. This is consistent with similar findings from other researchers. [8,14,20,23,24,25] This was not unexpected because of the progressive pressure effect from the gravid uterus as pregnancy advances as well the physiologic effect of pregnancy hormones on the urinary tract, the effect of which appears more marked in the second trimester. [14,23] Many of the patients in this study, booked in the 2nd and 3rd trimesters.

In this study, gram-negative bacteria were more prevalent in over 80% of cases. This is because, majority of the gram negative organisms are commensals of the digestive system and UTI is caused by ascending infection from the anogenital region due to poor hygiene and the proximity of the external urethral meatus to this region. [4,7] E.coli is widely documented from several studies as the commonest causative agent for both symptomatic and asymptomatic UTI. [2,6,7,8,12,24] This is not different from the findings in this study were E.coli made up 62.5% of the isolates. This is due to presence of the P-fimbria and S-fimbria with which it adheres to and colonizes the epithelium of the Urinary tract. [23] This is interestingly different from the finding by Yakasai et al in Kano where proteus mirabilis 33.3% was the predominant organism. [15] The reason for this is not clear.

The ideal drug for management of UTI in pregnancy is expected to be active against the majority of the pathogens and have a good safety profile. [7] The first line drugs with good sensitivity against most of the isolates are Levofloxacin 98(88.3%), Ofloxacin 90(81.1%), Ceftriaxone 78(70.3%), Ceftazidime 70(63.1%) and Nitrofurantoin 70(63.1%). Apart from the quinolones with safety concerns in pregnancy, the rest can be prescribed empirically while awaiting results of microbial culture and sensitivity. This is similar to the findings of other researchers [8,9,15,24,25].

Women with asymptomatic UTI in pregnancy are more likely to deliver premature or low birth weight infants and have a 30-40% chance of developing pyelonephritis. [5,18] Four (3.6%) of our patients presented with pre-term contractions. It is recommended by both the American College of Obstetrics anf Gynaecology (ACOG) and the Royal College of Obstetrics and Gynaecology (RCOG) that routine screening for asymptomatic bacteriuria should be the practice to identify and treat such asymptomatic cases [3,16,21].

In conclusion, UTI in pregnancy remains a significant cause of maternal and perinatal morbidities, if untreated, the sequelae is even grimmer. Routine screening for asymptomatic bacteriuria is advocated as well as prompt treatment of symptomatic and confirmed cases of suspected UTI.

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