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PREVALENCE AND AETIOLOGIC AGENTS OF URINARY TRACT INFECTION IN PREGNANCY IN ABAKALIKI METROPOLIS

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ABSTRACT
Urinary tract infections are common in pregnancy and are associated with complications such as abortion, prematurity, low birth weight, stillbirth, maternal anemia, preterm labour, hypertension, thrombosis, phlebitis, pre-eclampsia, chronic pyelonephritis, and rarely, kidney failure. A total of two hundred (200) urine samples were randomly collected from pregnant women attending the antenatal clinics of Ebonyi State University Teaching Hospital and Mile 4 Hospital, both in Abakaliki Metropolis to determine the prevalence of urinary tract infections in pregnancy, aetiologic agents and assess some predisposing factors. Using $\geq 10^5$ colony forming unit per milliliter as significant level of bacteriuria, the prevalence was found to be 48. 0%. There was no significant difference between age and rate of infection ($P > 0.05$). There was a high incidence in 21 – 25 age group (41.7%). There was also high incidence of infection in the third trimester (82.3%) while the second trimester was (17.7%). Multiparty is associated with increased urinary tract infection in pregnancy. *Staphylococcus aureus* was the most frequently isolated pathogen (44.8%), followed by *Klebsiella pneumonia* (15.2%), *Escherichia coli* (10.5%), *Enterococus faecalis* (9.5%), Coagulase – Negative Staphylococci (8.6%). *Pseudomonas aeruginosa* (6.7%), *Streptococcus pyogenes* and *Candida spp.* (1.9%) each, and *Proteus mirabilis* (0.9%). These findings underscore the importance of screening all pregnant women for significant bacteriuria so that positive cases should be treated subsequently with antibiotics in order to reduce the adverse effects on both maternal and fetal health.

KEYWORDS: *Klebsiella pneumonia,* preterm labour, pregnant women, Abakaliki Metropolis , antibiotics

INTRODUCTION

Urinary tract infections (UTI), which are caused by the presence and growth of microorganisms in the urinary tract, are perhaps the single commonest bacterial infections of mankind[1] (Theodore, 2007) and in pregnancy, it may involve the lower urinary tract or the bladder (Brook, 2001). Significant' bacteriuria is based on the presence of 100 000 organism per/ml in a carefully collected sample of clean – voided or midstream urine (Kass, 1962), distinguishing between infection and contamination. However, this relationship does not hold true in all circumstances. According to Leigh (1989), high fluid intake increases the rate of bladder emptying and lowers the bacterial count; inadequate chemotherapy may reduce the bacterial count; and use of alkalinizing or acidifying agents may also slow growth and give rise to a low bacterial count. It has been reported that in woman with acute infection of the lower urinary tract, 30 – 50% have counts less than 100,000 organisms/ml (Leigh, 1989).

Symptomatic and asymptomatic urinary tract infection is a common phenomenon in pregnancy. The main factor predisposing women to bacteriuria are pregnancy, sexual intercourse and short urethra. About 1/3 of urinary tract infections in sexually active women is mainly associated with sexual intercourse. Bladder infections in women often occur from the massaging effect of sexual intercourse on the urethra which introduces bacteria from the urethra to the urinary bladder. Furthermore, the position of the urethra in women makes it subject to faecal contamination and colonization with potentially pathogenic intestinal bacteria (Theodore, 2007)[1.] The hormonal effects in ureteric vasculature in pregnancy aided, perhaps, by mechanical pressure from the gravid uterus leads to urinary stasis and therefore, encourage bacterial growth in urine (Duguid et al, 1987)[5]. Reduced immune reactions that occur during pregnancy also contribute to increased incidence of urinary tract infection in pregnancy (Onuh eh all, 2006)[6].

Urinary tract infection during pregnancy contributes significantly to maternal and perinatal morbidity (Akerele et al, 200). Abortion, small birth size, maternal anemia, hypertension, preterm labour, phlebitis, thrombosis and chronic pyelonephritis are related to urinary tract infection during pregnancy (Pfau and Sacks, 1992; Akerele et al., 2002; Onuh et al., 2006).

E. coli remains the predominant organism implicated in urinary tract infection in pregnancy, though recent reports show change in pattern of the infection (Onuh et al, 2006). Recent studies in Nigeria show an increasing involvement of *Klebsiella Spp. Staphylococcus aureus, Proteus spp.,* and *Pseudomonas spp* in urinary tract infection in pregnancy (Abdul and Onile, 2001).

In view of this, this study aims at evaluating the prevalence of urinary tract infection and the etiologic agents amongst pregnant women in Abakaliki metropolis in Ebonyi State, South-east Nigeria.

MATERIALS AND METHODS

Study Area and Population.

This cross-sectional study was conducted at both the Ebonyi State University Teaching Hospital (EBSUTH) and mile 4 Hospitals located in Abakaliki metropolis between 1st august and 5th November, 2009. Abakaliki is the capital of Ebonyi state and as an urban settlement; it has hospitals, dispeneries and markets. Abakaliki is inhabited by civil servants, traders, farmers, and students. The highest temperature in Abakaliki occurs between march and April (immediately before the rainy season) and the lowest experienced in the peak of harmattan period (January); wet and dry seasons are distinct in the area, the wet season spans from April to October with an annual rainfall of between 1.700 mm and 20. 20 mm and while dry season spans from November to march (Ugo, 2003), the lush vegetation, inadequate drainage system and poor environmental sanitation prevail in the area.

Consecutive booked antenatal women who presented at the antenatal clinics of the above mentioned hospitals during the study period were randomly selected for this study. Pregnant women in the first trimester were excluded from the study as the hormonal changes affecting the urinary system might have not been fully elaborated at this gestational age. Also, pregnant women on antibiotics therapy within 72 hours to the study days were excluded due to the fact that the antibiotics must have inhibited or destroyed the pathogens.

Ethical Consideration

Approval was sought and collected from the Research/Ethics Committee of the above hospitals and informed consent obtained from the pregnant women before the commencement of the research. Demographic information such as age, occupation, number of children (parity), and duration of gestation were collected from the pregnant women using standard questionnaires and kept confidential during the research.

Sampling Technique

Two hundred (200) pregnant woman attending the above mentioned hospitals during the research period that either had any of the symptoms suggestive of urinary tract infections or without any symptoms were recruited into the study upon informed consent. The subjects were trained on vilval cleansing and urine collection to avoid contamination. Sterile universal containers were given to the eligible pregnant woman and mid – stream “Clean Catch” urine specimens collected and carried immediately to the Microbiology Unit. Department of Laboratory Services. Ebonyi State University Teaching Hospital (EBSUTH), for culture and Microscopy.

Culture Technique

All the urine samples were aseptically inoculated unto Blood agar, and MacConkey agar using calibrated loop technique (Vandepitte et al, 2003). Each urine sample was shaken gently, and then tipped to a slant and with sterile 0.001ml (1ui) inoculating loop the surface of the urine was touched so that the urine is sucked into the loop. The loop was never dipped into the urine. The 0.001 ml of urine was deposited on a blood agar plate and half of the plate was streaked by first making a straight line down the center (1). Followed by close passes at right angles through the original (2), and ending with oblique streaks crossing the two previous passes (3). MacConkey agar was inoculated in the same manner. The plates were incubated for 24 hours at 37^{0} C (Vandepitte, et al, 2003)

Direct Microscopy and Gram Staining

Preparation and examination of Gram-Stained smears of the urine samples were carried out, using the method described by Cheesbrough, (2000).

Bacterial Colony Count

After incubation at 37^{o} C for 24 hours, counts $>10^{5}$ colony forming unit per milliliter was taken as being significant in both symptomatic and asymptomatic pregnant women as described by Vandepitte et al, (2003).

Identification of Bacterial Isolates

A complete identification of each bacteria isolate was based on cultural examination, morphological examination, and biochemical characterization.

Statistical Analysis

Data collected was analyzed using Chi square test. $P<0.05$ was taken as being statistically significant with 95% confidence interval.

RESULTS

Two hundred (200) urine samples were collected and analyzed during the study period. Ninety-six (96) samples showed significant growth, which amounted to a prevalence of 48.0/%. The prevalence of infection in relation to age are shown in table 3, individuals of the age group 21-25 years had the highest incidence of infection (41.7/ %). Followed by age group 26-30 years (34.4/%), 31-35 years (18.8/%) and 16 -20 years (3.1/%). While the age group 36-40 years had the lowest incidence of infection (2.0/%). There was no significant difference between age and rate of infection (X^2 =13.432, df = 4, P>0.05). in table 4, there was higher rate of infection in the third trimester (82.3/%) compared to second trimester (17.7/%) and the difference was statistically significant (X^2 = 0.0647, df = 1, P< 0.05). in table 5, there was no significant difference between parity and frequency of urinary tract infection in pregnancy (X^2 = 9.8264, df 2, P> 0.05) there was a high frequency of infection occurring in those having 2 – 3 children (44.8/%). Followed by those having 0-1 children (36.4/%) while the lowest frequency of infection occurred in those with > 4 Children (18.8/%).

Table 2 showed the frequency of various significant pathogens isolated. There were one hundred and five (105) microbiological isolates as nine (9) samples yielded double growth of microorganisms. Among the significant isolates, staphylococcus aureus had the highest frequency of isolation with a frequency of (44.8/%), while *P. mirabilis* has the lowest frequency of (0.9/%).

Table 2: Frequency of Isolation of various significant pathogens in urine of pregnant women.

Pathogens	Number isolated	Percentage (%)
Staphylococcus aureus	47	44.8
Klebsiella Pneumonia	16	15.2
Escherichia coli	11	10.5
Enterococcus faecalis	10	9.5
Coagulase – negative		
Staphylococcus	9	8.6
Streptococcus pyogenes	2	1.9
Proteus Mirabilis	1	0.9
Pseudomonas aeruginosa	7	6.7
Candida species	2	1.9

Table 3: Prevalence of Urinary Tract infection in pregnant Women in relation to age.

Age groups (years)	Number examined	Number positive	% Positive
16 – 20	11	3	3.10
21 – 25	64	40	41.70
26 – 30	86	33	34.40
31 – 35	31	18	18.80
36 – 40 8	8	2	2.00

X^2 = 13.4321

Table 4: Prevalence of urinary tract infection in pregnant women in relation to gestational age.

Gestational age (weeks)	Number examined	Number positive	% Positive
13 – 25	37	17	17.7
26 – 40	163	79	82.3
Total	200	96	100.0

X^2 = 0.0647

Table 5: Prevalence of urinary tract infection in pregnant women in relation to Parity.

Parity	Number examined	Number Infected	% Positive
0 – 1	76	35	36.4
2 – 3	70	43	44.8
≥ 4	54	18	18.8
Total	200	96	100.0

X^2 = 9.8264

DISCUSSION

The commonly reported infections associated with pregnancy are urinary tract infection (asymptomatic bacteria, cystitis and pyelonephritis). Which are frequently encountered medical complications of pregnancy (de la Rosa et al; 1994 and Onuh et al; 2006). Although the majority of infections in pregnancy are asymptomatic, the mother is placed at high risk for low birth weight, preterm labour, hypertension, maternal anemia, thrombosis, still birth and abortion (Pfau and sacks 1992, Akerele et al, 2002, Onuh et al 2006). For instance, pyelonephritis could cause significant maternal and fetal morbidity and mortality (Akerele et al, 2002). The earlier documented sociodemographic risk factors for urinary tract infection in pregnancy like maternal age and high parity were proven to be associated with urinary tract infection during pregnancy in this study while gestational age was not associated with urinary tract infection in pregnancy. This study does not agree with that of Onyemelukwe et al, (2003) who reported that there was no relationship of either age or parity with bacteriuria in pregnancy. The report of this study is somewhat similar to that of Leigh, (1989) who reported an increasing parity as a risk factor of developing urinary tract infection in pregnancy but no relationship to age in developing urinary tract infection in pregnancy. The report of this study is in disagreement with that of Onuh et al, (2006) who reported that there was no relationship between either age or parity and bacteriuria in pregnancy. These differences may be as a result of the different locations in which these studies were being carried out.

In the study, ninety –six (96) urine samples gave significant growth amounting to 48. 0% prevalence. This prevalence does not agree with that of Onuh and colleagues (2006) who reported 32.7% although close to this finding. Furthermore, the prevalence in this study does not agree with that of Akinloye et al, (2006) who reported a prevalence of 21.7.0% and Onyemelukwe et al (2003) who reported a prevalence of 12.7%. also, the prevalence of this study does not agree with that of Duguid et al (1987), Leigh (1989), brook et al (2002) and Woodman, (2002) who reported a prevalence of 1 – 10%. This difference may be due to the inclusion of both symptomatic and asymptomatic pregnant women in this study or as a result of difference socioeconomic status of the pregnant women.

In this study, the frequency of urinary tract infection was higher in the third trimester compared to the second trimester. This is in agreement with Leigh, (1989) who reported an increased frequency of urinary tract infection in the third trimester compared to the second trimester of pregnancy. However, this report does not agree with Onuh et al, (2006) who reported a higher prevalence of urinary tract infection in the second trimester compared to the third trimester. This difference may be as a result of either change in urinary stasis and vesicoureteral reflux or decrease in urinary progestines and oestrogens in the various trimester of pregnancy.

In this study, the commonest pathogen isolated was Staphylococcus aureus (44.8/5) followed by klebsiella pneumonia (15.2/%) and Escherichia coli (10.5%) which are not similar to literature reports, where culture from pregnant women yielded more isolates of Escherichia coli, Klebsiella species and proteus mirabilis (Abdul and Onile, 2001; Woodman, 2002; Onyemelukwe et al; 2003 and Akinloye et al, 2006). The report of this study is similar to that of Akerele et al, (2002), who reported the common occurrence of staphylococcus aureus (24.1%) and Klabsiella pneumonia (18.2%) as the aetiologic agents of urinary tract infections pregnancy.

From this study, there tends to be a declining percentage of *E.coli* in the causation of urinary tract infection and a gradual replacement by other members of the Enterobacteriaceae and Enterococci. As in some other recent studies, there tends to be shift in the proportion of aetiological agents favouring organisms like *Staphylococcus aureus and Klebsiella pneumoniae* (Akerele et al; 2002, Onuh etal, 2006). It has been shown that in some women, perineal bacteria gain access into the urethra and then go on to colonize the bladder or kidney causing recurrent urinary tract infection. Such women are likely to have introital colonization with bacteria manifesting bacterial adherence (Onyemelekwe et al; 2003).

CONCLUSION

There is an abrupt decline in the frequency of *E. coli* as the aetiologic agent of urinary tract infection during pregnancy in our environment. In the same vein, there is gradual increase in the proportion of organisms such as *Staphylococcus areus, Klebsiella pneumoniae*, coagulase – negative *Staphylococcus*, *Enterococcus faecalis* and Pseudomonas aeruginosa in causing urinary tract infection in pregnant women.

There is also association of maternal age and parity with the rate of urinary tract infection during pregnancy. These call for frequent and consistent evaluation of the prevalence, aetiologic agents and predisposing factors of urinary tract infections during pregnancy in developing countries in order to reduce the devastation effects of urinary tract infections in pregnancy on both maternal and foetal health.

REFERENCES

Abdul, I F, and Onile B A (2001). Bacteriology and isolates from urine of women in Ilorin and their antibiotics susceptibility patterns. *Tropical Journal of Obstetrics and Gynaecology*; 18 (2): 61 – 65.

Akerele, J Abhlimen, P, and Okonofua, F (2002). Prevalence of asymptomatic Bacteriuria among pregnant women in Benin City, Nigeria. *British Journal of Obstetrics and Gynaecology*, 221 (2). 141-144

Akinloye, O, Ogbolu, D/O, Akinloye, O, M, and Alli, O, A T (2006); *Asymptomatic Bacteriuria of pregnancy in Ibadan,* Nigeria; a re-assessment.

Bonadio, M, Meini, M, Spitaleri, P and Gigli, C (2001). Current Microbiological and Clinical aspects of Urinary tract infections. *European Urology*; 40 (4), 439 – 445

British Journal of Biomedical science; 63 (3); 109- 112. Woodman, P J (200@). Urinary Tract Infection in Pregnancy. *Emedicine Journal*, 3 (6): 61 – 71.

Brook, G F, Butel J S, Moses, S A (2001. *Jawetz Melmick and Adelberg's Medical Microbiology*, 22nd edition. McGraw-Hill, New York. Pp 637 – 638

Cheesbrough, M. (2000). *District Laboratory Practice in Tropical Countries*, Part 2, Cambridge University Press, Cambridge, pp 6 3 – 70.

Cowan S T, Steel K J (1974). *Manual for the Identification of Medical Bacteria*, 2nd edition. Cambridge University Press, Cambridge. pp 103 – 115.

De la Rosa, M, Rojas, A: Garcia, V, Herruzo, A and Moreno, I (1994). Asymptomatic Bacteriuria and pyuria during pregnancy (in Spanish). *Enferm Infectious Microbiology in Clinics*; 121 (2): 79 – 81.

Duguid, J P, Marmion, B P, and Swain, R H A (1987). *In Mackie and McCartney Medical Microbiology: A Guide to the Laboratory Diagnosis and Control of infections*, Vo. 1. 13th edition. Churchill Livingstone, Philadelphia, PP329 – 330.

Kass, E H (1962): Pyelonephritis and bacteriuria: A Major Problem in Preventive Medicine. *Annals of Internal Medicine; 56: pg 46 – 53.*

Leigh, D (1989): Urinary Tract Infections. In: Parker, M T and Darden, B I (ends) Topple and Wilson's Principles of bacteriology, *Virology and Immunity*, Vol.3, *the edition. B C Decker, Philadelphia. Pp197 – 211.

Nester, W E, Anderson, D G, Roberts, C E, Pearsau, N N and Nester, M T (2004). *Microbiology; A human perspective*, 4th edition. McGraw – Hill, New York. Pp634 – 637.

Onuh, S O, Umeora, O U J, Igberase, Go, Azikem M E and Okpere, E E (2006). Microbiological Isolates and sensitivity pattern of urinary tract infection in pregnancy in Benin City, Nigeria, *Ebonyi Medical Journal*; 5(2); 48 – 52.

Onyemelukwe, N F, Obi, S N, Ozumba, B C (2003). Significant Bacteriuria in pregnancy in Enuhun, Nigeria. *Journal of College of Medicine*; 8 (2): 20 – 22.

Pfau, A, and Sacks, T CG (1992). Effective Prophylaxis for Recurrent Urinary Tract Infections During pregnancy. *Clinical Practice of Infectious Diseases*; 14; 820 – 814

Sleigh, J D, Robertson, J G and Isdale, M H (1964). Asymptomatic Bacteriuria in Pregnancy. *Journal of Obstetrics and Gynecology of the British Commonwealth*. 71:74 -.

Theodor, M. (2007). Prevalence and antibiogram of urinary tract infections among prison inmates in Nigeria. *The Internet Journal of Microbiology*; 3(2): 12 - 23

Ugo, C. (2003). *Polytheism: the gods of Abakaliki*. Handel Books Ltd., Enugu, Nigeria. PP 9 – 17.

Vandepitte, J; Verhaegen, J; Engbaek, K; Rohnor, P. Piot, P; Heuk, C C(2003). *Basic Laboratory Procedures in Clinical Bacteriology*, 2nd edition. WHO. Geneva. pp32 – 35.

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