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Full Length Research Paper

Urinary tract disease prevalence amongst pregnant women in South-eastern Nigeria

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This study is based on the prevalence of Urinary Tract Disease (UTIs) amongst pregnant women in Nigeria attending antenatal clinics at hospitals. Factors that predispose an individual to UTI. Listing, description and recognition of bacteria from urine samples. A total of 100 mid-stream urine (MSU) Specimen were collected and cultured for the presence of bacterial pathogens, 54 showed significant bacterial growths while 46 showed no significant bacterial growth. Bacterial agents were isolated from 54 pregnant women and were identified as: *Escherichia coli*;*Klebsiella* spp., *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and*Staphylococcus epidermidis*. *Escherichia coli* [20(37%)] was the commonest offending bacterial pathogen isolated. Other bacterial pathogens incriminated in this study were *Klebsiella* spp. [11(20.4%)], *Proteus mirabilis* [9(16.7%)], *Pseudomonas aeruginosa* [7(13%)], *Staphylococcus aureus* [4(7.4%)] and *Staphylococcus epidermidis* [3(5.6%)]. The study shows a high occurrence of UTIs (54%) despite the fact that most of the pregnant women showed no clinical symptom.

Key words: Pathogens, antibiotics sensitivity, bacteria, urine, urinary tract disease.

INTRODUCTION

Urinary Tract diseases are linked with multiplication of organisms in the urinary tract. UTI defined as the microbial invasion of any of the tissues of the urinary tract protrding from the renal cortex to the urethral meatus (Kunin, 1979) . The urinary tract includes the organs that collect and store urine and release it from the body which include: kidneys, ureters, bladder, urethra and accessory structures. Urine formed in the kidney is a sterile fluid that serves as a good culture medium for proliferation of bacteria (Omonigho et al., 2001) . UTI is evident by the presence of 10^5 microorganisms or of a single strain of bacterium per ml in two consecutive mid-stream samples of urine (Berg, 1985; Davidson et al., 1989). UTI could be described based on the part of the tract affected, for upper tract it is called Pyelonephritis and the lower part, cystitis (Stamm, 1998). As an anato-mical unit, an infection of any part can generally spread to its other parts (Roberts, 1967). The commonest mode of infection is the rising route, through which organisms of the bowel flora contaminated the urethra, ascends to the

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bladder and migrate to the kidney or prostrate. Haematogenous spread do occur particularly during neonatal period (Azubuike et al., 1999).

Factors that predispose an individual to UTI include:

(a) Stasis; a major cause of UTI during pregnancy.
(b) Obstruction of the flow of urine, which could be caused by stone.
(c) Presence of foreign body such as in-dwelling bladder catheter.
(d) A decrease in general body resistance such as observed in malnourished individuals, use of immuno-suppressive drugs and disease conditions e.g. diabetes (Olowu, 1996).

The pathological lesions of UTI include urethritis (inflammation of the urethra), cystitis (inflammation of the bladder) etc. infection of the urinary tract puts other parts at risk of infection.

It has been recognized for sometime that asymptomatic bacteriuria is common in pregnancy thus women are at increased risk of UTIs. Nicholson (1989) reported that except for a short period immediately after birth (infant period), females far exceed males in the prevalence of asymptomatic bacteriuria (Weatheral et al., 1988; Omonigho et al., 2001). Females are more susceptible to colonization with enteric bacteria due to shortness of their urethra. The close proximity of the urethral orifice to the rectum, which is in direct contact with perineal microbes, also makes the females to be more susceptible. In males, the sterility of the proximal two-thirds of the urethra, its longer length and the bactericidal effect of prostatic secretion constitute an excellent immunological defense against bacterial infection.

Also, the anatomical relationship of the female urethra to the vagina makes it liable to trauma during sexual intercourse as well as bacteria being massaged up the urethra into the bladder during pregnancy or childbirth; the moist environment of the females perineum favours microbial growth and predisposes females to bladder contamination (Weatheral et al., 1988; Duerden et al., 1990; Ebie et al., 2001). Other factors including improper cleaning of the perineum, the use of napkins and sanitary towel together with pregnancy and sexual intercourse contri-bute to the higher incidence of UTIs in various women.

In addition, urine of females was found to have more suitable pH and osmotic pressure for the growth of *Escherichia coli* than urine from males (Asscher, 1981; Obiogbolu, 2004). Also, bacterial colonization of the distal 4 cm of the urethra predisposes females to UTIs. Increase in the concentration of amino acids and lactose during pregnancy are believed to encourage the growth of *E. coli* in urine (Weatheral et al., 1988). In boys, UTI is a disease of infancy while in girls; a disease of school age with 3 - 5% of girls having asymptomatic bacteruria (Azubuike et al., 1999).

Clinical manifestation of UTI varies but the symptoms range from dysuria, lower abdominal pain, pyrexia of unknown origin and foul smelling urine (Davidson et al., 1989). UTI may generally be diagnosed from the symptoms and laboratory examination of the urine. Criteria for the diagnosis of UTI vary greatly depending on the patients and context. There is considerable evidence of practice variation in the use of diagnostic tests, interpretation of signs or symptoms (Jamieson et al., 2006).

According to Alexander et al. (2006) standard quantitative urine culture should be performed routinely at first antenatal visit. The presence of bacteriuria in urine should be confirmed with a second urine culture. Dipstick testing should not be used to screen for bacterial UTI at first or subsequent antenatal visits. Dipsticks to test only for proteinuria and the presence of glucose in the urine should be used for screening at the first and subsequent antenatal visits as a more cost- effective alternative to multi-reagent dipsticks that detect the presence of nitrite, leucocyte esterase and blood in addition to protein and glucose.

The prevalent organisms that are usually isolated from UTIs patients are *E. coli*, *Staphylococcus aureus*, *Klebsiella aerogenes*, *Pseudomonas aeruginosa*, *Proteus* spp. *Streptococcus faecalis* and *Enterobacter* spp. The prevalence and degree of occurrence of one or two of these organisms over others are dependent on the environment (Omonigho et al., 2001). Gram- negative bacteria have been found most frequently in UTIs cases by several authors with *E. coli* and *Klebisella* spp. being the most predominant organisms (Ayan et al., 1988; De-Mouy et al., 1988; Eghafona et al., 1988; Farooqui et al., 1989; Omonigho et al., 2001; Ebie et al., 2001). Other bacterial pathogens frequently isolated include *S. aureus*, *S. epidermidis* and *S. faecalis* (Eghafona et al., 1988; Omonigho et al., 2001). Stewart et al. (1993) recently reported the isolation of an unusual multiple resistant *Corynebacterium* from the urine of a comatose patient. The pathogen was reported to be resistant to sulphurfurazole, trimethroprion, nalidixic acid, cefazolin, floxacin, ofloxacin, norfloxacin, vancomycin and fusidin (Omonigho et al., 2001).

This current study reports on the bacteriological aetiology and incidence of Urinary Tract Infections (UTIs) among pregnant women attending antenatal clinics at hospitals in Akwa metropolis, Southeastern Nigeria.

MATERIALS AND METHODS

Study population

Urine samples were collected from a total of 100 pregnant women between the ages of 15 to 40 years. All these persons were outpatients attending the antenatal clinics at Akwa metropolis, Southeastern Nigeria. The urine samples were obtained by informed consent of the pregnant women used for this study and the permission to that effect was obtained from the ethical committee of the hospitals.

Sample collection

One hundred mid-stream urine (MSU) samples were collected in-

Table 1. Prevelance of UTIs in relation to age distributions of pregnant women.

Age group (years)	No. tested (%)	No. positive (%)	No. negative (%)
15-20	15(15.0)	8 (53.3)	7 (46.7)
21-25	39(39.0)	20 (51.3)	19 (48.7)
26-30	26(26.0)	16 (61.5)	10 (38.5)
31-35	12(12.0)	6 (50.0)	6 (50.0)
36-40	8 (8.0)	4 (50.0)	4 (50.0)
Total	100(100.0)	54 (54.0)	46 (46.0)

inside sterile disposable universal bottles from pregnant women. They were instructed on how to collect samples and the need for prompt delivery to the laboratory. The samples were labeled and transported to the Microbiology laboratory of Nnamdi Azikwe University, Akwa in iced pack and were analyzed within 30 min to 1 h of collection.

Description, Listing and recognition of bacteria from urine samples

Each MSU specimen was cultured on Cysteine-Lactose Deficient (CLED) agar and Blood agar as described by Cheesbrough (2002), where every specimen that yielded a pure heavy growth of bacterial pathogens were included in this study (Elhag and Chugh, 1982; Omonigho et al., 2001). The pure isolates of bacterial pathogens were transferred to Nutrient agar slants and stored in the refrigerator at 4 ± 1 °C. Suspected bacterial species were characterized by Gram stain followed by microscopic examination, motility test and biochemical tests and identified according to standard bacteriological methods as highlighted by Omer and Fadil (1986) and Cheesbrough (2002).

RESULTS

In this study, cultures that showed 10^5 bacterial colonies per ml of urine were said to have significant growth. Fifty-four (54%) bacterial pathogens were isolated in 100 specimens examined in this study (Table 1). Table 1 shows the incidence of UTIs in relation to age of the subjects. A higher percentage of pregnant women [16 (61.5%)] with UTIs were found within the age brackets of 26 - 30 years, followed by age groups 15 - 20 and 21 - 25 years having a total of 8 (53.3%)and 20 (51.3%) bacterial isolates respectively (Table 1).

Table 2 also shows the frequency of isolation of bacterial pathogens in subjects. Of the 54 bacterial pathogens obtained, *E. coli* [20(37.0%)] was the commonest offending bacterial pathogen isolated. Other bacterial pathogens incriminated in this study were *Klebsiella* spp. [11(20.4%)], *Proteus mirabilis* [9(16.7%)], *P. aeruginosa* [7(13.0%)], *S. aureus* [4(7.4%)] and *S. epidermidis* [3(5.6%)] (Table 2).

Table 3 shows the overall prevalence with age distribution of bacterial pathogens in UTIs among pregnant women. The indicate that the highest number of bacterial isolates was obtained from pregnant women within the age brackets of 21 - 25 years followed by 26 –30 years. Comparatively, lower number of bacterial isolates was obtained from age groups 31 - 35 and 36 - 40 years as shown in Table 3. Majority of the bacterial pathogens were also isolated from these two age groups with percentage occurrence of 37 and 29.6% respectively (Table 3).

Table 2. Percentage occurrence and distribution of bacterial pathogens in UTIs among pregnant women.

Isolates	Frequency (%)
Escherichia coli	20(37.0)
Klebsiella aerogenes	11(20.4)
Proteus mirabilis	9(16.7)
Pseudomonas aeruginosa	7(13.0)
Staphylococcus aureus	4 (7.4)
Staphylococcus epidermidis	3(5.6)
Total	54(100.0)

DISCUSSION

This study reports the microbiological examination of urine samples of 100 pregnant women that fall within the age groups 15 - 40 years. This investigation has shown that the incidence of UTIs in this population was 54.0%. This observation seems to agree with the findings of Stein and Funstuck (2000), who reported a substantial risk of 30 - 60% among pregnant women especially during the trimester but lower than a prevalence rate of 71.6% earlier reported in a similar study by Jellheden et al. (1996) in non-pregnant women less than 50 years of age with acute systems of UTIs.

The result of this current study is also compare favourable with 58% incidence of UTIs reported by Onifade et al. (2005) in a similar study among pregnant women in Southwestern Nigeria. However, Elder et al. (1971) reported a higher incidence of 66% while Sobczak et al. (1999), Omonigho et al. (2001) and Ebie et al. (2001) reported a lower incidence of 26.7, 22.3 and 35.3% respectively. This high incidence of UTIs may be due to hormonal effects observed in pregnancy, which reduces the tone of the ureteric musculature aided perhaps by mechanical pressure from the gravid uterus leading to urinary stasis thus encourages bacterial proliferation in urine, which is an excellent culture media (Obiogbolu,

Table 3. Overall prevalence with age distribution of bacterial pathogens in UTIs among pregnant women.

Isolates	Frequency (%)					
	No.	15-20	21-25	26-30	31-34	35-40
Escherichia coli	20 (37.0)	2(10.0)	7(35.0)	5 (25.0)	4(20.0)	2(10.0)
Klebsiella aerogenes	11 (20.4)	1(9.1)	4(36.4)	4(36.4)	2(18.2)	Nil
Proteus mirabilis	9(16.7)	2(22.2)	3(33.3)	3(33.3)	Nil	1(11.1)
Pseudomonas aeruginosa	7(13.0)	Nil	3 (42.9)	2 (28.6)	2(28.6)	Nil
Staphylococcus aureus	4 (7.4)	Nil	2 (50.0)	1 (25.0)	Nil	1(25.0)
Staphylococcus epidermidis	3 (5.6)	Nil	1(33.3)	1(33.3)	1(33.3)	Nil
Total	54(100.0)	5 (9.3)	20(37.0)	16(29.6)	9(16.7)	4(7.4)

2004) . It may also be due to genuine population susceptibility since it is known that such factors as low socio-economic status, sexual intercourse, pregnancy among other factors are common among Nigerian women too (Andriole, 1985; Ebie et al., 2001).

The result seen in this study also showed that there was a high incidence of UTIs among pregnant women within the age groups 21–25(37.0%) and 26 - 30(29.6%). This observation is similar to the findings reported by Adeyeba et al. (2002), it is believed that the subjects in this age group are more sexually active and are therefore more prone to UTIs.

The most common pathogens isolated in these pregnant women were *E. coli* (37.0%), *Klebsiella* spp. (20.4%), *P. mirabilis* (16.7%), *P. aeruginosa* 7(13.0%), *S. aureus* 4(7.4%) and *S. epidermidis* (5.6%) . This finding is similar to other reports which indicate that Gram-negative bacteria, particularly *E. coli* is the most implicating pathogen isolated in patients with UTIs (Burbige et al., 1984; Akinyemi et al., 1997; Okonofua and Okonofua, 1989; Onifade et al., 2005; Aiyegoro et al., 2007).

Our results in this current study showed that *E. coli* (37.0%) predominated over *Klebisella* spp. (20.4%). This result is contrary to the findings of Omonigho et al. (2001) who found *Klebisella* spp. to be more prevalent than *E. coli* in UTIs. This result compares favourably with the findings of other workers who found *E. coli* more predo-minant over *Klebisella* spp. in similar studies in UTIs (Ayhan et al., 1988; De-Mouy et al., 1988; Eghafona et al., 1988; Farooqui et al., 1989; Delzell, 2000; Omonigho et al., 2001; Ebie et al., 2001) . This investigation however confirmed the involvement of both pathogens in UTIs as earlier established by Logoria and Gonzalez (1987).

The 20.4% recorded for *Klebisella* species however brings to light the fact that *Klebisella* species are achieving more prominence as aetiologic agents of UTI than previously demonstrated by most workers (Obaseki, 1988; Abdulrahman et al., 1992; Adeyemo et al., 1994; Ebie et al., 2001). The 37.0% recorded for *E. coli* also agrees with the findings reported by Delzell (2000) who reported that this pathogen is the most common pathogen of UTIs during pregnancy. This high incidence of the *E. coli* could be attributed to the fact that it is a commensal of the bowel and that infection is mostly by faecal contamination due to poor hygiene.

This is owed to the fact that commensals of the intestine are more involved in the UTIs because of the anatomy proximity to the genitor- urinary area (Obiogbolu, 2004). Increase in concentration of amino acids and lac-tose during pregnancy also encourages the growth of *E. coli* (Weatheral et al., 1988).

Other pathogens isolated in order of prevalence include *Klebsiella* spp., *P. mirabilis*, *P. aeruginosa*, *S. aureus*, and *S. epidermidis*. This also revealed that the isolated pathogens in this study were coliforms which are index organism of safety, good hygiene and sanitary quality. This conforms to the report of Anyamene et al. (2002) that the dominant etiologic agents accounting for more than 85% of cases of UTIs are the Gram-negative bacilli which are normal flora of the intestinal tract.

A follow-up urinalysis helps to confirm that the urinary tract is infection-free. It is important to take the full course of treatment because symptoms may disappear before the infection is fully cleared. Prompt therapeutic intervention is therefore advocated in this current study as it is essential to prevent cases of asymptomatic UTI from becoming symptomatic with resultant damage.

This current study has shown beyond reasonable doubt that 54.0% of all the pregnant women attending antenatal clinics at the hospitals within Akwa metropolis, South-eastern Nigeria have asymptomatic bacteruria. Therefore, the findings of this current study have in no doubt helped to ascertain the facts that the findings of previous works on asymptomatic bacteruria in pregnancy are relatively similar. Though there could be slight variations but this could only be attributed to environ-mental factors, methods of samples collection and cultural methods.

In view of the grave consequences due to asymptomatic UTI in pregnant women involving not only these women but also to their unborn babies, there is need for urgent action to control the situation. It is there-fore recommended that routine microbiological analysis and antibiotic sensitivity test of mid-stream urine samples of pregnant women and other patients be carried out so as enhance in the administration of drugs for the treatment and management of UTIs, there should also be mass

education and public awareness programmes on the importance of proper personal hygiene and good environmental sanitation habits mostly during pregnancy; periodic screening should also be carried out on all pregnant women at the antenatal clinics for asymptomatic UTIs.

More so, further extensive work should be done to ascertain the extent of these consequences of UTIs in pregnancy in our environment. This will greatly help to improve all steps towards the prevention and control of UTIs in our community. Thereby enhance government efforts towards improving public health care system and providing “health for all”

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