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Incidence of Urinary Tract Infection (UTI) Among Pregnant Women Attending Antenatal Clinics at Some Selected Hospitals in Aba, Southeastern Nigeria

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A B S T R A C T

This study was carried out to determine the incidence of urinary tract infection (UTI) among pregnant women attending antenatal clinics at some selected hospitals in Aba, southeastern Nigeria. The sampling lasted for four months from May to August, 2015. Four hundred urine samples were collected using sterile disposable universal containers. The samples were transported to Microbiology Laboratory of Abia State Polytechnic, Aba and analyzed using microscopy, gram staining and biochemical tests for the identification of the microorganisms. The results obtained showed that 261 (61.5%) pregnant women were infected and age bracket 26-30 years had the highest incidence of UTIs with infection rate of 89.8%. Pregnant women in their second trimesters were most infected with infection rate of 66.7%. However, the statistical analysis revealed significant difference between UTIs and gestational age/educational status of the pregnant women (p-value<0.05). The most common pathogens isolated were *Escherichia coli* (37.0%), *Klebsiella* spp (20.4%), *Proteus mirabilis* (16.6%), *Pseudomonas* spp (13.0%), *Staphylococcus aureus* (7.4%) and *Staphylococcus epidermidis* (5.6%). The screening of pregnant women during antenatal clinics should be considered very important to avoid complications.

Introduction

Urinary tract infection (UTI) is defined as a condition of the urinary tract when infected with a pathogen causing inflammation (1). UTI can be said to be the invasion and multiplication of microorganisms that affect any part of the urinary tract (2). The urinary tract consists of the kidneys, ureters, bladder, urethra and other accessories.

Any part of these structures can become infected but the bladder and urethra infections are most common. The pathological lesions of UTI include pyelonephritis (inflammation of the urethra), cystitis (inflammation of the bladder) etc.

The urinary tract functions as an excretory system that produces, stores and eliminates urine which contains a variety of fluids, salts and no bacteria in the absence of contaminations (3). Urine formed in the kidney is a sterile fluid that serves as a good culture medium for the proliferation of bacteria (4). The causative agents of UTIs can either be bacteria, viruses, fungi and other parasites (5). Bacteria mostly incriminated in UTI include *Echerichia coli* and *Staphylococcus saprophyticus* with remainder caused by *Proteus* and other Gram-negative rods (6). The occurrence of one or two of these organisms over others is dependent on the environment. While generally not considered a cause of significant mortality, UTI represents an important cause of morbidity (7).

UTIs are more common among women than men. This is due to the fact that female urethra is much shorter and closer to the anus than the males; hence bacteria can pass easily into the urinary tract. 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 female's peritenium favors microbial growth and predisposes females to bladder contamination (8).

Pregnancy is one of the factors that increase the risk of UTI, partly due to the pressure of gravid/uterus on the ureter causing stasis of urine flow and is also attributed to the hormonal and immunological changes (9). UTI can be particularly dangerous in pregnant women where up to 50% of those with asymptomatic bacteriuria go on to develop pyelonephritis and these women experience higher rates of intrauterine growth restriction and low birth weight infants (10). About 80-90% of UTIs is caused by *Echerichia coli* which usually inhabit the colon (5); however, many other bacteria like *Staphylococcus saprophyticus* can occasionally cause infections. UTI is common with varying prevalence by age, sexual activity and the presence of genitourinary abnormalities (11). The presence of UTI has also been shown to increase the risk of preterm labor, preterm birth, pregnancy induced hypertension, preeclampsia, amnionitis and anemia (12). This study was designed to determine the prevalence of UTI among pregnant women attending antenatal clinics in some selected hospitals in Aba, Nigeria. Such data will be a useful tool for the Health Ministry.

Materials and Methods

Study Area

Aba is a major settlement and commercial center in the southeastern part of Nigeria. The geographical co-ordinates for Aba are 5º 07' N latitude and 7o 22' E longitude and 205m (673ft) above sea level. Aba is thickly populated and has stagnant water in many places particularly during the rainy seasons with garbage dumps littered in some parts of the city. People are exposed to poor hygiene and availability of portable water is not within the reach of the poor. These factors actually promote infection and their transmission.

Study Population

A cross-sectional study of pregnant women attending antenatal clinics at some selected hospitals in Aba, Nigeria were recruited into this study between the months of May and August, 2015. The hospitals were Abia State Teaching Hospital and Living Word Mission Hospital, both in Aba. The hospitals were selected based on their popularity. Pregnant

women who were taken antibiotics within the time of recruitment and those who were not willing to participate were excluded in the study.

Research Ethics

Ethical review and clearance of the research protocol were obtained from the Ethical Review Committee of the Department of Biology/Microbiology, Abia State Polytechnic, Aba. Permission was sought from the hospital authorities. All subjects who consented and signed the consent forms presented their identification data (name, gestational age, occupation and educational status).

Sample Collection

Four hundred (400) midstream urine (MSU) samples from the consented pregnant women were collected using labeled disposable universal containers. The containers were given to the pregnant women and they were instructed on how to collect the samples and the need for prompt delivering for analysis. The samples were collected and transported in iced packed container to the Microbiology Laboratory of Abia State Polytechnic, Aba, for analysis. The sample size was determined using kreijcie and Morgan (13) formula for determining sample size:

$S= X_2NP (1-P)/d_2 (N-1) +X_2P (1-P)$.

Sterilization of Media and Materials

The media used were prepared according to the manufacturer's specification and were sterilized by autoclaving at 121^{o}C for 15 minutes. All glass wares were washed and dry and were later wrapped in aluminum foil and sterilized in a hot air oven at 160^{o}C for 3 hours.

Microscopy

The urine samples were agitated and aliquots centrifuged at 500 rpm for 5 minutes. A volume of the urine samples were applied to a glass slide stained and examined under the microscope (14).

Culturing of the Urine Samples

With the aid of syringes, 0.1mL urine was cultured onto freshly prepared Nutrient agar, MacConkey, Manitol salt agar (MSA) and Potato Dextrose agar (PDA) plates (15). After overnight incubation at 37^{o}C for 24 hours, the plates were then examined macroscopically for bacterial growth. The bacterial colonies were counted. Only specimens which produced $\geq 10^5$ CFU/mL of urine were considered significant while specimens that produced $< 10^5$ colonies of urine were considered insignificant or due to contamination (16; 17; 18).

Representative of growing colonies were picked with a wire loop from incubated Nutrient agar and MacConkey plates and pure cultures were made with repeated sub-culturing. Resulting cultures were used for Gram stain, fermentation and Biochemical tests which include catalase, coagulase, Indole, urease, Oxidase tests etc, aimed at identifying the bacterial isolates. Cultures plated on Potato Dextrose agar were incubated at room temperature for 5 days (15). The results were taken and accurately recorded.

Results and Discussion

The results revealed a high rate of urinary tract infection (UTI) in the studied area. Out of 400 pregnant women sampled, 246(61.5%) were infected with UTIs. Prevalence of UTIs in relation to age (Table 1) showed that the age bracket 26-30 years

had the highest rate of infection with 88(89.8%) infected. This is followed by age bracket 21-25 years with 68(71.6). The least infected was in the age bracket 15-20 years with 36.7% rate of infection. There is no significant difference between the age groups of pregnant women and prevalence of UTI (*p-value* > 0.05).

In Table 2, the results of the prevalence of UTIs by gestational age were shown. Pregnant women in their 2nd trimester had the highest prevalence for UTIs (66.7%). The least infected was from the 1st trimester with 45(54.9%). There is significant difference between the gestational age (trimester) and the prevalence of UTIs (*p-value*< 0.05).

Table 3 shows the prevalence of UTIs in relation to their educational status. The results showed that those women with primary education had the highest rate of infection (87.9%), secondary education (55.3) and tertiary education (40.1%). There is significant difference between the educational qualifications of pregnant women and the prevalence of UTIs (p-value< 0.05).

The prevalence of UTIs among the pregnant women in relation to occupational status is shown on Table 4.The highest infection rate was obtained among pregnant women who were traders (89.7%). This is followed by students with infection rate of 51.8% while the least prevalence occurred among civil servants with 67(43.5%). There is no significant difference between the occupations of the pregnant women and the prevalence of UTIs.

Table 5 shows the percentage occurrence of the bacterial isolates obtained from the infected pregnant women. The most frequently isolate was *Escherichia coli* (37.0%), followed by *Proteus mirabilis* (20.4%) while the least was *Staphylococcus epidermidis* with 5.6%.

The incidence rate of 61.5% obtained from this study is higher when compared with the reports of other authors. Okonko et al (16) observed an incidence rate of 47.5% among pregnant women in Oluyoro Catholic Hospital, Ibadan, Nigeria while Onifade et al (19) obtained an incidence rate of 58% in a similar study among pregnant women in Ondo, Nigeria. Others who also worked among pregnant women in Nigeria include Oladeinde et al (18) with incidence rate of 55.0% and Lawani et al (20) with incident rate of 25.3%. The high incidence rate obtained in this study could be attributed to the environmental conditions where subjects reside. For instance, Aba (the study area) is thickly populated with stagnant water during the rainy seasons in many places and garbage dumps littered in many parts of the city. The people are also exposed to poor hygiene and non-availability of portable water. These factors promote infection particularly urinary tract infections. Among the age classes, infection was highest within the age-range 26-30 years (89.8%) and least within 15-20 years (36.7%). This finding agrees with the findings of Boye et al (21) with the highest prevalence (33.6%) occurring within the age bracket 27-32 years.

In this survey, the incidence rate was higher in the 2nd trimester (66.7%), followed by those in their 3rd trimester with 60.6% incidence rate. Boye et al (21) reported similar results with the 2nd and 3rd trimesters having 50.4% and 26.5% respectively.

Table.1 Prevalence of UTIs in Relation to Age of the Pregnant Women

Age (years)	Number Sampled	Number positive (%)
15-20	60	22(36.7)
21-25	95	68(71.6)
26-30	98	88(89.8)
31-35	82	40(48.8)
36-40	65	28(43.1)
Total	400	246(61.5)

P-value= 0.17; t= 3.931

Table.2 The Prevalence of UTIs among the Pregnant Women in Relation to Gestational Age

Gestational age (week)	Number Examined	Number Positive (%)
1st Trimester (1-12)	82	45(54.9)
2nd Trimester (13-28)	138	92(66.7)
3rd Trimester (29-40)	180	109(60.6)
Total	400	246(61.5)

P-value= 0.04; t= 4.284

Table.3 Prevalence of UTIs among the Pregnant Women in Relation to Educational Status

Educational Status	Number Examined	Number Positive (%)
Tertiary	137	55(40.1)
Secondary	123	68(55.3)
Primary	140	123(87.9)
Total	400	246(61.5)

P-value= 0.03; t= 3.935

Table.4 Incidence of UTIs among Pregnant Women in Relation to Occupational Status

Occupational Status	Number Examined	Number Positive (%)
Civil servants	154	67(43.5)
Traders	136	122(89.7)
Students	110	57(51.8)
Total	400	246(61.5)

P-value= 0.40; t= 0.058

Physiological and hormonal changes in pregnancy contribute to increased risk of developing UTIs, coupled with bad clean-up techniques complicated by heavily extended belly of pregnant women at these gestation stages (22; 23). Results from this study also revealed that educational status played a key role in urinary tract infections among these pregnant women. The highest prevalence (87.9 %) was obtained among those with primary education while those with tertiary education had the least (40.1%). Organisms that were implicated in this study include *Escherichia coli*, *Klebsiella* spp, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Staphylococcus*

epidermidis. This result collaborates with the finding of other authors (20; 22; 23). *Echerichia coli* was the most prevalent etiological agent in this study which agrees with the report of (22). The high rate of *Escherichia coli* infection could be attributed to its commensal nature in the intestinal tract and consequent faecal contamination due to poor hygiene.

In conclusion, this study highlighted the need to raise urgent attention to UTIs in the studied area. A high incidence rate of 61.5% reported in this study poses a big threat to the health of the pregnant women. There are social and economic burden associated with UTIs. This calls for increase personal and environmental hygiene and the need to expand health services for prevention and treatment to pregnant women. To do this health education during antenatal visits is strongly advocated.

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