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Detection of Urinary Tract Infection (UTI) among pregnant women in Oluyoro Catholic Hospital, Ibadan, South-Western Nigeria

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ABSTRACT

This study reports the detection of urinary tract infections among 80 pregnant women in Oluyoro Catholic Hospital Ibadan, South-Western, Nigeria for a period of 6 months. It was carried out to detect the presence of urinary tract infection in pregnant women, and to isolate and to identify the pathogens responsible for the infection. A total of 80 clean voided mid-stream urine samples were collected from pregnant women between the ages of 21-40 years. The results showed 38 bacterial isolates with an incidence of 47.5% in this population. The isolates were identified based on colonial morphology, microscopic characteristics, and biochemical tests using Bergey's Manual of Determinative Bacteriology. *Escherichia coli* 16(42.1%) was the most predominant organism. This was followed by *Staphylococcus aureus* 11(28.9%), *Klebsiella aerogenes* 7(18.4%), *Pseudomonas aeruginosa* 2(5.3%), and a mixed culture of *Klebisella aerogenes* and *Staphylococcus aureus* 2(5.3%). Urine microscopy revealed the presence of Pus cells in the urine samples collected. Two samples, representing 2.5% of the samples contained yeast cells, suggesting that Candidiasis was also predominant. The high incidence rate of 47.5% reported in this study should be of great concern, as not only do UTIs pose a threat to health, but they also impose an economic and social burden due to the stigma associated with these infections.

Keywords: bacteriuria, pregnant women, urine, Urinary Tract Infection

INTRODUCTION

Urinary Tract Infections (UTIs) is an infection caused by the presence and growth of microorganism anywhere in the urinary tract and is perhaps the single commonest bacterial infection of mankind (Morgan and McKenzie, 1993; Ebie *et al*., 2001). Urinary tract includes the organs that collect and store urine and release it from the body which include: kidneys, ureters, bladder and urethra. UTIs are among the most common bacterial infections in humans, both in the community and hospital settings and have been reported in all age groups in both sexes (Hooton *et al*., 1995). It is a serious health problem affecting millions of people each year and the leading cause of Gram-negative bacteriaemia. UTIs are also the leading cause of morbidity and health care expenditures in persons of all ages. In the United States, it is estimated from surveys of office practices, hospital-based clinics and emergency departments that these infections account for over eight million cases of UTI annually and more than 1 million hospitalizations, for an overall annual cost in excess of $1 billion (Patton *et al.*, 1991; Kunin, 1994; Aiyegoro *et al.*, 2007). The pathogens producing UTI have been said to be mostly derived from the hospital (Tapsal *et al*., 1975; Ebie *et al*., 2001).

UTI has become the most common hospital-acquired infection, accounting for as many as 35% of nosocomial infections, and it is the second most common cause of bacteraemia in hospitalized patients (Weinstein *et al.*, 1997; Stamm, 2002; Kolawole *et al.*, 2009). UTI accounts for a significant part of the work load in clinical microbiology laboratories and enteric bacteria (in particular, *Escherichia coli*) remain the most frequent cause of UTI, although the distribution of pathogens that

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cause UTI is changing (Ojiegbe and Nworie, 2000; Kolawole *et al.*, 2009).

Numerous reports have also suggested that UTI can occur in both males and females of any age, with bacterial counts as low as 100 colony forming units (CFU) per millimeter in urine (Akinyemi *et al*., 1997; Ebie *et al*., 2001). This is common in patients with symptoms of acute urethral syndrome, males with chronic prostatitis and patients with indwelling catheters (Karen *et al*., 1994). Females are however believed to be more affected than males except at the extremes of life (Ebie *et al*., 2001; Kolawole *et al.*, 2009). Untreated upper UTI in pregnancy carries well documented risks of morbidity, and rarely, mortality to the pregnant women (NICE 2003). Sexually active young women are disproportionately affected. An estimated 40 percent of women report having had a UTI at some point in their lives (Kunin, 1994).

Recently published studies have added to the body of knowledge concerning the pathogenesis, diagnosis and management of UTIs (Orenstein and Wong, 1999). Usually, a UTI is caused by bacteria that can also live in the digestive tract, in the vagina, or around the urethra, which is at the entrance to the urinary tract. Most often these bacteria enter the urethra and travel to the bladder and kidneys. Usually, the body removes the bacteria, and shows no symptoms. The signs and symptoms include burning feeling during urination, frequent or intense urges to urinate, even when one passes little urine, backaches or pains at the lower abdomen, cloudy, dark, bloody, or unusual-smelling urine, fever or chills (NKUDIC, 2005).

Women tend to have UTIs more often than men because bacteria can reach the bladder more easily in women. This is partially due to the short and wider female urethra and its proximity to anus. Bacteria from the rectum can easily travel up the urethra and cause infections (Ebie *et al*., 2001; Kolawole *et al.*, 2009). Moreover, the main factors predisposing married women to bacteriuria are pregnancy and sexual intercourse (NIH, 2004). Sexual activity increases the chances of bacterial contamination of female urethra. Sexual intercourse may also cause bacteria to be pushed into the urethra. This 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/ child birth (Duerden *et al*., 1990; Ebie *et al*., 2001, Kolawole *et al.*, 2009). Using a diaphragm can also lead to UTIs because diaphragms push against the urethra and make it harder to completely empty the bladder. The urine that stays in the bladder is more likely to grow bacteria and cause infections (APFP, 2004; NKUDIC, 2005).

However, the importance of coliform bacilli in UTI among pregnant women has long been known in developed countries (Omar and ElHaj, 1992). Health care practitioners regularly have to make decisions about prescription of antibiotics for urinary tract infections. UTI is the second most common clinical indication for empirical antimicrobial treatment in primary and secondary care, and urine samples constitute the largest single category of specimens examined in most medical microbiology laboratories (Morgan and McKenzie, 1993).

UTI is challenging, not only because of the large number of infections that occur each year, but also because the diagnosis of UTI is not always straight forward (Kolawole *et al.*, 2009). Criteria for the diagnosis of UTI vary greatly depending on the patients and context. According to Tena *et al.* (2008), there is not 1 best way of performing urine cultures. Guidelines for the diagnosis of UTI includes the use of sheep blood agar and either MacConkey agar or a similar selective medium for routine urine culture. The plates should be incubated overnight (at least 16 hours) at 37°C in ambient air; alternatively, the blood agar plate can be incubated in elevated (3%–8%) CO_2 (Clarridge *et al.*, 1988). For fastidious microorganisms, chocolate agar can be added to the MacConkey agar and the plates incubated in 5% CO_2 for 2 days (Clarridge *et al.*, 1988). CO_2 can play a role in the growth of microorganisms for instance, *E. coli* as a substrate for carboxylation reactions (Kozliak *et al.*, 1995). There is considerable evidence of practice variation in use of diagnostic tests, interpretation of signs or symptoms and initiation of antibiotic treatment such as drug selection, dose, duration and route of administration (Jamieson *et al.,* 2006). For patients with symptoms of UTI and bacteriuria the main aim of treatment is to get rid of infectious bacteria causing the symptoms. Secondary outcomes are adverse effects of treatment or recurrence of symptoms. This study therefore focuses on the detection and incidence of UTI among pregnant women Ibadan, South-Western, Nigeria. It also aimed to isolate and identify the organisms isolated from clinical specimen.

MATERIALS AND METHODS

Study population

Urine samples were collected from a total of 80 pregnant women between the ages of 21 to 40 years. All these persons were outpatients attending the antenatal clinics in Oluyoro Catholic Hospital (OCH) Ibadan, Oyo state. 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.

Urine collection

Clean catch urine samples were collected in sterile universal containers as described by Karlowsky *et al.* (2006) and Solberg *et al.* (2006). Eighty "clean catch" mid-stream urine (MSU) samples were collected 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 Medical Microbiology and Parasitology laboratory of University College Hospital (UCH), Ibadan in iced pack and were analyzed within 30 minutes to 1 hour of collection.

Demographic and clinical information

Demographic and clinical information of the subjects were obtained by chart abstraction and recorded on a prepared data collection form. The study groups were also stratified by Age distribution. Information was collected on the women's age, occupation, menstrual and obstetric histories, gestational age, and parity, perceived gynaecological symptoms, health care-seeking behaviour and contraceptive practices.

Sterilization of media and materials

The media used were Nutrient Agar (NA) from Biotec Limited, while Nutrient Broth (NB), MacConkey agar (MCA), Blood Agar (BA) and Cystein Lactose Eletrolyte Deficient (CLED) Agar were supplied by Oxoid Limited. All glassware were washed with detergent and rinsed with water, then allowed to dry. The glassware were later wrapped in aluminum foil and sterilized in a hot air oven at 160 °C for 3 h. Media were prepared according to the manufacturer's specifications and sterilized by autoclaving at 121 Ib/g for 15 min.

Microscopy

The urine samples were mixed and aliquots centrifuged at 5000 rpm for 5 min. The deposits were examined using both 10X and 40X objectives. Samples with 10 white blood cells/mm^3 were regarded as pyuric (Smith *et al.*, 2003). A volume of the urine samples were applied to a glass microscope slide, allowed to air dry, stained with gram stain, and examined microscopically (Kolawole *et al.*, 2009).

Culturing of urine sample

This was carried out as described by Cheesbrough (2002, 2004) and Prescott *et al.* (2008). Ten-fold serial dilutions were made by transferring 1.0 mL of the sample in 9.0 mL of sterile physiological saline. One mL was then poured into molten nutrient agar in Petri dishes and rotated gently for proper homogenization. The contents were allowed to set and the plates were then incubated at 37 °C for 24 h. Bacterial colonies appearing on the plates after the incubation period were enumerated to determine urine samples with significant bacteriuria. A loopful of each urine sample was also streaked on Mac Conkey agar and Blood agar plate for the isolation of the bacteria present in the urine. After incubation, plates with growth were selected, the colonies were isolated using inoculating loop and subsequently subcultured on agar slants for use in further tests.

Identification of isolates

The methods used in the identification and characterization of isolated bacteria include Gram stain followed by microscopic examination, motility test and biochemical tests according to Cheesbrough (2002; 2004). The isolates were identified by Bergey's Manual for Determinative Bacteriology (Buchanan and Gribbons, 1974).

RESULTS

Of the 80 samples examined in this study, only fifteen samples were observed to have pus cells, 4 had *Schistosoma haematobium* and yeast cells (Table 1).

Table 1: Microscopic examination of urine samples

Isolates	No. of Positive Samples (%)
Pus cells	15 (62.5)
Schistosoma haematobium	4 (16.7)
Yeast cells	4 (16.7)
Total	**24 (30.0)**

Also, of the 80 samples examined in this study, 38 (47.5%) were found to contain heavy and appreciable bacterial growth (significant bacteriuria) while 42 (52.5%) had no appreciable bacterial growth (Table 2). Urine microscopy revealed Pus cells in the urine samples collected while yeast cells was only found in 2 (2.5%) of the samples. Culture plates with bacteria counts greater than or equal to $1x10^5$ cfu/mL were taken as positive, thus indicative of UTI. The bacteria isolates were identified based on colony morphology characteristics, Gram stain reaction and biochemical tests.

Table 2 shows the incidence of UTI in relation to age of the subjects. Table 1 shows the incidence of UTI in relation to age of the subjects. It shows a high percentage of organisms were isolated from pregnant women within the ages 21-25 years, 31-35 years and 36-40 years while age groups 26-30 years had the least percentage (37.1%) as shown in Table 1.

Table 2: Distribution of UTI in relation to age of pregnant women

Age Group (years)	No. Tested (%)	No. Positive (%)	No. Negative (%)
21-25	14 (17.5)	7 (50.0)	7 (50.0)
26-30	35 (43.8)	13 (37.1)	22 (62.9)
31-35	22 (27.5)	11 (50.0)	11 (50.0)
36-40	9 (11.3)	7 (77.8)	2 (22.2)
Total	**80 (100.0)**	**38 (47.5)**	**42 (52.5)**

Of the 38 isolates obtained, Gram-negative bacteria occurred more frequently than Gram-positive bacteria, constituting 25 (65.8%) of the total isolates. These include *Escherichia coli* 16 (42.1%), *Klebsiella aerogenes* 7 (18.4%) and *Pseudomonas aeruginosa* 2 (5.3%) as shown in Table 3. Gram-positive bacteria accounted for 11 (28.9%), with *Staphylococcus aureus* 11 (28.9%) and mixed cultures of *Klebsiella* spp. and *Staphylococcus* spp. accounting for 2 (5.3%) as shown in Table 3. It was also

found that the rate of isolation of *Klebsiella aerogenes* and *Staphylococcus aureus* was higher in specimens collected from pregnant women in all age brackets while *Pseudomonas aeruginosa* were isolated exclusively from age brackets 36-40 years.

Table 3: Frequency of isolation of organisms in pregnant women

Isolates	No. of Positive Samples (%)
Escherichia coli	16 (42.1)
Staphylococcus aureus	11 (28.9)
Klebsiella aerogenes	7 (18.4)
Pseudomonas aeruginosa	2 (5.3)
Mixed cultures: *Klebsiella* & *Staphylococcus* spp.	2 (5.3)
Total	**38 (100.0)**

Table 4 shows the incidence of UTI by occupational group. UTIs were more prevalent among civil servants, this constituted 77.8% of the pregnant women with UTI, followed by teachers (70%), businesswomen (53.8%), traders (40.0%), professionals/artisans/full housewives (36.4%), and students 30.4% (Table 3).

Table 4: Incidence by occupational groups

Occupational Groups	No. Tested	No. Positive (%)
Students	23	7 (30.4)
Teachers	10	7 (70.0)
Civil Servants	9	7 (77.8)
Businesswomen	13	7 (53.8)
Traders	15	6 (40.0)
Professionals/Artisans/Housewives	11	4(36.4)
Total	**80**	**38 (47.5)**

Distribution of UTI in relation to parity (No. of pregnancy) is shown in Table 5. Fourteen (58.3%) of 24 women who were in their 3rd pregnancy and above or who have had more than 3 children had UTIs, 7 (43.7%) of 16 women were in their 2nd pregnancy also had UTIs while 17 (42.5%) of the 40 women who were in their 1st pregnancy had UTIs as shown in Table 5. This showed that parity is one of the possible factors affecting the prevalence UTIs among women.

Table 5: Incidence of UTI by parity (no. of pregnancy)

Parity	No. Tested	No. Positive (%)
First pregnancy	40	17 (42.5)
2nd pregnancy	16	7 (43.7)
3rd pregnancy and above	24	14 (58.3)
Total	**80**	**38 (47.5)**

Table 6 shows the incidence of UTI by gestational age (age of pregnancy) as at the time of this study. This revealed that women in their 6th and 7th month of their pregnancy had the higher incidences of UTI; 50.0% and 71.4% respectively while women in the early month of their pregnancy had no specific bacteria growth and shows no sign of UTIs.

Table 6: Incidence of UTI by gestational age (age of pregnancy)

Age of Pregnancy (Months)	No. Tested (%)	No. Positive (%)
3	2	Nil
4	4	2 (50.0)
5	11	3 (27.3)
6	14	7 (50.0)
7	14	10 (71.4)
8	24	12 (45.8)
9	11	5 (45.5)
Total	**80**	**38 (47.5)**

Table 7 shows the incidence of UTI by trimester (a period of three months, especially one of the three three-month periods into which human pregnancy is divided for medical purposes) as at the time of this study. This revealed that women in their 3rd trimester of their pregnancy had the highest incidence of UTI [27(55.1%)], followed by women in their 2nd trimester [12(41.4%)] while women in their first trimester of their pregnancy, though fewer in number, had no specific bacteria growth and shows no sign of UTIs.

Table 7: Incidence of UTI by trimester (period of 3 three-months of pregnancy)

Trimester (period of 3 three-months)	No. Tested (%)	No. Positive (%)
First trimester (1st 3 months)	02	Nil
Second trimester (2nd 3 months)	29	12 (41.4)
Third trimester (3rd 3 months)	49	27 (55.1)
Total	**80**	**38 (47.5)**

Table 8 shows the incidence of UTI in relation to the presenting clinical history. Among all pregnant women in the study, 38 (47.5) reported with symptom suggestive of an UTI and reproductive tract infection (RTI), including white discharge (42.5%), burning sensation while passing urine (1.3%) and vaginal itch (8.8%), others include abdominal pains (40%), malaria (8.8%), vomiting/spitting (5.0%) etc. Among those 48 (60%) women reported with symptoms, 17 (35.4%) women had one symptom, 33 (68.8%) women had two symptoms and 13 (27.1) women had all the three. Only 35 (72.9%) of the 48 pregnant women who showed symptoms of UTIs had specific

Table 8: Incidence of UTI by clinical history

Clinical History	No. Tested (%)	No. Positive (%)	No. Negative (%)
Symptomatic	48 (60.0)	35 (72.9)	13 (27.1)
No Symptoms	5 (6.3)	3 (60.0)	2 (40.0)
Discharges	34 (42.5)	13 (38.2)	21(61.8)
Burning Sensations	1 (1.3)	1 (100.0)	Nil
Abdominal Pains	32 (40.0)	18 (56.3)	14 (43.7)
Swollen Legs	4 (5.0)	1 (25.0)	3 (75.0)
Backache	22 (27.5)	10 (45.5)	12 (54.5)
Malaria	7 (8.8)	6 (85.7)	1 (14.3)
Headache	9 (11.3)	4 (44.4)	5 (55.6)
Stomachache	1 (1.3)	1 (100.0)	Nil
Waist pain	6 (7.5)	3 (50.0)	3 (50.0)
Cough	1 (1.3)	1 (100.0)	Nil
Dizzy	1 (1.3)	1 (100.0)	Nil
Vomiting/Spitting	4 (5.0)	Nil	4 (100.0)
Muscle pull	1 (1.3)	1 (100.0)	Nil
Body pain	3 (3.8)	3 (100.0)	Nil
Hand pain	1 (1.3)	1 (100.0)	Nil
Leg/Knee pain	4 (5.0)	2 (50.0)	2 (50.0)
Thing pain	2 (2.5)	1 (50.0)	1 (50.0)
Shoulder pain	1 (1.3)	Nil	1 (100.0)
Side pain	1 (1.3)	Nil	1 (100.0)
Buttocks pain	1 (1.3)	Nil	1 (100.0)
Cold	1 (1.3)	1 (100.0)	Nil
Sleeplessness	1 (1.3)	1 (100.0)	Nil
Itchy Sensation	7 (8.8)	3 (42.9)	4 (57.1)

growth in the urine culture while 3 (60.0%) of the 5 pregnant women which had no symptoms of UTI gave positive urine cultures (Table 7).

DISCUSSION

The incidence of UTIs in this study population was 47.5%. This is similar to the figures reported in previous studies. This study is in agreement with other reports which stress that UTI is more frequent in females than in males, during youth and adulthood (Ibeawuchi and Mbata, 2002; Asinobi et al., 2003; Olaitan, 2006; Mbata, 2007). The finding of this study is higher than the incidence rate of 11.9% reported by Aiyegoro *et al.* (2007) among children and adolescents in Ile-Ife and 16.5% reported by Okafor *et al.* (1993) in patients between ages 0 and 20 years. This figure is also higher than the prevalence rate of 22% significant bacteriuria reported by Ekweozor and Onyemenen (1996) in Ibadan and 25.6% by Nedolisa (1998) at the Jos University Teaching Hospital (JUTH). The findings of this study is also higher than the incidence rate of 28.1% reported by Olowu (1996) in a population of 2780 out-patients at the Lagos University Teaching Hospital (LUTH) and a prevalence rate of 30% reported by Anochie *et al.* (2001) among a population of 100 school children, between ages 4 - 18 years in a rural community in Enugu as well as 38.6% reported by Akinyemi *et al.* (1997) in Lagos, Nigeria and 35.5% rate recorded by Ebie *et al.* (2001) in Rukuba Military Cantoment, Jos, Plateau State.

However, the findings in this study comparably to the 58% incidence rate of UTI reported by Onifade *et al*. (2005) in a similar study among pregnant women in Ondo state, 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 and with Mbata (2007) who recorded 77.9% among Prison inmates in Nigeria. This high prevalence and incidence of UTI reported in this study may be attributed to the environmental conditions where the subjects reside. This may also be attributed to the lack of proper personal and environmental hygiene, genuine population susceptibility since these factors such as low socio-economic status, sexual intercourse, pregnancy among others are common among Nigerian men and women (Andriole, 1985; Akinyemi *et al.,* 1997; Kolawole *et al.*, 2009).

The low incidence rate of urinary tract infection reported among students (30.4%) in this study may be attributed to the extensive health care talk given regularly in schools and public awareness programmes among the housewives. UTIs were also more common among women whose husbands were transport workers, businessmen or in the armed forces. The incidence rate of bacteriuria among women in their first trimester is 42.5%. This figure is higher than the prevalence rate of 2-9% reported by Nicolle (2003). This shows that symptomatic bacteriuria occurs in 17-20% of pregnancies.

The findings of this study showed that 58.3% of the women who had UTIs were in their 3rd pregnancy and above or have had more than 3 children; 43.7% were in their 2nd pregnancy and 42.5% were in their 1st pregnancy. This showed that parity is one of the possible factors affecting the incidence and prevalence rate of UTIs among women. This study also showed that women in their 6th month (50.0%) and 7th month (71.4%) of their pregnancy had the higher incidence of UTI while women in their early month of the pregnancy had no specific bacteria growth and shows no sign of UTIs.

In this study, women in their 2nd and 3rd trimester were found to have the higher incidence of UTI; 41.4% and 55.1% respectively. Though fewer women were in their first trimester, they showed no specific bacteria growth and show no sign of UTIs. Vazquez and Villar (2000) also reported that 10-30% of women with bacteriuria in the first trimester develop upper UTI in the second or third trimester. Thus, pregnant women should be screened for bacteriuria by urine culture at 12 to 16 weeks of gestation. The presence of 1 $x10^5$ cfu of bacteria per mL of urine should be considered as highly significant.

Only fifteen samples were observed to have pus cells, 4 had *Schistosoma haematobium* and yeast cells. The pattern and frequency of occurrence of the bacterial isolates found in this study is similar what has been previously reported. *E. coli* is the most common pathogen among patients with uncomplicated UTIs (Kahlmeter, 2003). Other members of the family *Enterobacteriaceae* (such as some strains of *Klebsiella* spp.) and other organisms (such as *Staphylococcus aureus*), can have similar requirements (Barker *et al.*, 1978; Tena *et al.*, 2008).

The most implicating organisms causing urinary tract infections among these pregnant women in this study were *Escherichia coli* and were responsible for 42.1% of the cases of UTI. This was followed by *S. aureus* (28.9%), *K. aerogenes* (18.4%), *P. aeruginosa* (5.3%) and mixed cultures of *K. aerogenes* and *S. aureus* (5.3%). This finding is similar to other reports which suggest that Gram-negative bacteria, particularly *E. coli* is the commonest pathogen isolated in patients with UTI (Burbige *et al*., 1984; Akinyemi *et al*., 1987; Okonofua *et al*., 1989; Ebie *et al.*, 2001; Njoku *et al.*, 2001). Onifade *et al.* (2005) and Aiyegoro *et al.* (2007) also reported that *E. coli* was the most commonly isolated pathogen in significant bacteriuria. In a similar study by Nwanze *et al.* (2009) the commonest isolates were also *Escherichia coli* (51.2%), *S. aureus* (27.3%), and *Klebsiella pneumoniae* (12.8%) respectively. This same pattern was also reported by Kolawole *et al.* (2009). However, the 18.4% incidence rate of *K. aerogenes* reported in this study brings to light the fact that *Klebisella* species are achieving more prominence as aetiological agents of UTI than previously reported (Obaseki, 1988; Abuidurahman *et al*., 1992; Adeyemo *et al*., 1994; Nwanze *et al.*, 2009; Kolawole *et al.*, 2009).

According to Murray *et al*. (1998), *S. aureus* is believed to cause cystis in mainly young sexually active females, this was also found to constitute a recognizable percentage in this study. This confirms that this organism may be achieving prominence as an aetiological agent of UTI in pregnant women. In this study, a total of 38 isolates were obtained from the 38 pregnant women with positive cultures; only one bacterial species was isolated from each subject, suggesting a mono-microbial nature of urinary tract infection in the study population. High incidence of UTI was found in age groups 36-40 years, though, a high percentage of the bacterial isolates were obtained mainly from pregnant women in age group 26-30 years. This confirms the usual report that the risk of UTIs increases with age. The pattern of isolates reported in this study is consistent with the usually reported pattern, with *E. coli* being the most common organism isolated in cases of urinary tract infection followed by *S. auerus* and *K. pneumoniae*. *P. aerogunosa* was the least common isolates in this study.

The high incidence of urinary tract infections reported among pregnant women might be as a result of a variety of factors; women under 50 years of age with acute symptoms such as dysuria, urgency or frequency suggesting of lower UTI or loin pain suggesting of upper UTI are extremely likely to have bacteriuria. Asymptomatic bacteriuria becomes increasingly common with age, though prevalence in men is always lower than for women of the same age. Alternations in vaginal microflora also play a critical role in encouraging vaginal colonization with coliforms and this can lead to urinary tract infection (Hooton *et al*., 1995). The prevalence rate of 1-3% asymptomatic bacteriuria was reported in Sweden from neonatal period to school age (Hooton and Stamm, 1997) while 5.3% prevalence was reported in Saudi Arabia (Omar and ElHaj, 1992). In Nigeria, a prevalence rate of 2.1% was reported in Enugu (Okafor *et al*., 1993);- in Ile-Ife, a prevalence rate of 24% and 6% was reported among rural and urban children respectively with an annual incidence rate of symptomatic bacteriuria of 6.5 per 1000 admissions (Aiyegoro *et al.*, 2007), while Kolawole *et al.* (2009) reported 60% prevalence rate of UTI among patients attending Dalhatu Araf Specialist Hospital, Lafia, in Nasarawa State.

The high incidence rate of 47.5% reported in this study should be of great concern, as not only do UTIs pose a threat to health, but they also impose an economic and social burden due to the stigma associated with these infections. The findings of this study revealed that the important infecting organisms were found to be the commensals of perianal and vaginal regions. This calls for increase in personal hygiene (Kolawole *et al.*, 2009). This study has highlighted the need to raise awareness of UTIs and to expand services for prevention and treatment for pregnant women. To do this effectively, however, it may be necessary to improve the quality of health care provided at the community level. Since UTI may be symptomatic and asymptomatic in most cases, it is therefore suggested that routine screening of patients with unexplained sources of fever be done for UTI and the appropriate antimicrobials administered after sensitivity tests have been carried out in order to prevent the cases becoming symptomatic later with resultant renal damage.

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AUTHORS CONTRIBUTIONS

IO Okonko conceived and designed the study, wrote the proposal for ethical approval, and principally financed the whole study, purchased the materials used for sample collection and laboratory analysis, he also assisted in collection of samples, the laboratory analysis and contributed principally in writing up the manuscript as well as the data and statistical analysis of this study. LA Ijandipe addressed the subjects, also assisted in collection of samples, in the laboratory analysis and in reading of the results. OB Donbraye-Emmanuel provided the media for isolation and carried out the microscopy and the microbiological analysis of this study. AO Ilusanya supervised LA Ijandipe who used part of the data for her B.Sc. Thesis in the Department of Microbiology, Olabisi Onabanjo University, Ago-Iwoye, Ogun state, Nigeria. AA Ogun, OA Akanbi, J Ejembi and TOC Faleye contributed equally in writing up this manuscript, editing, proof-reading and financing this publication.

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