



Prevalence of Urinary Tract Infection among Pregnant Women Receiving Antenatal Care in Two Primary Health Care Centres in Karu Nasarawa State, Nigeria

Ajide Bukola¹, Adogo Lillian^{1*}, Saidu Henrietta¹ and Enna Maureen²

¹Department of Biological Sciences, Faculty of Science and Technology, Bingham University, Karu, Nigeria.

²Primary Health Care Luvu, Karu, Nasarawa State, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author AB designed the study. Author AL performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed literature searches. Authors SH and EM managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To determine the prevalence of urinary tract infections among pregnant women receiving antenatal care in two primary health care centres in Karu Nasarawa State.

Place and Duration of Study: This study was carried out in two primary health care centres in Karu Nasarawa State between March-August, 2015.

Methodology: A total of 150 pregnant women were enrolled for this study. Mid stream urine sample was collected from each pregnant woman, analysed and cultured on cystein lactose electrolyte deficient (CLED) medium.

Results: The results revealed that the incidence of UTI in this study population was 62.67% and 94 bacterial isolates were identified based on colonial morphology, microscopic characteristics, and biochemical tests. The most predominant bacterium was *Escherichia coli* (22.97%). This was

*Corresponding author: E-mail: adogolillian@gmail.com;

followed by *Klebsiella spp* (18.08%), *Staphylococcus spp* (15.95%), *Proteus spp* (13.82%), *Staphylococcus coagulase negative* (10.63%) and *Enterococcus spp* (8.51%). The statistical analysis carried out in this study was Chi Square (X^2). $X^2 = 20.97$, and at 0.05 degree of freedom, bacterial significance was 11.07.

Conclusion: The prevalence of urinary tract infection from this study is of significant value, therefore, screening of pregnant women for bacteriuria during antenatal visit should be a routine procedure to avoid complications in pregnancy.

Keywords: UTI; pregnancy; prenatal care; urologic diseases.

1. INTRODUCTION

Urinary tract infections (UTIs), are caused by the presence and growth of microorganisms in the urinary tract, and are perhaps the single commonest bacterial infections of mankind [1]. The urinary tract consists of the organs that collect and store urine and release it from the body which includes kidneys, bladder and urethra [2]. Urinary tract infection (UTI) no doubt is a common clinical diseases encountered in established health settings worldwide. It is generally estimated that millions of people are affected yearly [3], with a large proportion of the infections being inapparent; many also manifest with obvious clinical features while others still show complications in addition [4].

Urinary tract infection (UTI) is characterized by bacterial invasion and multiplication involving the kidneys and urinary tract pathways. 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 [5-7]. Recurrent infections are common and can lead to irreversible damage to the kidneys, resulting in renal hypertension and renal failure in severe cases [8].

Urinary tract infections are the most frequent bacterial infection in women [9] and it occur four times more frequently in females than in males [10]. They occur most frequently between the age of 16 and 35 years, with 10% of women getting an infection yearly and 60% having an infection at some point in their lives [11].

The female gender itself is a risk factor because of their short urethra, its proximity to the vagina and anus and the inability of women to empty their bladder completely [12]. Other main factors which make females more prone to UTI are pregnancy and sexual activity. In pregnancy, the physiological increase in plasma volume and decrease in urine concentration leads to the

development of glycosuria in up to 70% women which in the end leads to bacterial growth in urine [13]. Abnormalities of urinary tract or stones, diabetes mellitus, immunosuppression and past history of UTI tend to increase the risk [14,15]. In addition, the urine of females was found to have more suitable pH and osmotic pressure for the growth of *Escherichia coli* than the urine of males [16].

The pathogenesis of UTIs in women begins with the colonization of the vaginal introitus by uropathogens from the fecal flora, followed by ascension through the urethra into the bladder. Pyelonephritis develops when pathogens ascend to the kidneys via the ureters. The host and microbial factors that underlie progression from bladder to kidney infection require further investigation. Pyelonephritis can also be caused by seeding of the kidneys from bacteremia. It is possible that some cases of pyelonephritis are associated with seeding of the kidneys from bacteria in the lymphatics [17].

UTI represents one of the most infectious pathologies, affecting pregnant women as it has been reported among 20% of pregnant women and it is the most common cause of admissions in obstetrical wards [18]. Abortion, small birth size, maternal anemia, hypertension, preterm labour, phlebitis, thrombosis and chronic pyelonephritis are related to urinary tract infection during pregnancy [19,20].

Three common clinical manifestations of UTIs in pregnancy are: asymptomatic bacteriuria, acute cystitis and acute pyelonephritis [21]. UTI in pregnant women is also characterised by fever, flank pain and tenderness in addition to significant bacteriuria. Other symptoms may include nausea, vomiting, frequent urination, urgency, dysuria, premature birth and low birth weight [22].

The 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 [23].

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 [24].

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 [25].

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out in two Primary Health Care Centres in Masaka, Karu Local Government Area, Nasarawa State. Masaka is a district of Karu Local Government Area, and is among the towns that forms the Karu urban area, a conurbation of towns under Karu. It is about 18 km South-East of Abuja.

2.2 Study Population

Random sampling technique was used to collect urine samples from 150 pregnant women between the ages of 15 to 44 years. All these women reported for antenatal care (ANC) in the Primary Health centres in Masaka, Karu.

2.3 Ethical Approval

The urine samples were obtained with the informed consent of the pregnant women and ethical approval was obtained from the ethical committees of the Primary Health Care Centres.

2.4 Demographic Information

Socio-demographic data such as age, occupation, parity and gestational age were

collected from the pregnant women using standard questionnaires and kept confidential during the research.

2.5 Sample Collection

One hundred and fifty clean - catch midstream urine was collected from each pregnant woman into a wide-mouthed sterile screw capped container. The urine samples were labelled appropriately and transported to Bingham University Microbiology Laboratory for examination in iced pack and were analyzed within 30 minutes to 1 hour of collection.

2.6 Sample Processing

This was carried out as described by [26-28]. 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 hours. Bacterial colonies growing on the agar after the incubation period were enumerated to determine urine samples with significant bacteriuria.

A loopful of each urine sample was also streaked on Cysteine-Lactose Deficient (CLED) agar and Blood agar as described by [29]. After incubation, plates with growth were selected, the colonies were isolated using an inoculating loop and subsequently sub cultured on Nutrient agar slants and stored in the refrigerator for use in further tests.

Suspected bacterial species were characterized and identified according to standard bacteriological methods as highlighted by [30,31].

2.7 Sensitivity Test

With the aid of sterile forceps, the appropriate multi-disc depending on whether the test organism plated was Gram negative or Gram positive was placed firmly on the surface of nutrient agar. The antibiotics used were: Seprin, (30 µg), Chloramphenicol, Ciprofloxacin, (5 µg), amoxicillin (30 µg), Augmentin (30 µg), streptomycin (30 µg), pefloxacin (5 µg). The plates were left at room temperature to allow diffusion of the antibiotics from the disc into the agar medium. The plates were then incubated at 37°C for 24 hours in the incubator. After 24 hours

of incubation, the zones of inhibition were measured to the nearest millimeter and interpreted by the recommendations of clinical and laboratory standards [32].

3 RESULTS

A total of 150 midstream urine samples was collected from pregnant Women. Table 1 shows that *Escherichia coli* had the highest percentage of occurrence (32.7%), *Klebsiella* spp (18.08%), *Staphylococcus* spp (15.95%), *Proteus* spp (13.82%), *Staphylococcus* coagulase negative (10%) and *Enterococcus* spp had the least percentage of occurrence (8.51%).

Table 2 shows the prevalence of Urinary Tract Infection in relation to age, within the age group of 15-24 years; fifty seven pregnant women were screened, forty four of these women were positive to the infection with a prevalence rate of 46.80%. Within the age group of 25-34 years; seventy nine pregnant women were screened, thirty nine of these women were positive to the infection with a prevalence rate of 41.48%. Within the age group of 35-44 years; fourteen pregnant women were screened, eleven of these women were positive to the infection with a prevalence rate of 11.70%. A total of one hundred and fifty pregnant women were ninety four of them were positive to the disease with a prevalence of 62.67%.

In Table 3, the prevalence of the disease among pregnant women is shown. Nineteen women in their first trimester were screened and thirteen of them were positive with a prevalence of 13.82%. Fifty one women in their second trimester were screened out of which twenty nine of these women were positive with a prevalence of 30.82%. Eighty pregnant women in the third

trimester were screened for the infection out of which fifty two were positive with the highest prevalence rate of 55.31%. A total of one hundred and fifty pregnant women were screened, ninety four of them were positive to the disease with a prevalence of 62.67%.

Table 4 shows the prevalence of UTIs by occupational group. UTIs appear to be more prevalent among house wives who constituted (42.55%), business women (41.48%), students (8.51%) and civil servants appeared to be the least constituting (7.44%).

Antibiotics sensitivity disk was used to carry out sensitivity test on each bacterial isolate. Gentamycin was sensitive to all bacteria isolated but resistant to *Klebsiella* spp. The zone of inhibition was measured in diameter(mm) as: R-Resistance: 13 mm or less, I-Intermediate: 14-16 mm and S- Sensitive: 17 mm or more. The antibiotics used were: SXT – Septrin, CH – Chloranphenicol, CPX – Ciprofloxacin, SP – Sparfloxacin AM – Amoxicillin, AU – Augmentin, CN – Gentamycin, OFX – Travid S – Streptomycin, PEF – Pefloxacin (Table 5).

Table 1. Percentage occurrence and distribution of bacterial pathogens in UTIs among pregnant women

Microorganisms isolated	Percentage of occurrence (%)
<i>Escherichia coli</i>	31 (32.97)
<i>Klebsiella</i> spp	17(18.08)
<i>Staphylococcus</i> spp	15(15.95)
<i>Proteus</i> spp	13(13.82)
<i>Staphylococcus coagulase</i> negative	10(10.63)
<i>Enterococci</i> spp	8(8.51)
Total	94 (100)

Table 2. Prevalence of urinary tract infection in relation to age of pregnant women

Age (years)	Number screened	Number positive	Prevalence (%)
15 - 24	57	44	46.80
25 – 34	79	39	49.36
35 – 44	14	11	78.57
Total	150	94	62.67

Table 3. Prevalence of urinary tract infection in relation to trimester of pregnant women

Stage of pregnancy	Number screened	Number positive	Prevalence (%)
First trimester	19	13	13.82
Second trimester	51	29	30.82
Third trimester	80	52	55.31
Total	150	94	62.67

Table 4. Prevalence of urinary tract infection in pregnant women in relation to occupation

Occupation	Number screened	Number positive	Prevalence (%)
House wives	50	40	42.55
Civil servants	15	7	7.44
Business women	71	39	41.48
Students	14	8	8.51
Total	150	94	99.98

Table 5. Sensitivity test

Bacteria isolated	Antibiotics sensitivity profile									
	PEF	CN	AM	CPX	S	SXT	AU	OFX	CH	SP
<i>E. coli</i>	S	S	I	R	I	I	R	R	S	I
<i>Klebsiella</i> spp	S	R	S	S	R	R	S	R	R	R
<i>Staphylococcus</i> spp	R	S	S	R	R	R	S	R	R	S
<i>Proteus</i> sp	S	S	S	S	R	R	R	R	S	S
<i>Staphylococcus</i> coagulase negative	R	S	S	S	R	R	R	R	S	R
<i>Enterococcus</i> spp	R	S	I	R	S	R	S	R	R	S

Keys; R-Resistance, I-Intermediate, S- Sensitive

4. DISCUSSION

This study shows that the most common bacteria isolated from the mid stream urine samples of the pregnant women was *Escherichia coli*, with 32.97%. The second most common pathogen isolated was *Klebsella* spp (18.08%), followed by *Staphylococcus* spp (15.95%), *Proteus* spp (13.82%), *Staphylococcus coagulase* negative (10.63%) and *Enterococcus* spp (8.51%) as shown on Table 1. This results is similar to the separate findings of Daniyan and Abalaka [33] and Idakwo et al. [34].

The prevalence of UTI among pregnant women receiving antenatal care at the primary health care centres was considered to be high. Out of 150 urine sample of the pregnant women, 94(62.67%) showed significant growth of bacteriuria, which is similar to the findings of [34, 35]. However lower incidence rate of 10.21%, 3.6%. was recorded by Nileka and Sagar [36] and Perera et al. [37].

The prevalence of UTI in this study may be among other factors, as a result of poor personal and environmental hygiene, lack of awareness/education on urinary tract infection and how to prevent the infection [38] and may also be due to pregnancy-associated physiological changes, extended abdomen and difficulty of personal hygiene. According to [39] in the sixth week of pregnancy, the ureter begins to dilate and it continues until delivery. Increase progesterone and estrogens levels normally leads to decreased ureteral and bladder tone.

Increased plasma volume during pregnancy leads to decrease urine concentration and increase bladder volume. The combination of these factors leads to urinary stasis'.

Urinary tract infection occurs in every age and in both males and females. This study shows that pregnant women within the age of 15 to 24, (46.80%) were having more infection than women within the age of 25-34, (41.48%) and 35-44, (11.70%) and it may be as a result of sexual activity which increases the risk of UTI and women within the age group 15-24 are mostly sexually active. This report is also similar to that of [40] who also found that prevalence of UTI increases in sexually active women within the same age group.

Pregnant women in their third trimester were more infected than those in their second and first trimester which is in agreement with a separate studies conducted by [41-43]. This may be as a result of the pressure effect of a bigger uterus on the ureter at the third trimester, also the increasing smooth muscle relaxing effect of pregnancy hormones and pressure on the bladder from the descending part may lead to stasis of urine which can increase the multiplication of bacteria. The Prevalence of Urinary Tract Infection in pregnant women in relation to occupation was higher amongst housewives (42.55%) and low amongst students (8.51%).

Most of the isolates were found to be more sensitive to ciprofloxacin and gentamicin. Similar

observations was also reported by [44,34]. However, resistance to other antibiotics was also observed.

5 CONCLUSION

The study has revealed that the overall prevalence of UTI among pregnant women is 62.67%. All pregnant women should be screened for UTI with a urine culture, and treatment should be guided by the results of antibiotic susceptibility pattern of isolated organisms. Early diagnosis and treatment of UTI during pregnancy can ensure the safety of the mother and the fetus and also prevent complications during delivery.

This study has also shown that *Escherichia coli* are the principal urinary pathogen and that uropathogens are resistant to some antibiotics. Hence, further research is required to establish this information and study the resistance pattern of urinary pathogens.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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