



EVALUATION OF THE INCIDENCE OF UROPATHOGENIC BACTERIA AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC DOMA HOSPITAL GOMBE

¹*SHU'AIBU ISA, ²KABIRU MUSTAPHA Y., ³JABIR HAMZA A. and ¹SALEH RASHIDA

¹Department of Microbiology, Gombe State University, Gombe State, Nigeria

²College of Health sciences, Maryam Abacha American University of Niger, ADS Avenue, Roy Mohd VI, Du Maroc, Maradi, Republic Du Niger

³Department of Pharmaceutical Microbiology, Gombe State University, Gombe State, Nigeria

Corresponding Author: shuaibuisa2002@gmail.com

ABSTRACT

Urinary tract infections (UTIs) are common global problems associated with health conditions. Patients suffering from UTIs like other patients with clinical infections are liable to suffer from wide variety of infectious agents. This study evaluates the presence of uropathogenic bacteria so that appropriate measures to curb their menace could be enhanced. A total of 200 urine samples were collected from pregnant women between the ages of ≤ 20 to 40. CLED (Cystein Lactose Electrolyte Deficient) agar was used for differential isolation of uropathogenic bacteria. Positive samples were subjected to Gram's staining and biochemical identification to confirm their identities. Socio-demographic factors and clinical information were used to investigate the incidence. Organisms isolated were *Escherichia coli*, *Proteus spp.*, *Citrobacter spp.*, *Klebsiella spp.*, *Pseudomonas aeruginosa*, *Salmonella spp.*, *Shigella spp.*, *Yersinia enterocolitica* and *Vibrio spp.* with incidences of 54.4%, 12.2%, 10%, 5.6%, 5.6%, 3.3%, 3.3%, 3.3% and 2.2% respectively. In relation to =age group, women at 20 years or less had 50% (n=6/12) incidence, 21-25 years 63.3% (n=38/60), 26-30 years 42.9% (30/70), 31-35 years 34.3% (12/35) and 36-40 years 17.4% (4/23). Socio-demographic factors revealed that the sexually inactive educated women with good hygienic status and with repeated infection were found to have lower uropathogenic prevalence than the sexually active uneducated and unhygienic women with first time infection. *E. coli* had the highest frequency and *Vibrio spp.* had the least occurrence. The growth of *Vibrio spp.* and the other unrelated species to urine may be attributed to the improper hygiene of the pregnant women. The age group with highest incidence was 21-25 years. This may be due to the fact that women in this group are the most sexually active and might have had many previous pregnancies.

Keywords: Uropathogenic bacteria, pregnant women, Antenatal clinic, Doma hospital.

INTRODUCTION

One of the diseases that affect humans most often are the urinary tract infections (UTIs). They are significant problems of the public health that costs much economic burden (Mazzariol et al., 2017). These UTIs are among the commonest infectious diseases that clinicians commonly encounter in developing nations having an estimate of global annual incidence of 250 million (Beyene & Tsegaye,

2011). UTI is simply the presence of pathogenic microorganisms in the urinary tract usually classified by the site of infection:- kidney (pyelonephritis), bladder (cystitis), or urine (bacteriuria) and can be symptomatic or asymptomatic. UTIs occurring at normal genitourinary tract (GUT) without prior instrumentation are termed "uncomplicated." However, the "complicated" infections are those that occur

in the GUT upon diagnosis that are with functional or structural abnormalities, such as instrumentation including indwelling urethral catheters, and these are frequently asymptomatic (Gonzalez and Schaeffer, 1999; Beyene & Tsegaye, 2011). It has been globally estimated that UTIs that are symptomatic lead to as many as 7 million visits annually to outpatient clinics, 1 million visits annually to emergency departments, and 100,000 annual hospitalizations (Wilson and Gaido, 2004).

Several microorganisms are able to cause UTIs although the commonest pathogens that cause the simple ones in the community are *Escherichia coli* and other members of Enterobacteriaceae, and this accounts nearly 75% of the isolates. Comparatively, *Enterococcus faecalis*, and *Pseudomonas spp.* are also commonly found in patients in hospitalization and complicated urinary tract infections. However, the frequency of the pathogens may vary based on sex, age, catheterization, and hospitalization (Septon, 2000; Ghaima et al., 2018).

On the other hand, about 95% of the major causal agents of UTIs are bacteria, the most prevalent of which is the *E. coli* responsible for more than 80% of the infections (Nachimuthu et al., 2008). Moreover, the family of enteric Gram negative rods (*Enterobacteriaceae*) of which *E. coli* is a member is responsible for UTIs. Herein, it is also the major causes of uncomplicated cystitis and pyelonephritis followed by *Klebsiella pneumoniae*, *Proteus mirabilis* and by Gram-positive pathogens like *Enterococcus faecalis*, *Staphylococcus aureus* and *Staphylococcus saprophyticus*. In pregnant women, there is a very high possibility of UTIs from untreated bacteriuria which may be associated with high potential risks of preterm labour (Gilbert et al., 2013; Forson et al., 2018). This can even be worse

especially if antibiotic resistance is involved. This study was therefore conducted to evaluate the incidence of uropathogenic bacteria from pregnant women with the objective of analyzing such incidence on the basis of the age groups and the socio-demographic factors of the women.

MATERIALS AND METHODS

Sampling

A total of 200 urine sample were collected from 200 outpatient pregnant women between the ages of 15-40 years attending antenatal clinic at Doma hospital in Gombe metropolis. The samples were obtained by the informed consent of pregnant women and the permission to that effect was obtained from the research and ethical committee of the hospital. These samples were obtained over a period of 3 months and were the mid-stream urine (MSU) samples collected using sterile disposable universal containers. The patients were instructed on how to collect the samples and the need for prompt delivery to the laboratory. The samples were labeled and transported to the microbiology laboratory, Gombe State University and were analyzed within 1 hour of collection.

Demography and Clinical Information

Demography and clinical information of the subjects were obtained by chart obstruction and recorded on a prepared data collection form. The study groups were also stratified by age distribution. Information was collected on women's age, hygienic status, educational status, past history of UTIs and sexual activity.

Sample Processing and Identification of the Isolates

Mid-stream-clean-catch urine from participants were inoculated onto cysteine lactose electrolyte deficient (CLED) agar and incubated at 37 °C for 24 h as described by Cheesbrough (2010). Following incubation,

pure cultures were obtained and subjected to Gram's staining and biochemical tests such as indole production, citrate utilization, lactose fermentation, ornithine decarboxylation, urease test and motility as described by Cheesbrough (2010). These were conducted for proper identification of the bacterial isolates to species level.

RESULTS

Table 1: Incidence of urinary tract pathogens in pregnant women based on age groups

Age group (years)	No. of cases	No. of positive cases	% of positive cases
≤ 20	12	6	50
21-25	60	38	63.3
26-30	70	30	42.9
31-35	35	12	34.3
36-40	23	4	17.4
Total	200	90 (45%)	

The prevalence of the urinary tract pathogens in relation to age groups is displayed in Table 1. The age group of 21-25 years had the highest incidence of 63.3% (n=38/60). This is followed by the age group of ≤ 20 with 50% incidence (n=6/12), then 26-30 years with 42.9% incidence (n=30/70), then 31-35 years with 34.3% (n=12/35). However, the women of age group 36-40 years had the lowest incidence of infection of 17.4% (n=4/23).

The Frequency of urinary tract pathogens in the women in relation to socio-demographic and other factors is presented in Table 2. Prevalence of bacteria in women with good hygienic status was found to be 3.85% (n=5/130) and that of pregnant women with poor hygienic status was 21.4% (n=15/70). The significance of education has been evidenced by the fact that only 5.83% (n=7/120) of the examined cases are educated while 22.5% (n=18/80) were uneducated. On the past history of contact with uropathogens only 5% (n=7/140) had repeated infections while 20% (n=12/60) had first time infection. However, in the case of sexual activity, 10.7% (n=16/150) were found to be positive for uropathogens while those with the less active sexual activity with uropathogenic incidence were 20% (n=10/50).

Table 3 shows the percentage isolation of various pathogens from the urine samples of pregnant women. Among these isolates, *E. coli* had the highest percentage of isolation of 54.4% (n=49) while the lowest was *Vibrio spp.* 2.2% (n=2). However, other species including *Proteus spp.* and *Citrobacter spp.*

had percentage isolation of 12.2% (n=11) and 10% (n=9) respectively. *Klebsiella spp.* and *Pseudomonas aeruginosa* had 5.6% (n=5) isolation each. *Salmonella spp.*, *Shigella spp.* and *Yersinia enterocolitica* had 3.3% (n=3) each.

Table 2: frequency of uropathogens in pregnant women in relation to socio-demographic factors

Socio-demographic factors	No. of examine cases	No. of positive infections	Percentage of positive infections
Hygienic Status			
good	130	5	3.85%
Poor	70	15	21.4%
Education status			
Educated	120	7	5.83%
Uneducated	80	18	22.5%
Past history of uropathogens			
Repeated infection	140	7	5%
First time	60	12	20%
Sexual activity			
Active age	150	16	10.67%
Less active age	50	10	20%
Total	200	90 (45%)	

Table 3: Percentage isolation of various significant pathogens in urine of pregnant women

Pathogens	No. of isolate	Percentage (%)
<i>E. coli</i>	49	54.4%
<i>Proteus spp.</i>	11	12.2%
<i>Citrobacter spp.</i>	9	10%
<i>Klebsiella spp.</i>	5	5.6%
<i>Pseudomonas aeruginosa</i>	5	5.6%
<i>Salmonella spp.</i>	3	3.3%
<i>Shigella spp.</i>	3	3.3%
<i>Yersinia enterocolitica</i>	3	3.3%
<i>Vibrio spp.</i>	2	2.2%
Total	90	100%

DISCUSSION

Bacteriuria is commonly found in pregnancy with asymptomatic type capable of causing acute pyelonephritis. This condition will be a serious threat to both the foetus and the mother if left unchecked. It is thus necessary to carefully monitor UTIs when they occur in women during pregnancy (Matuszkiewicz-Rowińska et al., 2015). There exist several factors that encourage bacterial survival which make pregnant women more susceptible to UTIs. These include the increase in vitamins, amino acids and other nutrients in the urine contents. Growth of bacteria can also increase due to glycosuria whereby increase in the volume of plasma during pregnancy results in the decrease in the concentration of the urine concentration and majority of pregnant women suffer from this condition (Le et al., 2004; Ghaima et al., 2018). The result of this study showed that 45% of the 200 pregnant women attending antenatal care at Doma hospital were infected with urinary tract pathogens. This is nearly similar to 42.75% obtained in Ghana (Forson et al., 2018) slightly lower than that obtained in 2012 in Ghana (Boye et al., 2012) and that obtained in Nigeria (Okonko et al., 2009). However, the result is lower than the 85%

obtained in Nigeria (Turay et al., 2014) and higher than obtained in Thailand (Lumbiganon et al., 2009) and from Ethiopia (Tadesse et al., 2014). The variation in the incidences may be attributed to differences in socioeconomic conditions and genital hygiene (Demilie et al., 2012). This study is also in conformity with the study conducted in Sudan (Hamdan et al., 2011) and Bangladesh (Parveen et al., 2011).

It can be seen from this study that the age groups 21-25 and 26-30 had the highest number of positive cases. This is evident from the fact that women in these age groups are more sexually active and are thus expected to have higher incidence. Those at the older age 36-40 had the lowest number and hence the lowest incidence. The results in this study correspond with the results obtained in Baghdad in which the age group 21-30 had the highest occurrence of UTI pathogens and those ages of 41-50 recorded the lowest incidence (Ghaima et al., 2018). Similar results were also obtained in Yemen in which the age group of 15-24 recorded an incidence of 53.7% (Al Haddad, 2005). However, the study by Amiri et al. (2015) revealed that the highest incidence was observed in women above 30 years while the lowest incidence was in the age group of 25-30 years.

Pregnant women were assessed with the presence of uropathogens on the basis of socio-demographic factors which include Hygienic status, educational status, previous contact with uropathogens and sexual activity. Women with good personal hygiene had lower incidence than those with poor hygienic status. This is possible as good personal hygiene prevents the spread of infection (Woldemariam et al., 2019). Meanwhile, educated women were found to have fewer incidences of the uropathogens than the uneducated ones and those with history of contact tend to have fewer incidences than the

first timers. However, out of the examined cases of women at their active stage of sexual activity (n=150), the number was found to be higher (n=16) than those were sexually active (n=10). Their percentages of occurrence were deduced from their respective examined cases and not from the total females observed (n=200). Similar results were obtained (Ghaima et al., 2018). The reason for these differences in rate of bacterial UTIs etiologies may be differences in methodologies employed, the environment, social habits of the community, the personal hygiene standard and the education level.

Escherichia coli (*E. coli*) is the major aetiologic agent that causes UTIs and it accounts for up to 90% of cases (Ronald, 2002). In this study, the uropathogens isolated from the pregnant women were all Gram negative bacteria which made up 100% of all the isolates. *E. coli* is by far the commonest bacteria isolated from their urine samples accounting for 54.4% of the total bacteria isolated. This study is in conformity with various studies conducted around the world (Dromigny et al., 2002; Raka et al., 2004; Farajnia et al., 2009; Beyene & Tsegaye, 2011; Forson et al., 2018; Ghaima et al., 2018; Al-Naqshbandi et al., 2019). The highest prevalence of *E. coli* was followed by *Proteus spp.* and then *Citrobacter spp.* with *Vibrio spp.* having the lowest prevalence. This study does not agree with the studies of Ghaima et al. (2018) in which *Staphylococcus aureus* was the second; Beyene and Tsegaye (2011), in which *Klebsiella pneumoniae* was the second; Woldemarian et al. (2019). In this regard, multiparity, gestational age, history of UTIs and abnormalities in the anatomical sites of the urinary tract were reported to have affected the frequency of bacteriuria in pregnant women (Emiru et al., 2013).

CONCLUSION

There was overall prevalence of UTI due to the presence of the uropathogens, indicative of asymptomatic bacteriuria. *E. coli* was the most predominant bacterial isolate reported. Women at the age group of 21-30 had high prevalence of the isolates. Women with good hygiene status, educated women and those with repeated infection due to uropathogens had fewer occurrences of the uropathogens than those with poor hygiene standard, uneducated women and women with first time encounter respectively. However, women at the active stage of sexual activity had higher number of isolated uropathogens than those at the less active stage. Further study should be conducted to ascertain the antimicrobial resistant patterns of the bacterial isolates as well as their potential for biofilm formation which may pose a risk of persistence of infection.

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