Archives of Reproductive Medicine and Sexual Health
ISSN: 2639-1791
Volume 2, Issue 1, 2019, PP: 23-29

Prevalence of Urinary Tract Infection among Pregnant Women in Kano, Northern Nigeria

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Abstract

The objective of the study is to determine the prevalence of Urinary tract infection and organisms associated with the infection among pregnant women attending ante-natal at maternity ward of Murtala Muhammad Specialist Hospital Kano, Nigeria. A total of 145 urine samples of pregnant women were collected for period of 6 month from March, 2017 to August, 2017. Each sample was streaked using a sterilized platinum wire loop onto the surface of freshly prepared Cysteine-Lactose Deficient (CLED) agar, MacConkey and Nutrient agar plates for bacterial isolation. Isolates were subjected to Gram staining, indole, citrate utilization, catalase, urease, methyl-red, voges Proskauer and coagulase test for identification. The results showed that out of the total of 145 subjects, 23 subjects were diagnosed with urinary tract infection which accounted for 15.8% of the pregnant women. Prevalence of UTI among pregnant women showed that higher incidence found among subjects of age category 26 – 30 years. On the basis of socio-economic status, most of the UTI patients were unemployed. Rural dwellers occupy large percentage of UTI patients among the study subjects. The educational level of the subject showed higher prevalence among subjects without formal education. Prevalence of UTI among pregnant women based on the age of gestation showed higher incidence among subjects in 3rd trimester. The finding showed Escherichia coli are the most prevalent organism associated with UTI followed by Staphylococcus aureus, Klebsiella, Pseudomonas aeruginosa, Proteus sp while the least prevalent organisms is Staphylococcus epidermidis. It is concluded that urinary tract infection is one of the common medical complications of pregnancy.

Keywords: *Urinary tract infection, bacteria, prevalence, pregnant women.*

Introduction

Urinary tract infection (UTI) describes microbial colonization or inflammation of the bladder (cystitis), urethra (urethritis), or renal pelvis and kidneys (pyelonephritis). It is caused by the presence and growth of microorganisms in the urinary tract, which are the single commonest bacterial infections of all age groups and especially in pregnancy. Urinary tract infection is mainly caused by gram-negative organisms that include *E. coli* 60-70%, *Klebsiella* 10%, *Proteus* 5–10%, and *Pseudomonas* 2–5% and gram-positive bacteria, group B *Streptococcus* and *Staphylococcus species* [1]. The gram-positive pathogens are *Streptococcus species* and *Staphylococcus species* [2,3]. According to Ronaldo [4], the common etiologic agents of UTI include *Escherichia coli, Klebsiella spp, Staphylococcus aureus, Pseudomona spp* and *Streptococcus.* These organisms are mainly from the external genitalia, vagina, the genital tract, rectum, and gastro-intestinal tract. It may involve the lower urinary tract or the bladder [5]. These uropathogens generally infect cells in the urinary tract by initial attachment and subsequent ascension from the urethra, to the bladder, kidney and through the systemic circulation, causing bacteraemia, as a result of the renal cells being compromised [6]. Uropathogenic organisms are more likely to colonize anatomically and functionally normal urinary tracts; however individuals with obstructed and abnormal urinary tract structures have a higher risk of UTI [7].

UTIs are one of the most widely spread and costly medical complication of pregnancy, occurring in nearly

20% of all pregnancies. They are also accountable for 10% of all admissions to hospital during pregnancy [8,9]. Based on performed researches, the prevalence of Symptomatic urinary tract infection in pregnant women was found to be 1-18%. The prevalence of asymptomatic bacteriuria in pregnancy in India is 6.2% and varies widely within and between countries. For example, 10% in Iran,12% in Bangladesh,7.3% in Ghana, 6% in Singapore, 4.3% in Malaysia and 14.6% in Nigeria [10]. Pregnant women are more susceptible than men due to anatomy of short urethra and easy contamination of urinary tract with fecal flora. Urinary tract infection occurs in about 8% of all pregnant women and peaking in about 90% during the period of about 24 weeks of gestation [11].

Prevalence of bacteruria during pregnancy rises with parity, lower socioeconomic status, sexual activity, diabetes mellitus, chronic urinary retention and sickle-cell trait and disease. Other risk factors include, previous urinary tract infections history, young age, neuromuscular dysfunction bladder, structural disorders of urinary tract, renal stones, and catheterization [12,13]. Symptoms associated with urinary tract infection include – pain or burning (discomfort) sensation at urinating; a feeling of urgency at urination; cramps or pain in the lower abdomen; the need to urinate more often than usual; urine that looks turbid and has foul smell; pain, pressure or tenderness in the area of the bladder and when bacteria spread to the kidneys, there can be back pain, chills, fever, nausea and vomiting [14]. The objective of the study is to determine the prevalence of Urinary tract infection and organisms associated with the infection among pregnant women attending ante-natal at maternity ward of Murtala Muhammad Specialist Hospital Kano, Nigeria.

Materials and Methods

Ethical Consideration

An approval (MOH/off/797/T.I/49) for the study was obtained from Research and Ethic committee Kano State Ministry of Health through Health Service Management Board (HMB). The aim of the study was explained clearly to the clients and informed consent obtained before proceeding to the study.

Study Area

The study was conducted at maternity ward of Murtala Muhammad Specialist Hospital (MMSH), Kano. Kano state is located in the North-Western Nigeria with coordinates 11^0 30 N 8^0 30 E. It shares borders with Kaduna state to the south- west, Bauchi state to the South-East, Jigawa state to the East, Katsina state to the West and Niger republic to the North. It has a total area of 20,131km^2 (7,777sqm) and population of 11,058,300 [15].

Determination of Sample Size

The sample size for the study was determined from a standard epidemiology formula for minimum sample size calculation [16]. The sample size was given by the formula below;

$N = (Z_1\text{-}a)^2 (p) (1\text{-}p) / d^2$

N = minimum sample size

$Z_{1-}a$ = value of standard normal deviate which at 95% confidence interval has found to be 1.96.

P = the best estimate of prevalence obtained from literature review (9.5%) and

d = difference between the true population rate and sample that can be tolerated, this is the absolute precision (in percentage) on either side of the population.

$N = (1.96)^2 (0.095) (1\text{-}0.095)/ (0.05)^2 = 132.05$ as the minimum number of sample for the study. Therefore, a total of 132 with 10% (13) of this subject will be added to the research for attrition, making a total of approximately 145 samples.

Study Population

A total of 145 urine samples of pregnant women coming for ante-natal care at maternity ward of Murtala Muhammad Specialist Hospital Kano were collected for period of 6 month from March, 2017 to August, 2017. The subjects were approached and requested for voluntary consent to participate in the study. The inclusive criteria involve pregnant women complaining of lower abdominal pain.

Samples Collection

Early morning mid-stream urine samples of about 10 ml were collected from pregnant women complaining of urinary tract infection using clean and sterilized plastic bottles with air-tight screw cap tops. Each urine sample bottle was labeled with a reference code, age, occupation, socio-economic status, and age of gestation. The samples were placed in a cold

box for transportation to the laboratory, where it was stored until analyses were carried out. All samples were analyzed with the microbial culture method and conventional urine analysis.

Culturing, Isolation and Identification of Bacteria

Each of urine samples was streaked using a sterilized platinum wire loop onto the surface of freshly prepared Cysteine-Lactose Deficient (CLED) agar, MacConkey and Nutrient agar plates. The plates were incubated at 37^0C for 24 hours to isolate the growing microorganisms. Representative of growing colonies were picked with a sterile wire loop and re-inoculated onto the surface of nutrient agar, pure cultures were made with repeated streaking. The resulting pure colonies obtained were used for biochemical tests aimed at identifying the bacteria isolates. Isolates were particularly subjected to Gram staining, indole, citrate utilization, catalase, urease, methyl-red, voges proskauer and coagulase test [17].

Statistical Analysis

Statistical analysis Package for Social Science (SPSS) version 10.0 was used for statistical analysis of the data generated. Chi square was used to compare between two or more variables. Statistical significance was considered at *p*-value <0.05 and confidence level of 95%.

Results

Demographic Distribution Of The Subjects

The demographic distribution of the study subjects is presented in the table below. A total number of 145 subjects participated in the study. The subjects were categorized on the basis of their age categories, socio-economic status, resident, education level and gestation age of the pregnancy.

Table 1: *The demographic distribution of the study subjects*

Parameters	Frequency (n)	Percentage (%)
Age (years)		
Less than 20	12	8.3
21 – 25	39	26.9
26 – 30	56	38.6
31 – 35	31	21.4
36 – 40	07	4.8
Socio-economic status		
Employed	27	18.6
Unemployed	118	81.4
Resident		
Rural	52	35.9
Urban	93	64.1
Education level		
Primary school	39	26.9
Secondary school	45	31.0
Tertiary level	30	20.7
None	31	21.4
Gestation age		
1st trimester	36	24.9
2nd trimester	65	44.8
3rd trimester	44	30.3

Prevalence of Urinary Tract Infection

The prevalence of urinary tract infection among pregnant women coming for ante-natal at maternity ward of the Hospital is presented in the table below. The results showed that out of the total of 145 subjects, 23 subjects were diagnosed with urinary tract infection which accounted for 15.8 % of the pregnant women. Prevalence of UTI among pregnant women showed that higher incidence found among subjects of age category 26 – 30. On the basis of socio-economic status, most of the UTI patients were unemployed. Rural dwellers occupy large percentage of UTI patients among the study subjects. The educational level of the subject showed higher prevalence among subjects without formal education. Prevalence of UTI among pregnant women based on the age of gestation showed higher incidence among subjects in 3rd trimester.

Table 2: *The prevalence of urinary tract infection among pregnant women*

Parameters	Frequency (n)	UTI +	UTI-	X^2
Age (years)				
Less than 20	12	3	9	1.4045*
21 – 25	39	5	34	
26 – 30	56	10	46	
31 – 35	31	4	27	
36 – 40	07	1	6	
Socio-economic status				
Employed	27	1	26	3.6749*
Unemployed	118	22	96	
Resident				
Rural	52	14	38	7.4323
Urban	93	9	84	
Education level				
Primary school	39	6	33	12.4900
Secondary school	45	4	41	
Tertiary level	30	2	28	
None	31	11	20	
Gestation age				
1st trimester	36	3	33	6.3771
2nd trimester	44	7	37	
3rd trimester	65	13	52	

Key: * The result is not significant at $p<0.05$

The summary of the prevalence of urinary tract infection among pregnant women coming for ante-natal at maternity ward of the Hospital is presented in the figure below (Figure 1). The result showed that 23 out of 145 pregnant women were diagnosed with the infection which accounted for 15.8%

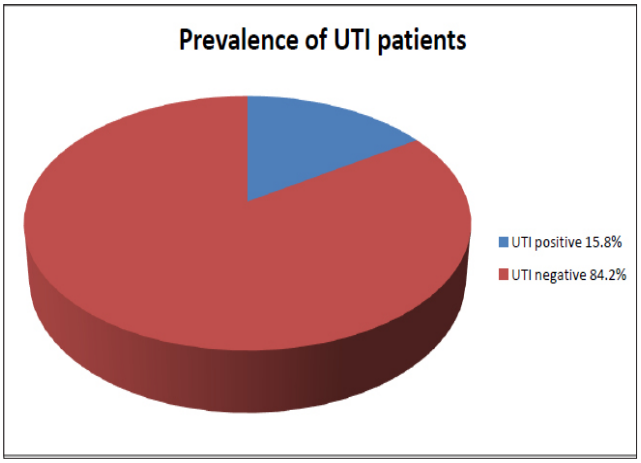

Fig 1: *Prevalence percentage of UTI patients*

Prevalence of Bacterial Isolates

The prevalence of bacteria isolated from 23 urine samples of UTI patients among pregnant women attending maternity ward of Murtala Muhammad Specialist Hospital Kano is presented in Table 3. The result indicated that *Escherichia coli* are the most prevalent organism with total 21 occurrences accounting for 25.9%, followed by *Staphylococcus aureus* with total of 17 isolates (20.9%), *Klebsiella* with 12 isolates (14.8%), *Pseudomonas aeruginosa* with total of 12 isolates (14.8%), then *Proteus* sp has 11 which accounted for 13.7% each while the least prevalent organisms is *Staphylococcus epidermidis* with 8 isolates (9.9%).

Table 3: *Prevalence of isolated from urine samples of UTI patients*

Organisms	No. of occurrence	Percentage occurrence (%)
E. coli	21	25.9
S. aureus	17	20.9
Klebsiella species	12	14.8
P. aeruginosa	12	14.8
Proteus species	11	13.7
S. epidermidis	8	09.9

Discussion

Urinary tract infection is one of the most common medical complications of pregnancy. This is because of anatomic and physiological changes that occur in pregnancy. The physiological changes increase the vulnerability to the development of asymptomatic to pyelonephritis which may result in maternal morbidity and poor fetal outcome [18]. The present study was conducted to determine the prevalence of Urinary tract infection and organisms associated with the infection among pregnant women attending ante-natal at maternity ward of Murtala Muhammad Specialist Hospital Kano, Nigeria. A total of 145 pregnant women were considered in the study.

In the present study, a total of 145 cases were considered of which 23 cases accounted for 15.8% were UTI positive while 122 cases (84.2%) were UTI negative. The overall prevalence of urinary tract infection among pregnant women complaining of lower abdominal pains in this study was found to be 15.8%. This result was in conformity with similar study conducted by Mikhail and Anyaegbunam [19] in Northern Tanzania who found the prevalence of UTI among pregnant women as 16.4%. Another study conducted by Muhammad and Fareid [20] found 14.6% as the percentage prevalence of pregnant women with Urinary tract infection. The result also correlates with that found in Khartoum, Sudan (14%). On the other hand, the result of the present study is in contrast with that of Nabbugodi et al. [21] who found prevalence of UTI among pregnant women as 26.7%. The differences in prevalence may be explained due to differences in socio-economic status, environmental condition, social habit, personal hygiene and educational level. Prevalence of UTI among pregnant women showed that higher incidence found among subjects of age category 26 – 30 years. However, the result is not significant. This finding was in conformity with that of Nwachukwu et al. [22] who study the prevalence of urinary tract infections in pregnant women in Onitsha, Nigeria who found similar result. Higher incidence among pregnant women in this category may be as result of higher sexual activity and women at this stage more sexually active which in turn increase the risk of UTI.

On the basis of socio-economic status, most of the UTI patients were unemployed. Unemployment is associated with low standard of living and poverty which promote infectious diseases. Rural dwellers occupy large percentage of UTI patients among the study subjects but there is no statistical differences at $p<0.05$. There is poor environmental sanitation and housing conditions in rural area and most of rural dwellers showed low personal hygiene which may increase the risk of urinary tract infection. This result supported the finding of Nworie and Eze [23] who found poor personal hygiene and bad housing condition among the factors causing high prevalence of UTI among rural dwellers. The educational level of the subject showed higher prevalence among subjects without formal education. According to this study, highest incidence of UTI is seen in 3rd trimester, followed by 2nd trimester and least is seen in 1st semester. This result supported that of Ranjan et al. [24] who found higher incidence among subjects in 3rd trimester. According to them, the increased incidence during third trimester may relate to increased mechanical obstruction due to gravid uterus. Secondly, most of the pregnant women in the study area come for ante-natal care during second or third trimester.

The prevalence of bacteria in the present study indicated that *Escherichia coli* are the most prevalent organism with total 21 occurrences accounting for 25.9%, followed by *Staphylococcus aureus* with total of 17 isolates (20.9%), *Klebsiella* with 12 isolates (14.8%), *Pseudomonas aeruginosa* with total of 12 isolates (14.8%), then *Proteus* sp has 11 which accounted for 13.7% each while the least prevalent organisms is *Staphylococcus epidermidis* with 8 isolates (9.9%). Several studies conducted on prevalence of bacteria

on urinary tract infection showed the presence of *E. coli, S. aureus, Klebsiella, Pseudomonas* and *Proteus* as the most dominant species [25,26,27]. Presence of members of Enterobacteriacea family such as *E. coli, Klebsiella* and *Proteus* means that infection was as result of poor personal hygiene because the organisms were of fecal origin. This may also be connected with the proximity of anus to female vagina. The domination of Gram–negative UTI bacteria could be attributed to an increase in levels of amino acids and lactose during pregnancy that particularly encourages *E. coli* growth. It could also be due to infection by faecal contamination due to poor hygiene [28]. Nworie and Eze [23] attributed the high prevalence of Staphylococcal infection to poor personal hygiene.

Conclusion

Urinary tract infection is one of the most common medical complications of pregnancy. The overall prevalence of urinary tract infection among pregnant women complaining of lower abdominal pains in this study was found to be 15.8%. Prevalence of UTI among pregnant women showed that higher incidence found among subjects of age category 26 – 30. On the basis of socio-economic status, most of the UTI patients were unemployed. Rural dwellers occupy large percentage of UTI patients among the study subjects. The educational level of the subject showed higher prevalence among subjects without formal education. Prevalence of UTI among pregnant women based on the age of gestation showed higher incidence among subjects in 3rd trimester. The finding showed *Escherichia coli* are the most prevalent organism associated with UTI followed by *Staphylococcus aureus, Klebsiella, Pseudomonas aeruginosa, Proteus* sp while the least prevalent organisms is *Staphylococcus epidermidis*. Health educational programs on preventive measures of the diseases for pregnant women should be provided.

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Citation: **Muhammad Ali, Muhammad S. Abdallah.** *Prevalence of Urinary Tract Infection among Pregnant Women in Kano, Northern Nigeria. Archives of Reproductive Medicine and Sexual Health. 2019; 2 (1): 23-29.*