

Prevalence of Urinary Tract Infections among Pregnant women attending the Antenatal Clinic of a General Hospital in Southwest Nigeria

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Abstract- This research was conducted to ascertain and evaluate the risk factors associated with Urinary tract infections (UTIs) in pregnant women within the study population. Urinary tract infections (UTIs) are predominantly caused by the presence and unimpeded growth of bacteria in the organs of the urinary tract. Upon receiving an ethical approval following a critical review, to commence the research, informed consent forms and a well-structured questionnaires were provided to respondents. A total of Two Hundred (200) participants were sampled. Their Urine samples were collected and cultured on Cystine Lactose Electrolyte Deficient (CLED), MacConkey and Nutrient agar media, using aseptic techniques to investigate the presence of bacterial uropathogens in the urine samples. Culturomic methods and biochemical characterization techniques were used in identification of these bacterial isolates. Factors studied for juxtaposing with the occurrence of bacterial isolates in the urine samples of respondents include participants' UTI medical history, educational status, gravidity status, pregnancy stage, sensation during urination and frequency of urination. Of all these factors, the frequency of urination and painful sensation during urination were found to be of statistical significance ($p < 0.05$) with the presence of bacterial isolates in urine samples analysed. The bacterial isolates recovered from the urine samples were *Klebsiella pneumoniae*, *Citrobacter freundii*, *Staphylococcus aureus*, *Enterobacter* spp., *Escherichia coli*, *Proteus mirabilis*, *Micrococcus* spp., *Klebsiella oxytoca*, *Serratia* spp., *Pseudomonas aeruginosa*, *Bacillus* spp., *Providencia rettgeri*, *Proteus vulgaris*, *Staphylococcus saprophyticus* and *Morganella morganii*. Pregnant women with medical history of UTI should seek medical advice and attention in their first trimester.

Keywords: Bacterial isolates, Urine sample, UTI, Pregnancy, Trimester.

I. INTRODUCTION

Infectious diseases constitute a prominent cause of global morbidity and mortality rates (Alam *et al.*, 2009). Urinary tract infections (UTIs) primarily occur in the urinary tract. The aetiological agents of

UTI are diverse, caused by different types of microorganisms, most especially by the bacterial species. The urinary tract is made of kidney, ureter, bladder and urethra. UTIs are majorly found in women than in men as a result of the shorter, wider female urethra which makes it easy for bacteria to enter the bladder. Unprotected sexual intercourse is also a causative factor (Bloomberg *et al.*, 2005).

Proper sampling and appropriate microbial analysis of Urine give an unambiguous means of isolating uropathogens (Heytens *et al.*, 2017). The uncomplicated UTI can be termed as the one in which lower tract infection affect women without immunological predisposition. This type of UTI can be treated with oral narrow spectrum antibiotics (Sobel and Kaye, 2015).

Complicated UTI are usually upper tract infection in individuals with predisposing factors and functional abnormalities. This class of UTI is treated with oral antibiotics with broad spectrum as multi drug resistant organisms are usually the causative agents. Most of bacteria causing UTIs start from the bowel, with a small percentage arising from normal flora (Foxman, 2003).

Over the years, bacteriuria in pregnancy has given concern to the Gynecologists globally. This is due to the risk and impact on mothers and their babies. The risk during pregnancy is high especially from 6 weeks to at least 22-26 weeks which may last till delivery (Emamghorashi *et al.*, 2012). Bacteriuria occurs during pregnancy, because there is a change in urine chemical composition which include glucose and amino acids, that promotes the proliferation of bacteria in urine (McCormick *et al.*, 2008). Considering the risk involved and the possible transmission of pathogens to neonates during the birth process, it is therefore essential to evaluate the prevalence of Urinary tract infections in

pregnant women attending the General Hospital Ota, Ogun State, Nigeria.

II. MATERIALS AND METHODS

An ethical approval for this study was obtained from the Covenant University Research Ethics Committee (CHREC/ 002/2019). Participants gave their informed consent after receiving proper explanation concerning the study and its purpose. Pieces of information obtained from the respondents were treated with utmost confidentiality.

Study Site

The study took place at the Ante-natal Clinic of the General Hospital, Ota, Ogun State. This study area is located at the Ado-Odo Ota Local Government Area. There was no gestational age limits. Study was conducted between March and June 2019. Ten to fifteen pregnant women participated weekly until the desired sample size of 200 was attained. Participants were requested to fill a standardized questionnaire to obtain their socio-demographic information and risk factors of UTI.

Sample collection

About ten millilitres (10ml) of midstream clean-catch urine samples from respondents individually, were collected in sterile universal sample bottles at the study site. Samples were immediately taken to Microbiology Laboratory of the Covenant University, Ota, Ogun State, Nigeria. Samples were analyzed within two hours of collection.

Urine samples were inoculated aseptically on Cystine Lactose Electrolyte Deficient (CLED), MacConkey agar and Nutrient agar for isolation and identification of the pathogens. The inoculated culture media were incubated aerobically at 37 for 24-48 hours and examined for significant growth (Cheesbrough, 2006). Organisms were identified using standard microbiological methods. Colonial morphology was the first step for identification by observing the size of the colony, colour, edge and lactose fermentation of the CLED Agar. After biochemical tests were conducted, Bergey's manual of Determinative Bacteriology was used for proper identification. Organisms were put on Nutrient agar slants and preserved at 4°C prior to biochemical testing.

Statistical analysis

The Statistical Package for Social Sciences (v.23 SPSS Inc., Chicago, IL) was used to analyze the collated data. The Chi-square (X^2) test was used to determine significant differences, with the p-value set at 0.05; indicating that p-values less than 0.05 were considered to show significant differences between the corresponding parameters studied.

III. RESULTS

Bacteria isolated were from twelve (12) genera of which gram positive bacteria had a lower frequency of occurrence (19.5%) than their gram negative counterparts (80.5%). In the gram positive bacterial group, *Staphylococcus* sp. occurred more frequently than the remaining two members of the group isolated (*Micrococcus* sp. and *Bacillus* sp.), while the frequency of occurrence of *Klebsiella pneumoniae* was the highest in the gram negative bacterial group (Table 1).

Table 2 reveals correlation between medical history of UTI in respondents and occurrence of bacteria in their urine samples across all the age groups represented. Out of a total of two hundred urine samples analysed in this study, bacterial growth was recovered from only 119 (59.5%) samples in culture. Twenty-three (23) respondents had medical history of Urinary tract infections (UTI) with the highest number of participants (13 respondents), falling within the age-bracket of 25-34 years, 46.2% of participants from this group (25-34 years) had the occurrence of bacteria in their urine samples. There is no significant difference between UTI medical history of pregnant women and the presence of bacteria in their urine samples across the age groups ($p > 0.05$).

In the group of respondents with no formal education, a large proportion of individuals (75%) had the occurrence of bacteria in their urine samples, while prevalence of UTI in individuals with the highest level of education was 58.3% (Table 3). There is no significant difference between educational status of participants and the occurrence of bacterial isolates in their urine samples ($p > 0.05$).

The frequency of occurrence of bacterial isolates was highest amongst participant at the second trimester of the pregnancy (67.2%) and lowest at the third trimester (20.2%). There is no significant

difference between the stages of pregnancy and the occurrence of bacterial isolates in respondents' urine samples ($p > 0.05$) (Figure 1).

Table 4 revealed that the prevalence of UTI in primagravida respondents was 60% (36), while the prevalence recorded for the multigravida respondents was 59.2% (83), this suggests a slightly higher prevalence rate in the primagravida group than in the multigravida group of participants. There is no significant difference between the occurrence of bacterial isolates and gravidity status of sampled pregnant women.

Prominent signs that often manifesting in UTI are painful urination and frequent urination, when these two were juxtaposed in investigating the prevalence of UTI by presence of bacterial isolates in respondents' urine samples, it was observed that the highest proportion of individuals from whose urine samples bacterial isolates were recovered, who experienced painful urination were found in the group with highest urination frequency (10 - 15 times daily) (28.5%) as against the '1-4 times daily group' (14.3%) and '5-9 times daily' group (4.29%).

There is significant difference between the frequency of urination, painful urination and presence of bacteria in urine samples from respondents ($p < 0.05$).

Table 1. Occurrence of bacterial isolates in urine samples of pregnant women.

Microorganisms	Frequency (%)
<i>Klebsiella pneumoniae</i>	29(25.6)
<i>Citrobacter freundii</i>	15(13.2)
<i>Staphylococcus sp</i>	12(10.6)
<i>Enterobacter sp</i>	11(9.8)
<i>Escherichia coli</i>	11(9.8)
<i>Proteus sp</i>	9(8.0)
<i>Micrococcus sp</i>	7(6.2)
<i>Klebsiella oxytoca</i>	6(5.2)
<i>Serratia sp</i>	4(3.5)
<i>Pseudomonas aeruginosa</i>	3(2.7)
<i>Bacillus sp</i>	3(2.7)
<i>Providencia rettgeri</i>	2(1.8)
<i>Morganella morganii</i>	1(0.9)

Table 2: Correlation between medical history of UTI in respondents and occurrence of Microorganisms in their urine samples across all age groups.

Organisms	Age (years)				Total
	15-24years	25-34years	35-44years	45-55years	
Present	3	6	4	0	13
Absent	1	7	2	0	10
Total	4	13	6	0	23

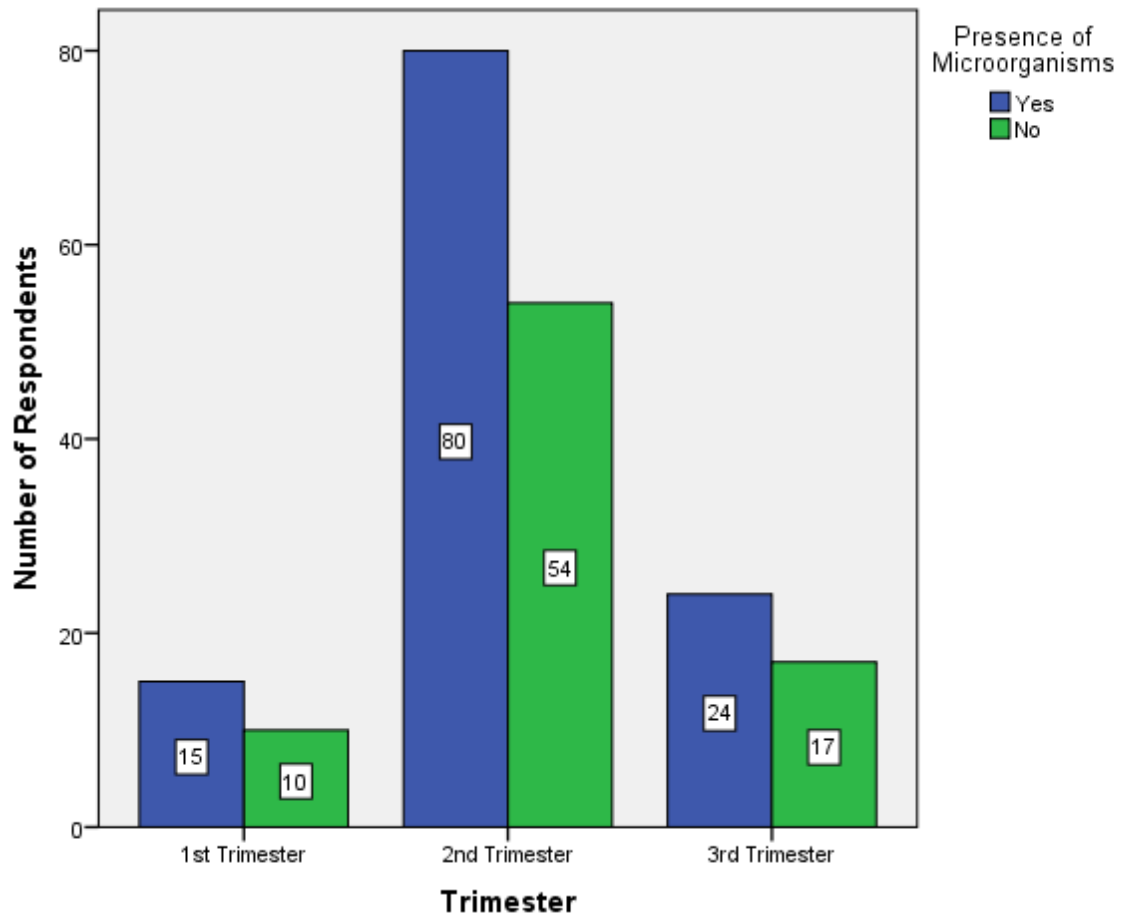
There is no significant difference between the UTI medical history of pregnant women, the presence of microorganisms in their samples and their ages ($p > 0.05$).

Table 3. The educational status of respondents according to the occurrence of microbial isolates in their urine samples.

Educational Status	Organisms		Total
	Yes	No	
None	3	1	4
Primary	6	3	9
Secondary	40	27	67
Tertiary	70	50	120
Total	119	81	200

There is no significant difference between the educational status of participants and the occurrence of microbial isolates in their urine samples ($p > 0.05$).

Figure 1: The stages of pregnancy and the occurrence of bacterial isolates in urine samples of pregnant women.



There is no significant difference between the stages of pregnancies and the occurrence of microorganisms in respondents' urine samples ($p > 0.05$).

Table 4. Presence of microorganisms in participants' urine samples in line with their gravidity status.

Gravida	Organisms		Total
	Present	Absent	
Primigravida	36	24	60
Multigravida	83	57	140
Total	119	81	200

There is no significant difference between the occurrence of microorganisms and the gravidity status of respondents ($p > 0.05$).

Table 5. Prevalence of UTI by Frequency and painfulness of urination in urine samples of respondents.

Organisms	Urination frequency	Painful urination		Total
		Yes	No	
Present	1-4	4	24	28
	5-9	3	67	70
	10-15	6	15	21
Absent	1-4	0	18	18
	5-9	8	42	50

10-15	1	12	13
Total	22	178	200

Result shows a significant difference between the frequency of urination, painful urination and presence of microorganisms in urine samples from respondents ($p < 0.05$).

IV. DISCUSSION

Eighty one (81) urine samples were negative with no growth. Among 119 cases, the isolate with highest frequency of occurrence was *Klebsiella pneumoniae* (25.6%), with a host of other gram negative bacteria occurring with more prominence than their gram positive counterparts. *Klebsiella pneumoniae*, a member of the enterobacteriaceae family, is strongly associated with nosocomial infections and a major leading cause of urinary tract infections after *E. coli*. The high frequency of occurrence could be as a result of its ability to cause hospital acquired infections among these group of individuals who visit the hospital often, coupled with the virulence features of *Klebsiella pneumoniae* that enhance its pathogenicity as a member of the medically important enterobacteriaceae family. This is in line with a report from Oladosu *et al.* (2016).

The highest occurrence of bacteria in the urine sample of pregnant women was seen in second trimester (67.2%). This is most likely due to ureteral dilation and ureterovesical reflux characterizing this state of pregnancy. This is in agreement with a report from Delzell and Lefevre (2000).

In this study, the highest prevalence of UTI was found in the 25-34 years age group. This age group is susceptible to UTI due to early exposure to sexual intercourse which may lead to minor urethral trauma and easy transfer of bacteria from the perineum into the bladder which is in line with a report from Jalali (2015). Sexual intercourse and use of contraceptives may also increase the risk of UTI.

The highest recorded prevalence of UTI in this study was among participants without formal education. This suggests that formal education had a positive impact in knowledge and awareness of individuals about how to maintain proper personal hygiene. This result agrees with the findings of Muhammadu and Muhammadu (2019).

Multigravida status has been reported to have increased risk factors for developing bacteriuria among pregnant women due to physiological

changes that must have occurred in the urinary tract of such individuals. This is in line with a report from Nwachukwu *et al.*, (2018).

Painful urination linked with high frequency of urination which was observed in this study, buttressed these signs as hallmarks of UTI, though there is generally an increase in urination in pregnancy due to the increased bladder volume. This is line with the findings of Delzell and Lefevre (2000); Okonko *et al.*, (2018);

Findings from this study showed that bacteriuria and Urinary tract infection remains a problem during pregnancy. Improper genital hygiene, increased sexual activity, urination habit, socio economic level play a major role in the occurrence of UTI and bacteriuria during pregnancy. These findings could be due to lack of knowledge of UTI and bacteriuria among the pregnant women and how it could be prevented.

V. CONCLUSION

This study recommends that pregnant women should be educated on healthy micturition practices such as avoiding delay in urination and acquiring the habit of micturition before sleep and after sexual intercourse as these practices could reduce bacterial multiplication.

Provision of health education and enlightenment programs about Urinary tract infection for pregnant women is essential. Constant screening of pregnant women for early detection and proper treatment at each trimester by quantitative urine culture is imperative in antenatal clinics.

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