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Prevalence and Antibiotic Susceptibility Pattern of Urinary Tract Infection Among Pregnant Women Attending Antenatal Care at Maternity Clinic in Dambam, Bauchi State

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ABSTRACT

Urinary tract infections (UTI) constitute the most common morbidity during pregnancy resulting in severe complications and fatality. This study aimed to determine the prevalence and antibiotic susceptibility pattern of urinary tract infection among pregnant women attending Antenatal Care Clinic (ANC), at Dambam, Bauchi State. A total of 290 pregnant women aged 15 – 40 years (Mean age, 23.4 SD± 2.1 years) were screened for bacteriuria using standard microbiological method. Antimicrobial sensitivity pattern of the bacterial isolates was determined by Modified Kirby-Bauer disc diffusion method. Questionnaires were used to obtain information on biodata and socio-demographic characteristics of the study population. The prevalence of urinary tract infection among pregnant women screened was 17.24% (n = 50). *Pseudomonas aeruginosa* constitutes the most prevalent organism, 15 (5.17%) cultured, followed by *Klebsiella spp* 12, (4.14%) while *Staphylococcus aureus*, *Staphylococcus saprophyticus* and *Enterococcus spp* constitute the least isolates (1.38%) each. The study revealed a significant association (P_ < 0.05, P = 0.000) between the frequency of bacterial isolates and marital status while other demographic characteristics such as educational status, age and occupation of the subjects did not indicate any significant relationship. Majority of the bacterial isolates were resistant to Cefalexin, Levofloxacin, and Clindamycin but were however, sensitive to Ciprofloxacin, Ceftriaxone and Amoxicillin-clavulanic acid. Considering the significant bacterial isolates from pregnant women investigated expressing some resistance against commonly used antibiotics, hence there is need for educational campaign to enlighten women about UTIs during pregnancy and useful prevention/control measures to checkmate associated complications and fatality.

Keywords: Antenatal Care, Bacteriuria, Infection, Pregnant Women, Prevalence, Urinary Tract Infection.

INTRODUCTION

Background of the Study

Urinary tract Infection (UTI) describes microbial colonization or inflammation of the bladder (cystitis), urethra (urethritis), or renal pelvic and kidneys (pyelonephritis). It is mainly caused by Gram-negative organisms that include *E. coli*, 60-70%, *Klebsiella* Spp, 10%, *Proteus* Spp, 5–10%, and *Pseudomonas* Spp, 2–5% and Gram-positive bacteria such as GBS Streptococcus species and *Staphylococcus* species including *S. aureus*[(1,2,3)].

Urinary tract infection (UTI) in pregnancy is associated with significant morbidity for both the mother and the baby and can result in serious complication if unchecked [4].The condition is also regarded as one of the most widely spread and costly medical complications of pregnancy, occurring in nearly 20% of all pregnancies [4]. It is also accountable for about 10% of all admissions to hospital during pregnancy[5,6].The bacterial agents causing urinary tract infections (UTI) originate mainly from the external genitalia, vagina, the genital tract, rectum, and gastro-intestinal tract. It may involve the lower urinary tract or the bladder or upper urinary tract such as the pelvis and kidneys[7].

Based on previous studies, 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 was 6.2% and varies widely within and between countries. For example, it was reported to be 10% in Iran, 12% in Bangladesh, 7.3% in Ghana, 6% in Singapore, 4.3% in Malaysia and 14.6% in Nigeria[8].

Prevalence of bacteriuria 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[9,10]. The additional predisposing factors as reported by [11] include pregnancy-specific biochemical changes in urine, with higher amounts of glucose, amino acids and hormone degradation products, which increase urinary pH. Similarly, as in non-pregnant women, in pregnant women UTIs are classified either as asymptomatic bacteriuria (ASB), when the infection is limited to bacterial growth in urine, or symptomatic infections (acute cystitis, acute pyelonephritis), when bacteria invade urinary tract tissues, inducing an inflammatory response [11].

The UTIs in pregnancy are by definition considered complicated infections and require a special diagnostic approach and management. 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[12,13].

MATERIALS AND METHODS

Ethical Considerations

Approval for the study (BSMOH/REC/ 87/2019) was obtained from Research and Ethics committee, Bauchi State Ministry of Health through Health Management Board (HMB). Before the urine samples were collected, the pregnant women attending antenatal clinic in Town Maternity Clinic Dambam informed consent to participate in the study were obtained. The Questionnaire was designed to obtain biodata and socio-demographic characteristics of the study subjects.

Study Area

Dambam town is the head-quarter of Dambam Local Government Area (LGA), one of the 20 LGAs in Bauchi State. It is located in the north of Bauchi and shares borders with Darazo, Misau, Katagum and Gamawa LGAs. It has an area of 1,077 km² and a population of 150,922 at the 2006 census[14]. Maternity Clinic Dambam is situated opposite Dambam District Head Palace by the northwest along Palace Road, adjacent to the central mosque Dambam.

Sample Size Determination

The sample size for the study was determined from a standard epidemiology formula for minimum sample size calculation[15]. The sample size is given by the formula below.

$$N = \frac{Z^2Pq}{d^2}$$

N = minimum sample size

Z^2 = value of standard normal deviation which at 95% confidence interval has been found to be 1.96.

Pq = the best estimate of prevalence obtained from the 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) (1-0.095)/ (0.05)2 = 132.05 as the minimum number of samples for the study. Therefore, a total of 132 with 10% (13) of this subject were added to the research for attrition rate, making a total of approximately 145 samples [(16)].

Study Population

The study population comprised 290 pregnant women attending ANC at Dambam Maternity Clinic

Collection of Urine Samples

The pregnant women who volunteered to participate in the study were adequately educated on how to take mid-stream urine samples of their first urine (on the day of submission) into sterile capped, dry, wide naked, leak-proof, and labeled sample tubes which were given to each of them. Early morning clean catch midstream urine sample was aseptically collected in sterile containers, into which a trace of boric acid was added as a preservative as described by[(`17)] from 290 UTI patients attending Maternity Clinic Dambam, from September 2019 to March 2020. The samples were maintained in a cool box containing ice and transported to the Microbiology Departmental Laboratory, Kano University of Science and Technology, Wudil for processing. Analyses of the samples were *commenced* immediately after arrival at the Laboratory.

Urine culture/Sample processing

The Petri dishes were first labeled with a marker and the wire loop was then flamed to red hot. A loopful (0.001ml) urine sample was taken from each case and inoculated unto Cysteine Lactose Electrolyte Deficient (CLED), MacConkey and, Mannitol Salt Agar (MSA) agar in duplicates and incubated aerobically at 35 - 37°C overnight for 24 - 48 hours as described by[(18)]. After incubation, plates with growth of ≥ 10 colonies which is equivalent to 10^5 bacterial cells/ml (i.e. significant bacteriuria) were selected. The colonies were picked using inoculating loop and subsequently sub-cultured on Nutrient agar slant for use in further test.

Subculture

A pure growth refers to culture which contains only a single species of organism [(19)]. The isolates were sub-cultured into Nutrient agar and incubated in air at 37^0 C for 24 hours. Inoculation was carried out by striking a loopful of the isolates using inoculating loop from the culture plates on freshly prepared solidified Nutrient agar plates. The procedure was carried out in an aseptic manner in order to prevent contamination.

Biochemical Tests for Identification of Bacterial Isolates

The isolated bacteria were identified using standard biochemical tests including; Gram staining, Indole, Citrate utilization, Catalase, Lactose fermentation, Urease, Methyl red, Voges-Proskauer, Oxidase, Coagulase and motility tests.

STATISTICAL ANALYSIS

Statistical Package for Social Science (SPSS) Software version 20 (2011, IBM Corp USA) was used for statistical analysis. The prevalence of bacterial urinary tract infection among pregnant women was expressed in percentages and simple proportions and Chi-square test (χ^2) was used to determine the relationship between the prevalence of the infection and socio-economic characteristics of the study

population (Fedelis, 2000). A P_value of ≤ 0.05 was considered statistically significant.

RESULTS

Table 4.1: shows the prevalence of bacteriuria among pregnant women screened. *Pseudomonas aeruginosa* was the predominant organism isolated (15, 5.17%), followed by *Klebsiella* spp (12, 4.14%) while *Staphylococcus aureus*, *Staphylococcus saprophyticus* and *Enterococcus* spp (4, 1.38%) were the least bacterial isolates. The result shows that there was no significant difference among the prevalence of bacteria causing UTI in the studied subjects ($\chi 2 = 11.008$, P = 0.088, df = 6).

Tables 4.2; a: and b shows the socio-demographic information of the study subjects. A total of 290 pregnant women with suspected urinary tract infections were included in the study. Out of this figure, 50 (17.24%) were positive for bacteriuria while 240 (82.76%) were negative. The ages of the women ranged from 15 – 40 years. The highest percentage of bacteriuria is seen among age group 21 - 25 (25, 8.62%) and the least prevalence was found among those aged 36 – 40 (3, 1.03%) and the difference was not significant ($\chi 2 = 4.694$, P = 0.320, df = 4).

When prevalence of bacterial isolates from pregnant women was based on Marital status, the married women had the highest percentage of bacteriuria (16.21%), followed by single, widowed and divorced with 0.34% prevalence rates respectively. The result shows a significant association (P < 0.05) between UTI and marital status ($\chi 2 = 3.000$, P = 0.000, df = 3).

However, when frequency of bacterial isolates from pregnant women was considered according to Occupation, the study shows highest percentage of bacteriuria among house wives with 13.10%, followed by civil servants with 2.41% and others 1%. The study shows no significant difference ($\chi 2 = 3.596$, P = 0.308, df = 3) in prevalence of bacterial isolates based on the occupation of the pregnant women studied

Table 4.2, also shows prevalence of bacterial isolates among pregnant women screened according to educational background, of which the study subjects with only primary education were the most vulnerable group with bacteriuria of (7.93%), followed by those with non-formal educational background (6.21%), as well as those who had Secondary School (2.41%). The study shows no significant difference ($\chi 2 = 12.129$, P = 0.007, df = 3) in the frequency of bacterial isolates and educational status of the subjects investigated.

The characteristic of the study population in relation to parity is also shown in table 4.2. A total of 146 (50.34%) were multiparous, followed by 86 (29.66%) primiparous while 58 (20%) nulliparous. In this case, the number of bacteriuria ranges from 10%, 5% and 1% among Multiparous, Primiparous and Nulliparous respectively. The study showed no significant difference ($\chi 2 = 3.836$, df = 2, P = 0.147) in the prevalence of bacterial isolates and parity of the subjects. Distribution of UTI infection by gestational age among pregnant women screened is displayed on table 4.2. The pregnant Women in second trimester, that is 4 - 6 months of pregnancy were found to have the highest percentage of bacteriuria (7.24%), while 6.90% and 3.10% were seen among pregnant women in their third and first trimester respectively ($\chi 2 = 2.851$, P = 0.240, df = 2). The result shows that, there was no significant difference in the frequency of bacterial isolates among this group of the subjects.

Table 4.3: shows the prevalence of bacterial isolates among pregnant women according to the risk factors. Those study population using Pit latrine type of toilet experienced high bacteriuria among pregnant women with 14.14%, followed by those with the habit of engaging in Open defecation with 2.06%. The study however, shows no significant difference ($\chi 2 = 2.701$, P =

0.440, df = 3) in the prevalence of bacterial organisms cultured among the study group.

The result of antimicrobial susceptibility pattern of urinary bacterial isolates to commonly used antimicrobial agents is shown in tables 4.4; a and 4.4; b. *Escherichia coli* demonstrated high sensitivity pattern (100%) to Ciprofloxacin, (88%) to Co-trimoxazole and Tetracycline, (77%) to Ofloxacin, Gentamycin and Ceftriaxone with low sensitivity pattern (55%) to Levofloxacin. *Escherichia coli* shows resistance rates of 44% to Levofloxacin, 22% to Ofloxacin, Gentamycin and Ceftriaxone and 11% to Co-trimoxazole, Amoxi-clav and Tetracycline.

Enterococcus species shows high sensitivity pattern (100) to Cloxacillin, Ceftriaxone, Tetracycline, Erythromycin and Amoxi-clav with low sensitivity pattern (75%) to Clindamycin and (50%) to Co-trimoxazole and Cefalexin. *Enterococcus* species shows resistance rates of 50% and 25% to Co-trimoxazole, Cefalexin and Clindamycin respectively.

Klebsiella species had shown sensitivity pattern (100%) to Ciprofloxacin, 91% to Amoxi-clav, 88% Co-trimoxazole, 75% to Levofloxacin, Ofloxacin and Ceftriaxone, 66% to Gentamycin and low sensitivity pattern of 50% to Tetracycline. *Klebsiella* species shows resistance rates of 33%, 25%, 16% and 8% to Gentamycin, Levofloxacin and Ceftriaxone, Co-trimoxazole and Ofloxacin and Amoxi-clav respectively.

Proteus species shows sensitivity pattern (90%) to Ciprofloxacin and Amoxi-clav, (80%) to Tetracycline, (70%) to Levofloxacin and Gentamycin, (60%) to Ceftriaxone. A Resistance pattern of *Proteus* species shows a rate of (70%) to Co-trimoxazole and Ofloxacin, (40%) to Ceftriaxone, (30%) to Levofloxacin and Gentamycin, (20%) Tetracycline and (10%) Ciprofloxacin and Amoxicillin-clavulanic acid.

Pseudomonas aeruginosa shows sensitivity pattern of (93%) to Amoxi-clav, (86%) to Co-trimoxazole, (80%) to Ciprofloxacin and Tetracycline, (73%) to Ofloxacin and Ceftriaxone and (60%) to Levofloxacin and Gentamycin. *Pseudomonas aeruginosa* showed resistance rates of (40%) to Levofloxacin and Gentamycin, (26%) to Ofloxacin and Ceftriaxone, (20%) Ciprofloxacin and Tetracycline, (13%) Co-trimoxazole and (6%) Amoxi-clav. *Staphylococcus aureus* shows sensitivity pattern of (100%) to Amoxi-clav, Ceftriaxone and Cloxacillin, (75%) to Co-trimoxazole, Clindamycin and Erythromycin and low sensitivity pattern (50%) to Cefalexin and Tetracycline. The resistance pattern was shown to be (50%) to Cefalexin and Tetracycline, (25%) to Co-trimoxazole, Clindamycin and Erythromycin.

Staphylococcus saprophyticus demonstrated high sensitivity pattern (100%) to Cloxacillin, Co-trimoxazole, Ceftriaxone, Erythromycin and Amoxi-clav. *Staphylococcus saprophyticus* shows low sensitivity pattern (50%) to Clindamycin and Cefalexin. The resistance pattern of the organism was seen to be (100%) to Tetracycline and (50%) to Clindamycin and Cefalexin.

Table 4.5: shows the number of *in-vitro* antibiotic resistance spectrum of Gram negative isolates. *Pseudomonas aeruginosa* showed highest resistance rates (6, 40%) to Levofloxacin and Gentamycin respectively and the least was seen with *Escherichia coli* that shows resistance rates of 1, 11% to Co-trimoxazole, Amoxi-clav and Tetracycline respectively.

Table 4.6: shows the number of *in-vitro* antibiotic resistance spectrum of Gram positive isolates.

Staphylococcus aureus and *Staphylococcus saprophyticus* showed highest resistance pattern (2, 50%) to Cefalexin and Tetracycline, while *Staphylococcus saprophyticus* shows least resistance pattern to (0, 0.0%) to Co-trimoxazole, Clindamycin, Cloxacillin, Amoxi-clav, Ceftriaxone and Erythromycin respectively.

Table 4.7: shows screening for the occurrence of ESBL producers among MDR

strains. *Proteus* spp and *Pseudomonas aeruginosa* shows the highest number (4, 44.44%) of potential ESBL producers respectively while gram positives showed no potential ESBL producers (n = 0).

Table 4.8: shows no true ESBL producers among the isolates by Double Disk Synergy Test.

Table 4.1: Etiology and Frequency of bacterial uropathogens isolated from pregnant women

Organism	No. (%) Positive	No. (%) Negative	P-value
Ps. aeruginosa	15 (5.17%)	275	
Klebsiella spp	12 (4.14%)	278	
Proteus spp	10 (3.45%)	280	
Escherichia coli	9 (3.10%)	281	
Staphylococcus aureus	2 (0.69%) (2)	288	
Staph. saprophyticus	2 (0.69%) (2)	288	
Enterococcus spp	(4)	286	
Total	**50 (17.24%)**	**240 (82.76%)**	**0.088**

$\chi 2 = 11.008$ df = 6 P- value = 0.088

Table 4.2; a: Prevalence of bacterial UTI according to Socio-demographics

Parameter	No. (%) Positive	No. (%) Negative	P-value	
Age range (Years)	**No (%) Positive**	**No (%) Negative**	**P-value**	
15 – 20	11 (3.8)	90 (31.03)		
21 – 25	25 (8.62)	99 (34.14)		
26 – 30	7 (2.41)	22 (7.59)		
31 – 35	4 (1.38)	16 (5.52)		
36 – 40	3 (1.03)	13 (4.48)		
Total	**50 (17.24)**	**240 (82.76)**	**0.320**	
Marital Status	**Total No Tested**	**No (%) Positive**	**No (%) Negative**	**P- value**
Married	255	47 (16.21)	208 (71.72)	
Single	4	1 (0.34)	3 (1.03)	
Widowed	12	1 (0.34)	11 (3.79)	
Divorced	19	1 (0.34)	18 (6.21)	
Total	**290**	**50 (17.24)**	**240 (82.76)**	**0.000**
Occupation	**Total No Tested**	**No (%) Positive**	**No (%) Negative**	**P- value**
Civil Servant	40	7 (2.41)	33 (11.38)	
Farmer	23	2 (0.69)	21 (7.24)	
House Wife	190	38 (13.10)	152 (52.41)	
Others	37	3 (1.03)	34 (11.72)	
Total	**290**	**50 (17.24)**	**240 (82.76)**	**0.308**

Table 4.2; b: Prevalence of bacterial UTI according to Socio-demographics

Parameter	No. (%) Positive	No. (%) Negative	P-value	
Educational Level	**Total No Tested**	**No (%) Positive**	**No (%) Negative**	**P- value**
Tertiary	44	2 (0.69)	42 (14.48)	
Secondary	70	7 (2.41)	63 (21.72)	
Primary	96	23 (7.93)	73 (25.17)	
Non-formal Education	80	18 (6.21)	62 (21.38)	
Total	**290**	**50 (17.24)**	**240 (82.76)**	**0.007**
Parity	**Total No Tested**	**No (%) Positive**	**No (%) Negative**	**P-value**
Multiparous		146	29 (10)	117 (40.38)
Primiparous		86	16 (5.52)	70 (24.14)
Nulliparous		58	5 (1.72)	53 (18.28)
Total		**290**	**50 (17.24)**	**240 (82.76)** **0.147**
Trimester	**Total No.**	**No. (%) Positive**	**No. (%) Negative**	**P- value**
First		71	9 (3.10)	62 (21.38)
Second		130	21 (7.24)	109 (37.59)
Third		89	20 (6.90)	69 (23.79)
Total		**290**	**50 (17.24)**	**240 (82.76)** **0.240**

Table 4.3: Prevalence of Bacterial Isolates or UTI from Pregnant Women according to Risk Factors

Variables	Total No Screened	No (%) Positive	No (%) Negative	P- value
Type of toilet use				
a. Water closed	Yes 21	1 (0.34)	20 (6.90)	
	No 269			
b. Pit latrine	Yes 241	41 (14.14)	200 (68.96)	
	No 262			
c. Open defecation	Yes 28	6 (2.06)	22 (7.59)	
	No 262			
Use of Catheter	Yes (10)	2 (0.69)	(8) (2.76)	
	No 280			
Total	**290**	**50 (17.24)**	**240 (82.76)**	**0.440**

$\chi 2 = 2.701$ df = 3 P – value = 0.440

Table 4.4 a: Antibiotic Sensitivity Pattern of Bacteria Isolatedfrom Urine culture of Pregnant Women at Dambam Maternity Clinic

Antibiotic (µg)	*E. coli* (n = 9)	*Enterococcus* spp (n = 4)	*Klebsiella* spp (n = 12)	*Proteus* spp (n = 10)	*P. aeruginosa* (n = 15)	*Staph. aureus* (n = 4)	*Staph. sapr.* (n = 4)
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No.(%)	No. (%)
[1]COT (25)	8 (88)	2 (50)	10 (83)	2 (20)	13 (86)	3 (75)	4 (100)
[2]OFN (5)	7 (77)	-	9 (75)	3 (30)	11 (73)	-	-
[3]LFX (5)	5 (55)	-	9 (75)	7 (70)	9 (60)	-	-
[4]GEN (10)	7 (77)	-	8 (66)	7 (70)	9 (60)	-	-
[5]AMC (30)	8 (88)	4 (100)	11 (91)	9 (90)	14 (93)	4 (100)	4 (100)
[6]CIP (10)	9 (100)	-	12 (100)	9 (90)	12 (80)	-	-
[7]CTR (30)	7 (77)	4 (100)	9 (75)	6 (60)	11 (73)	4 (100)	4 (100)
[8]TET (30)	8 (88)	4 (100)	6 (50)	8 (80)	12 (80)	2 (50)	2 (50)
[9]ERY (15)	-	4 (100)	-	-	-	3 (75)	4 (100)
[10]CFX (10)	-	2 (50)	-	-	-	2 (50)	2 (50)
[11]CDN (2)	-	3 (75)	-	-	-	3 (75)	2 (50)
[12]CXC (10)	-	4 (100)	-	-	-	4 (100)	4 (100)

Co-trimoxazole[2] Ofloxacin [3] Levofloxacin [4] Gentamicin [5] Amoxicillin-clavulanic acid [6] Ciprofloxacin [7] Ceftriaxone [8] Tetracycline [9] Erythromycin [10] Cefalexin [11] Clindamycin [12] Cloxacillin.

Table 4.4 b: Antibiotic Resistance Pattern of Bacteria Isolated from Urinary culture of Pregnant Women at Dambam Maternity Clinic

Antibiotic (µg)	*E. coli* (n = 9)	*Enterococcus* spp (n = 4)	*Klebsiella* spp (n = 12)	*Proteus* spp (n = 10)	*P .aeruginosa* (n = 15)	*Staph. aureus* (n = 4)	*Staph. sapr.* (n = 4)	
	No. (%)	No. (%)	No. (%)		No. (%)	No. (%)	No. (%)	No. (%)
[1]COT (25)	1 (11)	2 (50)	2 (16)	7 (70)	2 (13)	1 (25)	0 (0)	
[2]OFN (5)	2 (22)	-	2 (16)	7 (70)	4 (26)	-	-	
[3]LFX (5)	4 (44)	-	3 (25)	3 (30)	6 (40)	-	-	
[4]GEN (10)	2 (22)	-	4 (33)	3 (30)	6 (40)	-	-	
[5]AMC (30)	1 (11)	0 (0)	1 (8)	1 (10)	1 (6)	0 (0)	0 (0)	
[6]CIP (10)	0 (0)	-	0 (0)	1 (10)	3 (20)	-	-	
[7]CTR (30)	2 (22)	0 (0)	3 (25)	4 (40)	4 (26)	0 (0)	0 (0)	
[8]TET (30)	1 (11)	0 (0)	6 (50)	2 (20)	3 (20)	2 (50)	2 (50)	
[9]ERY (15)	-	0 (0)	-	-	-	1 (25)	0 (0)	
[10]CFX (10)	-	2 (50)	-	-	-	2 (50)	2 (50)	
[11]CDN (2)	-	1 (25)	-	-	-	1 (25)	2 (50)	
[12]CXC (10)	-	0 (0)	-	-	-	0 (0)	0 (0)	

Co-trimoxazole[2] Ofloxacin [3] Levofloxacin [4] Gentamicin [5] Amoxicillin-clavulanic acid [6] Ciprofloxacin [7] Ceftriaxone [8] Tetracycline [9] Erythromycin [10] Cefalexin [11] Clindamycin [12] Cloxacillin

DISCUSSION

Urinary Tract Infection is a very common disease; its diagnosis and treatment have important implications for pregnant women's health, development of antibiotic resistance, and health care cost[(20)]. Surveillance of local UTI's etiology, as well as antibiotic susceptibility, is useful to guide empirical treatment, as prevalence of Uropathogenic organisms and their characteristics may vary with geographical area and time[(21)]. There should also be attempts to increase the prediction of causative uropathogens with demographic and clinical information.

The prevalence of urinary tract infection in this study was found to be 17.24% comparable with 17.19% reported by[(22,23).] *On the other hand, the result of this study is in contrast with that of [(24)] who found the prevalence of UTI among pregnant women as 26.7%*,Ghana Police Hospital (31.6%), Cape Coast – Ghana (50.4%), Urban Community of Meerut, India (53.82%) [(25,26)].It was however, higher than the results of other studies done in a tertiary institution in Jos - Nigeria that accounted for 4.2% [(27)], also in India, the prevalence of asymptomatic bacteriuria was found to be 10.47% which is in agreement with previous studies done by[(28,29, 30)] (10.86%) reported that symptomatic urinary tract infection occurs in 1-2% of all pregnancies. The overall prevalence of UTI in pregnancy in the region was found as 13.4%. The dissimilarity may be due to the difference in the environmental, geographical, and social nature of the population. *Another study conducted by [(31)] found to be 14.6% as the percentage prevalence of pregnant women with Urinary tract infection. Their result also correlates with that found in Khartoum, Sudan (14%).* The maternity ward of Murtala Muhammad Specialist Hospital

Kano, Nigeria with 15.8%[16], *this finding was in conformity with that of [32] who study the prevalence of urinary tract infections in pregnant women in Onitsha, Nigeria who found similar result (15.8%),*and Northan Tanzania (16.4%).

The differences in prevalence may be explained due to differences in socio-economic status, environmental condition, social habit, personal hygiene and educational level.

The study revealed a lower prevalence rate compared to other studies done within the country, and the sub-region. This could be because the study lacked the capacity to confirm other causes of UTI. Aside the common bacteria known to cause UTI, microorganisms such as Chlamydia and Mycoplasma which require special culture techniques to isolate and as such could not be determined in this study and may also cause UTI[33]. In addition, the difference could also be based on the differences in sanitary conditions and personal hygiene of the population sampled.

Anatomical differences between males' and females' urethra (shorter in females than in males), close proximity of the urethral meatus to the anus, sexual intercourse and lack of post coital voiding, incontinence, diaphragm and spermicide use, and oestrogen deficiency may be underlining factors for the high prevalence rate in females [33]. It could also be due to the use of tub bath. Accordingly, it had been a repeated observation over the years that many women who present with urinary tract infection give a history of taking frequent tub baths[34]. It is plausible that, hot water washes away some of the protective mucosal coating of the urethral and vaginal introituses, making the mucosa drier and more susceptible to bacterial colonization [20].

Generally, the highest occurrence of urinary tract infection recorded in this study was among the age group 21-25 years which correlates with studies done in Kuwait (63.4%)[35]. It was observed that females of the age group 21-25 years were found to be more susceptible to urinary tract infection followed by 15-20 years and 26-30 years. A prospective study of risk factors for symptomatic urinary tract infection in young women indicated that the factors of this increasing incidence of UTI in females in these age groups are associated with high sexual activity, use of diaphragm with spermicide and history of recurrent UTIs. Diaphragm and spermicide use increased risk of urinary tract infection. This is due to partial urethral compression by the rim of the diaphragm. Spermicide contains monoxynol-9 which can cause a chemical irritation to the vaginal and urethral mucosa as well as changes in the normal flora. This in turn predisposes to colonization by coliforms as well as *Staphylococcus saprophyticus*.

Gram negative bacteria, normal flora of the intestinal tract, have been reported to be the predominant aetiologic agents, accounting for more than 79% of all UTI cases[36,37,38]. This value compares favourably with findings of this study, as the Gram-positive bacteria isolated were *Staphylococcus aureus* (4), *Staphylococcus saprophyticus* (4) and *Enterococcus faecalis* (4) which constituted 20% of the significant microbial growth. *Pseudomonas* spp(25.86%) was found to be the most prevailing Gram negative bacteria followed by *Klebsiella* spp(20.68%), *Proteus* spp(17.24%) and *Escherichia coli* (15.51%) in that order. Studies conducted in Urban Community of Meerut - India, Abuja and Zaria – Nigeria, showed different patterns with *E. coli* as the prevalent pathogen followed by *Klebseilla* spp[39].

Studies done on UTI in other parts of the world showed that *E. coli* and *Klebseilla* spp are the commonest uropathogens in UTIs[40,22, 41]. High incidence of Gram negative, Enterobacteriaceae, in causing UTI has many factors which are responsible for their attachment to the uroepithelium. Also, they can colonize in the urogenital mucosa with adhesins, pili, fimbriae, and P-1 blood group phenotype receptors[42].

Knowing the antibiotic resistance pattern among uropathogens responsible for UTI is not only important in guiding clinicians to prescribe appropriate antibiotics, but also provides evidence-based recommendations in empirical antibiotic therapy of UTI [(43)]. The results of this study demonstrated high resistance of Gram-negative bacteria to Ofloxacin, Levofloxacin, Tetracycline and Gentamycin.

Resistance of *E. coli* to Ceftriaxone, Gentamycin and Levofloxacin does not correlate with other finding[(33)] though lower than findings from other research elsewhere[(39)].

The tested fluoroquinolones in this study showed low activity against *E. coli* and *Klebsiella*. Ofloxacin and Levofloxacin showed significant resistance to *Klebsiella* spp. *Escherichia coli* showed similar resistance to Levofloxacin. This resistance rate against fluoroquinolones was also reported by some other studies done in Spain, Europe, Iran [(44)] and in India [(23)]. This resistance rate might be due to abuse/misuse and the use of antibiotics without restriction. It has been shown in the studies that highly prescribing habits of the physicians are the driving factor for the antibiotic resistance for this group of antibiotics [(20)].

According to this study, no single isolate was found to be a true ESBL producer; this may be due to the fact that most strains were sensitive to broad-spectrum antibiotics including cephalosporins. ESBL production was found to be 0.0%.

CONCLUSION

The result of this study showed that out of the total 290 study subjects, 50 subjects were diagnosed with bacteriuria which accounted for 17.24% of the pregnant women. Prevalence of UTI among pregnant women showed that higher incidence found among subjects of age category 21 – 25 years.

On the basis of socio-economic status, most of the UTI patients were unemployed. The educational level of the subjects showed higher prevalence among subjects with primary education. Prevalence of UTI among pregnant women based on the age of gestation showed higher incidence among subjects in 2n*d* trimester. *This study however revealed significant association between multiparity, use of pit latrine toilet, catheterization and UTI during pregnancy. Pregnant women with previous history of catheterization, multiparity, use of pit latrine toilet is more likely to have UTI during pregnancy than others.*

The finding showed Pseudomonas species as the most prevalent organisms associated with UTI followed by Klebsiella, Proteus species while the least prevalent organisms are Enterococcus species, Staphylococcus saprophyticus and Staphylococcus aureus. The isolated pathogens were sensitive to Amoxicillin-clavulanic acid, Ceftriaxone, Ciprofloxacin, Cotrimoxazole, Cloxacillin, Gentamicin, Ofloxacin and Tetracycline. ESBL production was found to be 0.0%.

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