Vedic Research International

Cell Signaling

Journal home page at www.VedicJournals.com

RESEARCH ARTICLE

Bacteriuria in Pregnancy: Prevalence and Antimicrobial Sensitivity Pattern Amongst Pregnant Women Attending the North West Regional Hospital, Bamenda

NDOHNUI N NOEL, EMMANUEL N TUFON*, NYIANBAM Y WAINDIM, TABE–TANYI C AKWO, ROLAND N BONG

Department of Medical Laboratory Sciences, Department of Medical Biochemistry, St Louis University Institute of Health and Biomedical Sciences, Mile 3 Nkwen, Bamenda, Cameroon.

Article Info

ABSTRACT

Bacterial urinary tract infection is a frequently encountered medical complication in pregnancy and is associated with increased risk of preterm delivery, delivery of low birth weight infants, intrauterine growth restriction and increased maternal and neonatal mortality. This study therefore evaluated the prevalence and antimicrobial sensitivity pattern amongst pregnant women attending the North West Regional hospital, Bamenda. Urine culture, bacteria isolation and antimicrobial sensitivity testing were done using standard methods. From the results obtained, 8.4% of the 310 pregnant women screened had significant Bacteriuria and of the seven bacteria species isolated, the most frequently encountered pathogen was *Escherichia coli* (50%). Bacteria isolates were most sensitive to Gentamicin (76.9%), Nitrofurantoin (73.1%) and Ciprofloxacin (65.4%). Resistance to Amoxicillin (76.9%) and Cotrimoxazole (69.2%) were most common. The most prevalent isolate *Escherichia coli* was most sensitive to Gentamicin (76.9%), Nitrofurantoin (76.9%), Cefuroxime (76.9%) and ciprofloxacin (76.9%). In conclusion, the prevalence of significant bacteriuria was found to be 8.4% with *Escherichia coli* being the most prevalent microorganism (50%). Most isolates exhibited sensitivity to Gentamicin, Nitrofurantoin and Ciprofloxacin.

INTRODUCTION

Urinary tract infections (UTI) are frequently encountered medical complication in pregnancy and the three types in pregnancy are asymptomatic bacteriuria, cystitis and pyelonephritis [1]. Although the incidence of bacteriuria in pregnancy is similar to that of their non – pregnant counterpart, the incidence of acute pyelonephritis in pregnancy is up to 30% higher compared to the case of non – pregnancy. Bacteriuria urinary tract infections can be symptomatic or asymptomatic. Asymptomatic bacteriuria implies a positive urine culture without specific symptoms. Women with asymptomatic bacteriuria during pregnancy are more likely to deliver

*Corresponding Author

Emmanuel N Tufon

Department of Medical Laboratory Sciences, Department of Medical Biochemistry, St Louis University Institute of Health and Biomedical Sciences, Mile 3 Nkwen, Bamenda, Cameroon.
Email: tufipiccollo@yahoo.com

prematurely, have low birth weight infants or have a 20-30 fold increased risk of developing pyelonephritis [2].

Escherichia coli is the most commonly isolated pathogen in urine specimen of pregnant women and accounts for 80 – 90% of initial and 70 - 80% in recurrent infection [3]. Other gram negative pathogens include; *Klebsiella pneumonia, Proteus mirabilia, Pseudomonas aeruginosa* and gram positive includes; *Streptococcus agalactiae,* and *Staphylococcus saprophyticus* [4]. Antimicrobial treatment of asymptomatic bacteriuria also improves foetal outcomes by decreasing the frequency of low birth weight and preterm delivery. Results of previous studies recommend continue antimicrobial therapy for the duration of pregnancy. However, recent studies have reported similar benefits in patients treated for 14 days with Nitrofurantoin, amoxicillin or trimethoprim. The infectious disease of America recommends a course of 3-7 days antimicrobial therapy for pregnant women with asymptomatic bacteriuria [5].

In most developing countries, screening for bacteriuria in pregnancy by culture technique have not been implemented because of the cost, meanwhile the urine dipstick leukocytes esterase in pregnancy have limitations and are of comparatively lower sensitivity and specificity [6]. This study therefore focuses on the prevalence of bacteriuria and its antimicrobial sensitivity pattern amongst pregnant women attending the North West Regional hospital, Bamenda.

MATERIAL AND METHODS

Study Area
This descriptive cross – sectional hospital based study was conducted at the Bamenda Regional hospital located in the North West Region of Cameroon. This hospital was purposively chosen because it is the main referral hospital for the region.

Study Population
A total number of 310 pregnant women were randomly selected to take part in the study using a simple random sampling technique

Urine Collection and Processing
All consenting participants were provided with specimen collection instructions and then given sterile disposable urine containers to collect 20 – 30ml of 'clean catch mid stream urine'. The samples were then labeled and transported to the laboratory for analysis within one hour. A drop of uncentrifuged well-mixed urine was put on a clean grease free slide, stained by Gram's staining method and examined under the oil immersion objective of the microscope. Presence of ≥1 bacteria per oil immersion field correlates with significant bacteriuria of ≥10 colony forming unit (CFU)/ml of urine.

Urine Culture
A semi – quantitative calibrated loop technique was adopted for the primary isolation of the organism. A loopful of well – mixed uncentrifuged urine was streaked into the surface of Cysteine Lactose Electrolyte Deficient (CLED) agar and Eosine Methylene Blue (EMB) agar. After incubating for 24 hours at 37^OC, the colony forming units per milliliter of urine was determined. The bacteria isolated were identified by standard procedures [7].

Antimicrobial Sensitivity Test
Kirby – Bauer's disc diffusion agar method was used for antimicrobial sensitivity testing. Antibiotic discs of common drugs used for treatment of suspected Gram negative and positive bacterial infection commercially available in our hospital and setting were tested. Antibiotics tested were Penicillin (Amoxicillin - 10μg), Quinolones (Ciprofloxacin - 5μg), Nalidixic acid - 30μg, second generation Cephalosporins (Cefuroxime - 30μg), aminoglycosides (Gentamicin - 10μg), Nitrofurantoin, semi – synthetic antibiotics, Amoxicillin – clavulanic acid (Augmentin - 30μg) and Trimethoprime – sulfamethoxazole (Cotrimoxazole - 25μg). Individual colonies were suspended in normal saline to 0.5 McFarland standards

and using sterile swabs, the suspensions were inoculated on Muller Hilton agar. The plates were allowed for five minutes to absorb the solution and then a sterile forceps was then used to apply the antibiotic discs onto the surface of the inoculated plates, pressed gently to ensure complete contact, inverted and incubated at 37◦C for 18 to 24 hours.

According to the sizes of the zones of inhibition around the antibiotic discs, the organisms were classified using the interpretative chart report as sensitive, intermediate or resistant to a specific antibiotic [8].

Statistical Analysis
SPSS version 17.0 was used to analyze data. The Chi square test was used to establish any statistical difference and probability values (p) of <0.05 were considered as statistically significant.

Ethical Considerations
Ethical clearance was obtained from the Institutional Review Board of the Bamenda Regional hospital. All participants were adequately informed of the merits and demerits of the study and interested persons signed an informed consent form. All information obtained was kept under strict confidentiality.

RESULTS

Distribution of significant bacteriuria by demographic characteristics of the respondent
From the results (Table 1), the highest prevalence of significant bacteriuria was found in the women within the age range of 21 – 25 years but majority of the participants were within the age range of 26-30 years (38.4%). Majority of the participants were married (82.9%) and lived in urban area (88.1%). Most of the participants had secondary school qualification (56.8%) and were of the poor socioeconomic class (91.3%).

Bacteriuria and Isolated Microorganisms
Overall, significant bacteriuria was found in 8.4% (26/310) cases. Table 2 summarizes the isolated microorganisms whereby *Escherichia coli* was the most common pathogen (50%) followed by *Staphylococcus saprophyticus* (15.4%), *Citrobacter freundii* (7.7%), *Serretia marcescens* (7.7%) and *Proteus mirabilis* (7.7%).

Antimicrobial sensitivity pattern
The antimicrobial sensitivity pattern of the isolated bacteria is shown on Table 3. Overall, Gentamicin showed high sensitivity (76.9%) against the isolates followed by Nitrofurantoin (73.1%) and Ciprofloxacin (65.4%). *Escherichia coli* being the most common isolated bacteria (50.0%) was 76.9% sensitive to Ciprofloxacin, Gentamicin and Nitrofurantoin. However, it was highly resistant to Amoxicillin (92.3%) and Cotrimoxazole (69.3%) respectively (Table 4).

DISCUSSION

Bacterial urinary tract infections are associated with risk to both fetus and mother (Kindel *et al*, 2007). Analyzing the respondents based on age, the highest prevalence of significant bacteriuria

Table 1: Significant bacteriuria based on demographic characteristics

Variables	Frequency (%)	Significant Bacteriuria	Non – significant Bacteriuria
Age Group (years)			
15 – 20	33 (10.6)	3 (1.0)	30 (9.6)
21 – 25	111 (35.8)	10 (3.2)	101 (32.6)
26 – 30	119 (38.4)	5 (1.6)	114 (36.8)
≥31	47 (15.2)	8 (2.6)	39 (12.6)
Marital Status			
Married	257 (82.9)	4 (1.3)	49 (19.0)
Unmarried	53 (17.1)	22 (7.1)	235 (75.8)
Level of Education			
Primary	61 (19.7)	2 (0.7)	59 (19.0)
Secondary	176 (56.8)	17 (5.5)	159 (51.3)
University	73 (23.5)	7 (2.2)	66 (21.3)
Area of Residence			
Urban	273 (88.1)	21 (6.8)	252 (81.3)
Rural	37 (11.9)	5 (1.6)	32 (10.3)
Socioeconomic Status			
Poor class	283 (91.3)	24 (7.8)	259 (83.5)
Middle class	19 (6.1)	1 (0.3)	18 (5.8)
Rich class	8 (2.6)	1 (0.3)	7 (2.3)

was observed in pregnant women within the age range of 21 – 25 years. This is in line with the work of Alghalibi group [9], who reported a high prevalence of UTI in pregnant women aged 21 – 25 years. Also a high prevalence of significant bacteriuria (7.1%) was observed amongst married pregnant women and also amongst those who reside in urban areas (6.82%) probably due to the fact that the study was conducted in and urban area. In the present study, significant bacteriuria was found in 8.4% of the pregnant women. This finding is comparable with the findings of 7%, 7.3% and 8.9% obtained in Ethopia, Ghana and Iran respectively [10-12]. This result is however low compared to 58% reported by Onifade [13] co-workers in south western Nigeria and 30.6% reported by Imade *et al* [14] in Benin city, Nigeria. As observed, most studies *Escherichia coli* was the most prevalent microorganism (50.0%) isolated. This result compares with those reported by other studies of Zhanel [15,16] and Nicolle [17] who suggested that the aetiological pattern of UTIs with respect to bacterial pathogens is apparently similar worldwide. However, other pathogens such as *Staphylococcus*

Table 2: Distribution of Isolated Bacteria

Bacteria Isolated	Frequency (%)
Escherichia coli	13 (50.0)
Staphylococcus saprophyticus	4 (15.4)
Citrobacter freundii	2 (7.7)
Serretia marcescens	2 (7.7)
Proteus mirabilis	2 (7.7)
Proteus vulgaris	2 (7.8)
Klebsiella pneumonia	1 (3.8)

saprophyticus (15.4%), *Citrobacter freundii* (7.7%), *Serretia marcescens* (7.7%) etc were also found.

Overall, Gentamicin showed a high sensitivity pattern (76.9%) against the isolates. This may probably be due to the fact that it is a broad spectrum antibiotic highly active against both Gram – negative and Gram – positive bacteria or that the high cost of the drug limits it use in the locality making resistant difficult to result from abusive use of the antibiotic. Similarly, Nitrofurantoin (73.1%) and Ciprofloxacin (65.4%) showed high sensitivity but care should be taken in treating bacteriuria

Table 3: Antimicrobial Sensitivity Pattern of the Isolated Bacteria

Antibiotic	Sensitive n (%)	Intermediate n (%)	Resistant n (%)
Amoxicillin	5 (19.2)	1 (3.8)	20 (76.9)
Amoxicillin/Clavulanic acid	14 (53.8)	9 (34.6)	3 (11.5)
Nalidixic acid	15 (57.7)	3 (11.5)	8 (30.8)
Ciprofloxacin	17 (65.4)	6 (23.1)	3 (11.5)
Cefuroxime	13 (50.0)	2 (7.7)	11 (42.3)
Cotrimoxazole	8 (30.8)	0 (0.0)	18 (69.2)
Gentamicin	20 (76.9)	6 (23.1)	0 (0.0)
Nitrofurantoin	19 (73.1)	4 (15.4)	3 (11.5)

in pregnancy since studies have shown that Gentamicin causes foetal oto and nephrotoxicity. Ciprofloxacin causes irreversible arthropathy in animal studies while Nitrofurantoin causes maternal or foetal haemolysis in individuals deficient in glucose –6–phosphate dehydrogenase [2]. Amoxicillin (19.2%) and Cotrimazole (30.8%) showed the least sensitivity on the isolates, which can be compared to the 20% and 30.6% of Amoxicillin and Cotrimazole respectively reported by Akinloye *et al* [18]. *Escherichia coli, which was the dominant organism,* isolated exhibited high sensitivity to Ciprofloxacin, Gentamicin and Cefuroxime and Nitrofurantoin each. This result is in accordance with the work of Akerele *et al* [19] who reported a 99.7%, 56.9%, 81.1% and 61% sensitivity to Ciprofloxacin, Gentamicin and Cefuroxime and Nitrofurantoin respectively. The choice of antibiotics should however, be based on urine culture.

Table 4: Anti biotic Sensitivity Pattern to *Escherichia coli*

Antibiotic	Sensitive n (%)	Intermediate n (%)	Resistant n (%)
Amoxicillin	1 (7.7)	0 (0.0)	12 (92.3)
Amoxicillin/Clavulanic acid	9 (62.2)	3 (23.1)	1 (7.7)
Nalidixic acid	8 (61.8)	1 (7.7)	4 (30.8)
Ciprofloxacin	10 (76.9)	1 (7.7)	2 (15.4)
Cefuroxime	10 (76.9)	0 (0.0)	3 (23.1)
Cotrimoxazole	4 (30.8)	0 (0.0)	9 (69.2)
Gentamicin	10 (76.9)	3 (23.1)	0 (0.0)
Nitrofurantoin	10 (76.9)	2 (15.4)	1 (7.7)

CONCLUSION

This study showed that 8.4% of the pregnant women attending the North West Regional hospital Bamenda had significant bacteriuria with *Escherichia coli* being the most prevalent (50%) microorganism isolated. Most isolates exhibited sensitivity to Gentamicin (76.9%), Ciprofloxacin (65.4%) and Nitrofurantoin (73.1%). We strongly recommend that Amoxicillin should not be used for the treatment in the study area because of its wide resistance to most bacteria.

ACKNOWLEDGEMENT

REFERENCES

1. Millar LK, Wing DA, Paul RH, Grimes DA: **Outpatient treatment of pyelonephritis in pregnancy: a randomized controlled trial**. *Obstetrics & Gynecology* 1995, **86**:560-564.

2. Smaill F: **Asymptomatic bacteriuria in pregnancy**. *Baillière's best practice & research. Clinical obstetrics & gynaecology* 2007, **21**:439-450.

3. Gilstrap III LC, Ramin SM: **Urinary tract infections during pregnancy**. *Obstetrics and gynecology clinics of North America* 2001, **28**:581-591.

4. Ovalle A, Levancini M: **Urinary tract infections in pregnancy**. *Current opinion in urology* 2001, **11**:55-59.

5. Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM: **Infectious Diseases Society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults**. *Clinical Infectious Diseases* 2005:643-654.

6. Stenqvist K, Dahlen-Nilsson I, Lidin-Janson G, Lincoln K, Oden A, Rignell S, Svanborg-Eden C: **Bacteriuria in pregnancy frequency and risk of acquisition**. *American journal of epidemiology* 1989, **129**:372-379.

7. Murray PR, Baron LJ, Pfaller MA, Tenovar FC: *Manual of Clinical Microbiology*. Washington DC American society of microbiology press 1999.

8. Wikler MA: *Performance standards for antimicrobial susceptibility testing: sixteenth informational supplement*, vol 26: Clinical and Laboratory Standards Institute; 2006.

9. ALGHALIBI SM, AL-JAUFY A, AL-MOAYAD E: **Bacterial urinary tract infection among pregnant women in Sana'a City-Yemen**. *Arab gulf journal of scientific research* 2007, **25**:23-31.

10. Gebre-Selassie S: **Asymptomatic bacteriuria in pregnancy: epidemiological, clinical and microbiological approach**. *Ethiopian medical journal* 1998, **36**:185.

11. Turpin C, Minkah B, Danso K, Frimpong E: **Asymptomatic bacteriuria in pregnant women attending antenatal clinic at komfo anokye teaching hospital, kumasi, ghana**. *Ghana medical journal* 2007, **41**:26.

12. Enayat K, Fariba F, Bahram N: **Asymptomatic bacteriuria among pregnant women referred to outpatient clinics in Sanandaj, Iran**. *International braz j urol* 2008, **34**:699-707.

13. Onifade A, Omoya F, Adegunloye D: **Incidence and control of urinary tract infections among pregnant women attending antenal clinics in government hospitals in Ondo State, Nigeria**. *J. Food Agric. Environ* 2005, **3**:37-38.

14. Imade PE, Izekor PE, Eghafona NO, Enabulele OI, Ophori E: **Asymptomatic bacteriuria among pregnant women**. *North American Journal of Medical Sciences* 2010, **2**:263.

15. Zhanel G, Harding G, Nicolle L: **Asymptomatic bacteriuria in patients with diabetes mellitus**. *Review of Infectious Diseases* 1991, **13**:150-154.

16. Zhanel GG, Nicolle LE, Harding GK: **Prevalence of asymptomatic bacteriuria and associated host factors in women with diabetes mellitus**. *Clinical infectious diseases* 1995, **21**:316-322.

17. Nicolle LE: **A practical guide to antimicrobial management of complicated urinary tract infection**. *Drugs & aging* 2001, **18**:243-254.

18. Akinloye O, Ogbolu D, Akinloye O: **Asymptomatic bacteriuria of pregnancy in Ibadan, Nigeria: a re-assessment**. *British journal of biomedical science* 2006, **63**:109.

19. Akerele PA, F. Okonofua, J: **Prevalence of asymptomatic bacteriuria among pregnant women in Benin City, Nigeria**. *Journal of Obstetrics & Gynecology* 2001, **21**:141-144.

Visit us @ www.vedicjournals.com : DOI: http://dx.doi.org/10.14259/cs.v1i1.11