ORIGINAL ARTICLE

Predictors of Asymptomatic Bacteriuria among Obstetric Population in Ibadan

Awonuga D A *MBBS, FWACS, FMCOG, MSc. (Human Reprod. Biology).* ****Fawole A O** *MBBS, FWACS, FMCOG,* *****Dada-Adegbola H A** *MBBS, FWACP, FMCPath,* ***** Olola F A** *ASLT (Microvirol.), HND(Microbiol.),* ******Awonuga O M** *RN, RM, BNSc, PGDE*

Department of Obstetrics and Gynaecology, Sacred Heart Hospital, Abeokuta, Nigeria, **Department of Obstetrics and Gynaecology, University of Ibadan ***Department of Microbiology and Parasitology, University of Ibadan and Consultant Microbiologist, University College Hospital, Ibadan, Nigeria.*Department of Microbiology and Parasitology, University College Hospital, Ibadan, Nigeria****Department of Nursing, University of Ibadan, Nigeria*

Abstract

Background: *Asymptomatic bacteriuria in pregnancy is the major risk factor for symptomatic urinary tract infection during pregnancy. Screening and identification of bacteriuria during pregnancy have been recommended. The general objective of the study was to determine the pattern as well as possible predictors of asymptomatic bacteriuria at the University College Hospital, Ibadan.*

Methods: *The study was a descriptive, cross sectional, exploratory survey of the pattern of asymptomatic bacteriuria among all consecutive patients presenting for the first antenatal visit at the University College Hospital, Ibadan during the study period.*

Results: *The prevalence of asymptomatic bacteriuria was 10.7%. Although no statistically significant association was found, the prevalence was higher among women aged between 26 - 35 years (11.5%) and those with only secondary education (14.6%). Other demographic parameters characterized by high rates of bacteriuria were Christian women (12.7% compared to 4.3% among Muslims) and genotypes AS and AC (16.4% and 16.7% respectively). Low parity (para 1-2), 2nd and 3rd trimesters of pregnancy were the identified possible obstetric predictors of bacteriuria in pregnancy. Staphylococcus species constitute the predominant isolates in 3rd trimester and among Muslim pregnant women.*

Conclusion: *Since no statistically significant predictors for bacteriuria in pregnancy were found, routine screening of all our pregnant women for this condition in 2nd trimester is recommended.*

Keywords: *Asymptomatic bacteriuria, Pregnancy, Prevalence, Bacterial isolates, Predictors.*

Date Accepted for Publication: 19th April 2010
NigerJMed 2010: 188 - 193

Introduction

Bacteriuria is a common and important complication of pregnancy[1]. Pregnant women with asymptomatic bacteriuria are at high risk for a number of complications for both mother and the unborn child. Maternal complications include overt urinary tract infection in 30-40% of patients as pregnancy advances[2,3]. Whether or not symptomatic urinary tract infection ensues, the foetus is still at risk for prematurity, low birth weight and even fetal wastage[3].

Asymptomatic bacteriuria refers to the situation in which there are persistent, actively multiplying bacteria within the urinary tract without symptoms[4] Overall prevalence of bacteriuria in pregnancy varies from 4-7%, although a range of 2-11% has been reported.[4,5]. Prevalence increases with age, sexual activity, parity and sickle cell trait. Other factors associated with bacteriuria in pregnancy are lower socio-economic status, history of recurrent urinary tract infection, diabetes mellitus and anatomic or functional urinary tract abnormalities[1]. The highest prevalence has been reported in African-American multiparas with sickle cell trait while the lowest prevalence has been found in affluent white women of low parity[4]. Prevalence rates among pregnant Nigerian women has been variously reported to be between 4-23.9%[6,7,8,9,]. Bacteriuria is typically present at the time of first pre-natal visit and only approximately 1-2% of pregnant women develop bacteriuria after a negative screening early in pregnancy[1,10].

Bacteriuria is said to be significant when there are at least 100,000 bacteria colonies of a single pathogen per milliliter (ml) in freshly voided urine collected by the mid - stream clean catch technique[10]. The original criterion for diagnosis required bacteria counts of $=10^5$/ml on two consecutive clean catch samples.

Correspondence to ***Dr David O Awonuga,*** *E-mail lekanawonuga@yahoo.com*

However, detection of 10^5 bacteria /ml or more in a single voided midstream urine sample is accepted as adequate and a more practical alternative[11,12].

The condition is detectable and largely treatable. Its consequences are also preventable. Hence, screening for asymptomatic bacteriuria is justifiable and ultimately cost-effective[13] and has therefore been recommended[14,15]. Generally, in our environment, screening for asymptomatic bacteriuria is not practiced in any form in most maternity units despite overwhelming evidence clearly demonstrating its benefits in preventing symptomatic urinary tract infection and the associated adverse pregnancy outcome[1,2,5]. Screening has been reported to be cost-effective when prevalence of bacteriuria is above 2%[16]. However, the current prevalence of asymptomatic bacteriuria in Ibadan is not precisely known.

This study was therefore designed to determine the prevalence of asymptomatic bacteriuria among the obstetric patients at University College Hospital Ibadan and identify possible predictors for the condition that may modify modality of screening.

Materials and Methods

The study was a descriptive, cross-sectional, exploratory survey of healthy pregnant women presenting for the first antenatal (Booking) visit at the University College Hospital, Ibadan between 1st of April and 31st of May 2006.

All consecutive patients presenting for the first antenatal visit (booking) during the period of study were adequately counseled about asymptomatic bacteriuria and those who gave their written informed consent to participate in the study and comply with follow up if necessary were recruited into the study. Relevant information was obtained from all the patients recruited for the study. This included their age, parity educational level, gestational age and occupation. Genotype of participants were also subsequently retrieved and recorded.

History of index pregnancy was explored to exclude symptoms of acute urinary tract infection and current or previous use of antibiotics. Gestational age of the index pregnancy was calculated from the 1st day of last menstrual period or where necessary by early ultra-sound scan. The mobile telephone numbers of the patients were obtained and recorded in the proforma.

Pregnant women who had symptoms of acute urinary tract infection and those who were on, or had been on antibiotic treatment in index pregnancy prior to booking were excluded from the study. Others excluded were those known to have underlying renal disease and those who could not give informed consent.

Sample Collection and Processing

On presentation at booking antenatal clinic, the patients were instructed adequately by the nursing staff on how to collect clean catch mid-stream urine. After initial cleaning of the perineum with running water, the first part of the urine was voided and about 10mls of the mid-stream urine was collected into the sterile universal bottles which had been correctly labelled and distributed to them.

The urine samples in the sterile universal bottles were transported to the laboratory for processing within one hour and where immediate processing was not possible, the samples were promptly refrigerated at 4^0C to avoid multiplication of bacteria at room temperature. They were subjected to routine microscopy, culture and sensitivity according to standard practice. Suspected pathogens were identified using standard biochemical and sugar utilization tests[17].

Significant bacteriuria was defined as presence of at least 10^5 single bacteria colonies per millilitre of urine.

Follow up

All the study participants were requested to report at the clinic one week after the initial testing for review with the result of microbiological culture. Patients with positive culture results were however contacted by telephone to report for follow up treatment immediately their results were available.

Those who were positive for significant bacteriuria from urine culture were treated based on the sensitivity pattern. They were re-evaluated with a repeat urine culture to ascertainr clearance of bacteriuria after completion of a 10-day course of appropriate antibiotics and were subsequently followed up throughout pregnancy with monthly urine microscopy and culture till delivery.

Data Management

The proforma for data capture was pre-tested on a sample of 10 pregnant women in the antenatal clinic and adjusted as appropriate. Data entry and analysis were done with SPSS software version 11. Statistical analysis was performed with the chi-square test, Fisher's exact test and student t test as appropriate. Level of statistical significance was set at 5%.

Ethical Approval: Ethical approval was obtained from the joint Institutional Review Board (IRB) of University of Ibadan / University College Hospital Ibadan, Nigeria, before the commencement of the study.

Results

During the study period, 245 women presented for booking for antenatal care at the University College Hospital, Ibadan. Out of these women, 229 were counseled on asymptomatic bacteriuria and informed about the study. Sixteen patients declined to participate in the study and 8 were excluded because they were either taking antibiotics or had used antibiotics in the index pregnancy. Therefore, two hundred and five (205) patients participated in the study. Significant bacteriuria was found in 22 patients giving a prevalence of 10.7%.

The mean age of patients involved in this study was 30.6 years 4.3 (SD) with a range of 19 - 43 years. The parity of the patients ranged from 0 to 7 with para 0 being the modal parity. The mean gestational age at booking during this study was 20.9 weeks 7.0 (SD) with a range of 6 - 40weeks.

Evaluation of the demographic characteristics of the participants showed that the prevalence of asymptomatic bacteriuria was not significantly influenced by patients' age groups. However the prevalence rates varied among the age groups with highest prevalence seen in the age group 26 - 35 (11.5%). Most of the patients involved in this study were highly educated with about 72.2% having attained tertiary level of education. Asymptomatic bacteriuria was lower among patients with tertiary level of education (9.8%) compared to those who had secondary education (14.6%) as shown in Table I.

The prevalence of asymptomatic bacteriuria among Christians in this study was 3-fold higher than among their Muslim counterparts (12.7% versus 4.3%). Also, prevalence of asymptomatic bacteriuria was higher among women with genotypes AS and AC (Table I) compared to other genotypes. However, the influence of educational level, religion and blood genotypes on the rate of asymptomatic bacteriuria were not statistically significant.

Table II shows the parity and the gestational ages of participants involved in this study. Prevalence of bacteriuria rose to a peak among para 1-2 women and subsequently declined with increasing parity. Prevalence of bacteriuria was least in the first trimester (6.5%), but there was a marked rise in the 2nd and 3rd trimesters with prevalence rates of about 11.2% and 12.2% respectively. However these trends were not statistically significant (Table II).

The bacterial pathogens isolated from urine of bacteriuric women in this study were mostly Gram negative organisms (E. coli and klebsiella), accounting for over 45% of the isolates. *Staphylococcus saprophyticus,* a coagulase negative staphylococcus was the second commonest organism isolated in this study (Figure 1).

Table 3 shows the distribution of the bacterial isolates with regard to the demographic characteristics of the pregnant women. Generally, the isolates were fairly evenly distributed in relation to these parameters. However, Muslim women in this study appeared to have a predilection for staphylococcus aureus though the total number of the isolates was small. Notwithstanding, this was found to be significant statistically.

Similarly, in relation to the obstetric characteristics of the women, uropathogenic isolates in the 3rd trimester of pregnancy were mostly staphylococcal organisms. This was significantly different from the distribution of the isolates in the other two trimesters and in relation to the parity of the women (Table 4).

Table I: Demographic Characteristics of Patients Screened For Asymptomatic Bacteriuria

Characteristics	Bacteriuric (22)	Non Bacteriuric (183)	Total (205)	Prevalence of AB (%)	Significance
Age (years)					
16 -25	2	19	21	9.5	
26 -35	18	139	157	11.5	P = 0.806
36 - 45	2	25	27	7.4	NS
Mean age ± SD	30.73ÿ4.41	30.61ÿ4.27	30.6ÿ4.30		P = 0.901
Educational Level					
≤ Primary	1	10	11	9.1	
Secondary	6	35	41	14.6	P = 0.664
≥ Tertiary	15	138	153	9.8	NS
Religion					
Christianity	20	138	158	12.7	P = 0.079
Islam & Others	2	45	47	4.3	NS
Genotype					
AA	12	101	113	10.6	
AS	9	46	55	16.4	P = 0.217
SS / SC	0	5	5	0.0	NS
AC	1	5	6	16.7	
Unknown	0	26	26	0.0	

NS Not Significant

Table II: Parity and Gestational Age Of Patients Screened For Asymptomatic Bacteriuria

Characteristics	Bacteriuric (22)	Non -Bacteriuric (183)	Total (205)	Prevalence of AB (%)	Significance
Parity					
Para 0	9	79	88	10.2	
Para 1 - 2	12	79	91	13.2	P = 0.582
Para 3 - 4	1	21	22	4.5	NS
≥ Para 5	0	4	4	0.0	
Gestational age (Trimester)					
1st trimester	2	29	31	6.5	
2nd trimester	14	111	125	11.2	P = 0.691
3rd trimester	6	43	49	12.2	NS
Mean Gestational age (weeks) ± SD	21.91ÿ6.80	20.70ÿ7.04	20.9ÿ7.0		P= 0.477

NS Not Significant

Fig 1: Bacterial Isolates Among Bacteriuric Patients

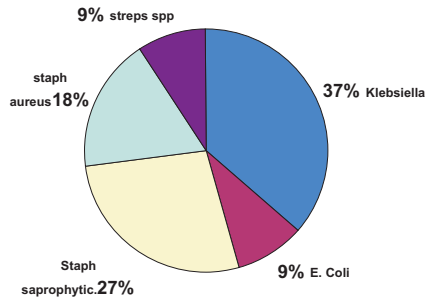

Table III: Distribution of Bacterial isolates according to the demographic parameters of the Bacteriuric women

Characteristics	Bacterial Isolates					Significance
	Klebsiella	E. Coli	Staph aureus	Staph Saprophyticus	Streps spp.	
Age						
16 -25	0	0	1	1	0	
26 -35	7	2	3	4	2	P = 0.841
36 45	1	0	0	1	0	NS
Total	**8**	**2**	**4**	**6**	**2**	
Educational Level						
≤ Primary	0	0	1	0	0	
Secondary	3	0	1	2	0	P = 0.557
≥ Tertiary	5	2	2	4	2	NS
Total	**8**	**2**	**4**	**6**	**2**	
Religion						
Christianity	8	2	2	6	2	
Islam	0	0	2	0	0	P = 0.042
Total	**8**	**2**	**4**	**6**	**2**	S
Genotype						
AA	5	0	3	3	1	
AS	3	2	1	2	1	P = 0.615
AC	0	0	0	1	0	NS
Total	**8**	**2**	**4**	**6**	**2**	

NS Not significant S Statistically Significant

Table IV: Distribution of bacterial isolates according to gestational age and parity of the patients

Characteristics	Bacterial isolates					Significance
	Klebsiella	E. coli	Staph aureus	Staph saprophyticus	Streps spp.	
Parity						
Para 0	2	2	1	3	1	
Para 1 2	5	0	3	3	1	P = 0.660
Para 3 4	1	0	0	0	0	NS
Total	**8**	**2**	**4**	**6**	**2**	
Gestational age						
1st Trimester	0	1	0	1	0	
2nd Trimester	6	1	0	5	2	P = 0.013
3rd Trimester	2	0	4	0	0	S
Total	**8**	**2**	**4**	**6**	**2**	

NS Not significant S Statistically significant

Discussion

The prevalence of asymptomatic bacteriuria among pregnant women attending the first antenatal (Booking) clinic at University College Hospital Ibadan, was 10.7%. This is lower to that reported by Okonofua (14.1%) at the Obafemi Awolowo University Teaching Hospital[18] but slightly higher than that of Oyetunji et al, in Sokoto[9] (8.0%), Tungrul et al (8.1%) among Turkish women[19] and Ojo and Akinkugbe (9.7%) 30 years ago in Ibadan[20]. It also falls within the reported range of 2-11 in most reviews[1,11,21],. The prevalence in this study is significantly higher than that obtained by Nnatu and Odum in Lagos (4.0%)[8] and Mandara and Shittu in Zaria (4.8%)[7] , among Nigerian urban population . It is however much lower than the value obtained by Olusanya and others in Ogun State University Teaching Hospital Sagamu (23.9%)[10]. The variability in rates may be influenced by locality (lower in urban population such as Lagos and Zaria) and method of urine collection (mid stream, clean catch specimen which can be contaminated if not properly done).

Analysis of the study revealed that the demographic characteristics of the expectant mothers at the booking clinic did not significantly affect their risk of having asymptomatic bacteriuria. However, in specific terms the analysis showed that prevalence rate was higher among age groups 26-35 years (11.5%). Advancing maternal age has been linked with high prevalence of bacteriuria because of the increasing frequency of co-morbid condition, which is associated with neurogenic bladder and increased residual urine volume or urinary reflux[19,22]. Maternal educational level had no consistent pattern of influence on the risk of acquiring asymptomatic bacteriuria in this study, although attainment of tertiary level of education was associated with less risk compared to secondary education (9.8% vs 14.6%). Educational level attained may also be an indicator of socio-economic status of the women. Lower level of education and low socio-economic status have been related to higher prevalence rate of asymptomatic bacteriuria in many studies and reports[22,23]. Up to 5 times greater incidence have been quoted in different studies[23]. It could be due to existence of crude and unhygienic toilet facilities in poor communities. Education improves the attitudes and believes of women and has a protective role against most of the morbidities[23,24].

Christians in this study had 3 times the prevalence rate of bacteriuria compared to the Muslims, though this was not significant statistically. Similar findings were obtained by Veri and colleagues who found 3 times higher prevalence among booked Caucasians (mostly Christians) compared to their Bangladesh counterparts (mostly Muslims) at Royal London Hospital[25]. Overall, Muslim women are said to have a slightly lower risk of urinary tract infection due to their practice of ablution after defecation and micturition[25]. Though not statistically significant, women with genotypes AS and AC were found to have higher prevalence of bacteriuria (16.4% and 16.7% respectively) in this study compared to genotype AA (10.6%) . Sickle cell trait (AS) has been reported to double the risk of asymptomatic bacteriuria[26,27].

Prevalence of asymptomatic bacteriuria in this study increased from 1st trimester value of 6.5% to about 11% in the 2nd trimester with a further, though slight increase in the 3rd trimester. Stenqvist et al in their study of repeated screening for bacteriuria in pregnancy found an increasing risk of acquiring bacteriuria with duration of pregnancy[28]. The findings of this study is however at variance with that obtained by Nnatu and co- workers who found a decreasing prevalence rate with duration of pregnancy (5.3%, 4.1% and 2.8% in 1st, 2nd and 3rd trimesters respectively)[8]. Parity in this study did not show any pattern of influence on the risk of bacteriuria in

pregnancy though highest rate was seen among para1-2 (13.2%). Studies elsewhere have reported significant increase in risk of bacteriuria in pregnancy with increasing parity[26,28,29].

In this study, gestational age and religion of the pregnant women were shown to significantly affect the type of urinary bacterial isolates causing asymptomatic bacteriuria as evidenced by significant predilection for staphylococcal organisms among Muslim women and in the 3rd trimester of pregnancy. Studies elsewhere however did not support these findings[8,25,28]. This may be a novel finding which requires larger multi center studies to validate. Though, not a common urinary pathogen, staphylococcal organisms are currently receiving increasing attention as causative agents of bacteriuria in pregnancy[30]. A number of studies from Nigeria and elsewhere have reported staphylococcus aureus to be one of the commonest isolates in bacteriuria of pregnancy[10,19,31,32].

In conclusion, this study has revealed a relatively high prevalence of asymptomatic bacteriuria among the obstetric population at the University College Hospital, Ibadan. It has shown that demographic and obstetric parameters do not significantly influence the risk of acquiring bacteriuria of pregnancy. However, microbiological isolates causing this condition are affected by religion and gestational age in pregnancy. Considering the relatively small size of the sample population which may have affected stastistical analysis, larger multi centre studies are recommended to further elucidate predictors of bacteriuria and causative uropathogens in pregnancy in our environment.

It is recommended that routine screening for asymptomatic bacteriuria should be offered to all pregnant women presenting for antenatal care at booking.

References

1. Patterson TF, Andriole VT. Bacteriuria in Pregnancy. Current Treatment Options in infectious disease 2003; 5: 81-87.
2. Garingalo Molina FD. Asymptomatic Bacteriuria Among pregnant women: Overview of Diagnostic Approaches. Phil J Microbiol Infect Dis 2000; 29 (4): 197-186.
3. Andriole V, Patterson TF. Epidemiology, Natural history and management of urinary tract infection in pregnancy. Med Clin North Am 1991; 75 (2): 359-371
4. Cunningham FG, Gant NF, Leveno KJ, Gilstrap LC,Hauth JC, Wenstrom KD. Renal and Urinary Tract Disorders In: Williams Obstetrics (Gunningham F.G., Gant N.F et al eds) 21st edn. Mc Graw-Hill, Medical Publishing Division. New York: 2001. 1251-1271.
5. Nicolle LE. Screening for asymptomatic bacteriuria in pregnancy. In: Canadian Guide to Clinical Preventive Health Care. Ottawa: Health Canada, 1994; 100-6.
6. Mandara MU, Shittu SO. Asymptomatic Bacteriuria in Antenatal Patients at ABUTH Hospital Zaria, Nigeria. Trop J Obstet Gynaecol 1999; 16(1): 41-45.
7. Nnatu S, Essien EE, Akinkugbe A, Odum CU. Asymptomatic bacteriuria in pregnant Nigeria Patients. Clin Exp. Obst. Gyn. 1989; 16 (4): 126-128.
8. Oyetunji JA, Ahmed Y, Nwobodo EI, Ekele BA and Audu-Airede LR. Asymptomatic Bacteriuria in Pregnancy in Sokoto Nigeria. Trop J Obstet Gynaecol 2005; 22 (Suppl 1): pp S23.
9. Olusanya O. Ogunledun A, Fakoya T.A. Asymptomatic significant bacteriuria among pregnant and non-pregnant women in Sagamu Nigeria. Cent Afr J Med. 1992; 38 (7): 197-302.
10. Robson SC. Hypertension and Renal disease in pregnancy. In Dewhurst's Textbook of Obstetric and Gynaecology for Postgraduate (Edmonds DK Ed.) 6th Edn. Blackwell Science Ltd. Oxford:1999. 166-185.
11. Smaill F. Antibiotics for asymptomatic bacteriuria in pregnancy (Cochrane Review). In the Reproductive Health Library, Issue 9, 2006. Oxford: Update Software Ltd.
12. Miller LK, Cox SM. Urinary tract infection complicating pregnancy. Infect Dis Clin of North Am 1997; 11 (1): 13-26.
13. Gratacos E, Torres PJ, Villa J, Alonso P, Cararach V. Screening and treatment of asymtomatic bacteriuria in pregnancy to prevent pyelonephritis. J Infect Dis. 1994; 169: 1390-1392.
14. US Preventive Services Task Force (USPSTF). Screening for asymptomatic bacteriuria: Recommendation Statement. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ) 2004.
15. US Preventive Services Task Force (USPSTF). Screening for Asymptomatic Bacteriuria: Guide to Clinical Preventive Services. Second edition Washington DC: US Department of Health and Human Services. Office of Disease Prevention and Health Promotion. 1996.
16. Wadland W, Plante D. Screening for asymptomatic bacteriuria in pregnancy. Fam Phy 1989; 29 (4): 372-376.
17. Cheesbrough, M. Biochemical tests to identify bacteria. In: District Laboratory Practice in Tropical Countries (Part 2). Low priced edn. Cambridge University Press. U.K: 2002. pp 62-70.
18. Okonofua FF, Adediran A, Okonofua B. Incidence and Pattern of Asymptomatic Bacteriuria of Pregnancy in Nigerian Women. Nig Med. Pract. 1989; 17 (3): 35-38
19. Tungrul S, Oral O, Kumru P, Kose D, Alkan A, Yildirim G. Evaluation and importance of asymptomatic bacteriuria in pregnancy. Clin Exp Obstet Gynecol. 2005; 32 (4): 237-40
20. Ojo OA and Akinkugbe OO. The significance of asymptomatic bacteriuria in pregnancy in Ibadan. W Afr J Surg 1976; 1: 23 28.

21. Larry C, Gilstrap LC, Susan M, Ramin MD. Urinary tract infections during pregnancy. Obstet Gynecol 2001; 28: 1-9
22. Faro S, Fenner DE. Urinary tract infections. Clin Obstet Gynecol 1998; 41: 744-54.
23. Younis N, Khattab H, Zurayk H, El-Mouelhy M, Amin MF, Faray AM. A Community Study of gynaecological and related morbidities in rural Egypt. Stud Fam Plan 1993; 24: 175-86
24. Matthew K, Cline MD, Chasse BD, Cayeli M. Maternal Infections: diagnosis and management. Primary Care Clin Pract. 2000; 27: 13-50.
25. Veri E, Chia P, Griffith DJ, Harlow BL. Bacteriuria in pregnancy: a comparison of Bangladeshi and Caucasian women. Int Urogynecol J Pelvicfloor Dysfunct. 1997; 8: 8-12.
26. Pastore LM, Savitz DA, Thorp JM Jr. Predictors of urinary tract infection at the first prenatal visit. Epidemiology 1999; 10: 282.
27. Kiningham R. Asymptomatic bacteriuria in pregnancy. Am Fam Physician 1993; 47 (5): 1232-1238.
28. Stenqvist K, Dahlen-Nilson I, Lichin-Janson G. Becteriuria in pregnancy: Frequency and Risk of Acquisition. Am J Epidemiol 1989; 29 (2): 372-79.
29. Naheed F, Shabnum I. Frequency and risk factors of asymptomatic bacteriuria during pregnancy. JCPSP 2006; 16 (4): 273-275.
30. Barr JG, Ritchie JWK, Henry O. Microaerophilic / anaerobic bacteria as a cause of urinary tract infection during pregnancy Br J Obstet Gynaecol 1985; 92: 506-510.
31. Akerele J, Abhulimen P, Okonofua F. Prevalence of asymptomatic bacteriuria among pregnant women in Benin City, Nigeria. J Obstet Gynaecol. 2001 Mar; 21 (2): 141-4
32. Gebre-Selassie S. Asymptomatic bacteriuria in pregnancy: epidemiological, clinical and microbiological approach. Ethiop Med J 1998; 36 (3): 185-92.