



Asymptomatic Bacteriuria and the Antibiotic Susceptibility Pattern of the Urinary Bacterial Isolates from Pregnant Women Attending Antenatal Care Clinic at Abia State University Teaching Hospital, Aba, Abia State, Nigeria

***Uchechukwu C F, Onwuakor C E, Emmanuel C P, Ezemadu U R, Odo S E and Umeh M N**

Department of Microbiology, Michael Okpara University of Agriculture, Umudike, P.M. B. 7267, Umuahia, Abia state, Nigeria.

Received: 10 Oct 2019 / Accepted: 18 Nov 2019 / Published online: 01 Jan 2020

*Corresponding Author Email: uchefchidi@gmail.com

Abstract

This study assessed the prevalence of asymptomatic bacteriuria and the antibiotic susceptibility pattern of the urinary bacterial isolates from pregnant women attending antenatal care clinic at Abia state University Teaching Hospital, Aba, Abia State, Nigeria. Mid-stream urine samples were collected from 100 pregnant women attending antenatal care at Abia state University Teaching Hospital, Aba, Abia State, Nigeria between the ages of 18-49 years. Each specimen was cultured on Cystine Lactose Electrolyte Deficient (CLED) agar using standard bacteriological methods. Identification of suspected colonies and antibiotic sensitivity testing were done. Thirty-eight samples (38) which represent 38.0% showed significant bacteriuria while 62 samples (62.0%) showed no bacteriuria or no significant bacterial growth. *Escherichia coli* was found to be the most predominant, (36.8%) followed by *Proteus* spp, (21.1%), *Pseudomonas aeruginosa* (18.4%), *Staphylococcus aureus* (15.8%) and the least *Klebsiella* spp. (7.9%). Nitrofurantoin, Ciprofloxacin, Ofloxacin, Gentamicin and Ceftazidime were very effective antimicrobial agents against the isolates while the isolates were highly resistant to Cefexime and Augmentin (Co-amoxiclav). *E. coli* was the most common bacteria for asymptomatic bacteriuria among pregnant women attending antenatal care at Abia state University Teaching Hospital, Aba, Abia State, Nigeria in this study. Education on the importance of inclusion of urine screening in antenatal care should be emphasized.

Keywords

Bacteriuria, asymptomatic, antibiotic susceptibility pattern, urinary bacterial isolates, pregnant women, Aba Nigeria.

INTRODUCTION

Bacteriuria is a clinical condition that refers to the presence of one or more bacteria in urine. It is basically a disease condition caused by a wide variety of bacteria. The upper urethra is the most frequent

site of infection within the urinary tract, but the entire system is always at risk of invasion by bacteria once one of the parts is infected (22).

The term 'bacteriuria' means the presence of bacteria in urine. It may result from contamination

during or after collection of urine or it may indicate the presence of bacteria in bladder urine.

To distinguish among these possibilities, the term “significant bacteriuria” was introduced which was defined as the occurrence of 10^5 or more bacteria per ml of voided midstream urine aseptically collected. Bacteriuria can be divided into symptomatic and asymptomatic (22).

Asymptomatic bacteriuria refers to the presence and multiplication of bacteria in the bladder urine in the absence of symptoms of urinary tract infection while symptoms are present in symptomatic cases.

Bacterial infections of the urinary tract are commonly seen in outpatients, hospitalized patients and apparently healthy populations.

Asymptomatic bacteriuria occurs reliably more frequently in females as compared with males and it is a major criterion of urinary tract infection (UTI) (22). Reasons adduced to this include shorter and wider urethra and its proximity to the anus. Asymptomatic bacteriuria (ASB) accounts for 2-10% pregnancies in developed countries while incidence is much more in developing and under- developed countries.

Asymptomatic bacteriuria is a major risk factor for the development of urinary tract infections (UTIs) during pregnancy resulting in serious medical and obstetrical complications if untreated. In pregnancy, various hormonal and mechanical changes lead to significant alterations in the urinary tract like dilatation, decrease in peristalsis in the ureter and decrease in bladder tone. In addition, the physiological increase in plasma volume during pregnancy, decreases urine concentration leading to decreased ability of the lower urinary tract to resist invading organisms (14). These changes have a profound impact on the acquisition and natural history of bacteriuria and lead to an otherwise healthy woman susceptible to serious infection complications. Also, a number of conditions like low socioeconomic status, multiparity, illiteracy, medical disorders like diabetes mellitus and sickle cell trait are also associated with increased incidence of asymptomatic bacteriuria in pregnancy (14).

Symptomatic bacteriuria poses no problems because of its easy diagnosis and treatment due to its overt symptoms but asymptomatic bacteriuria is difficult to diagnose which is more common in pregnant women.

Therefore, to prevent untoward complications in the mother and baby that may arise due to asymptomatic bacteriuria; it has been suggested to do routine screening for all pregnant women attending the antenatal clinic even in the absence of symptoms (23).

Knowledge of the nature, cause and outcome of bacteriuria has obviously been based on the study of the development of symptoms and signs over a period of time. This infection in adult usually leads to the irritation of urethral mucosa, causing frequent painful urination with turbid urine (21). In infants there may be unexplained jaundice or an appearance suggestive of sepsis. In healthy individuals the normal kidney and bladder urine are sterile, but the urethral and introital flora consist largely of non-pathogenic *Corynebacterium*, *Lactobacillus*, *Staphylococcus epidermis*, *Gardnerel lavaginalis* and non-haemolytic streptococci, while *E-coli* may be absent or found in small quantities.

The state of bacteriuria is detected by qualitative urine culture indicated by finding more than 10^5 colony forming units (CFU).

Urinary tract infection (UTI) is a common health problem among women compared with men due to shorter urethra, closer proximity of the anus with vagina, and pathogen entry facilitated by sexual activity (15). It is estimated that one in three women of childbearing age contracts urinary tract infection which may manifest symptoms or remain asymptomatic (11). Pregnant women are more susceptible to urinary tract infection, owing to altered anatomical and physiological state during pregnancy (1).

In Nigeria and many other developing countries, routine urine culture for detecting asymptomatic bacteriuria is not carried out for antenatal women probably due to cost and delay in obtaining culture result (18). Strip urinalysis is often preferred by most clinicians to culture in accessing urine in pregnant women because of speed and simplicity. Though this method can detect presence of protein, nitrite, and leucocytes esterase enzyme which may suggest bacteriuria, its sensitivity is low (8). Moreover, unlike culture, strip urinalysis fails to identify the etiologic agents and the antibiotic sensitivity pattern. This practice will not allow for proper management of urinary tract infection in pregnant women attending antenatal care thus increasing their risk of coming down with complications.

Due to the above reasons, the burden of urinary tract infection in pregnant women and its associated complications in this environment may still be highly underestimated.

MATERIALS AND METHODS

This was a prospective descriptive study among asymptomatic pregnant women attending their antenatal clinic visit at the antenatal clinical at Abia State University Teaching Hospital, Aba between March to July, 2016.

Systematic random sampling technique was employed in recruiting 100 subjects who met the stated criteria. A structured questionnaire containing information on biodata was administered on all recruited subjects at booking. The study was approved by the Ethical Research Committee of the hospital.

LABORATORY PROCEDURE

About 5ml of midstream urine was collected into a sterile universal bottle and the samples taken to microbiology laboratory for analysis within 2 hours of collection.

URINE CULTURE

Urine culture was done with 0.001 ml of well mixed urine delivered by a sterile calibrated wire loop and plated on Cysteine lactose electrolyte deficient agar (CLED) agar plates, which were incubated aerobically at 35-37°C for 24 hours. Repeat culture was ordered for contaminated specimens. Each significant isolate was identified by colonial morphology, gram staining and biochemical reactions according to standard procedure. Antibiotic sensitivity testing was done by emulsifying selected isolates in normal saline at a turbidity compared to 0.5 Mac Farland's standard. Using sterile swabs, suspensions were inoculated on Muller-Hinton agar in accordance with modified Kirby-Bauer method and incubated at 35-37°C for 18-24 hrs. multiple antibiotic impregnated discs including; gentamicin (10 µg), cefuroxime (25 µg), augmentin (30µg), ofloxacin (30 µg), nitrofurantoin

(300 µg), ciprofloxacin (5µg), cefixime (25µg), ceftazidime (30µg) and cefuroxime (30µg) were tested against gram-positive and gram-negative organisms as appropriate. Interpretation was done by comparing the diameter of zone of inhibition with those of a standard table in three grades of susceptibility which are sensitive, intermediate and resistant.

RESULTS

Out of the 100 specimens screened, 38(38%) had asymptomatic bacteriuria while 62(62%) had none. The highest percent occurrence was among the age group 18-25 (50%) followed by 34-41 (39.4%) while 26-38 had the least prevalence. Women at their 3rd trimester were most infected (39%) followed by those at their second trimester (36.4%) while none in the first trimester was infected. Table 1 shows the socio-demographic characteristics of women screened for asymptomatic bacteriuria. Table 2 shows the prevalence of bacteria isolated from urine of women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State. Table 3 shows the antibiotic sensitivity pattern of bacterial isolates from pregnant women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State. Figure 1 shows average percentage susceptibility of different antimicrobial agents against bacteria isolated from urine sample of pregnant women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State.

Table 1: Socio-demographic characteristics of women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State. Screened for asymptomatic bacteriuria.

Characteristics	No. screened	No. Infected	% Infected
Age (Years)			
18 – 25	2.0	1.0	50.0
26 – 33	65.0	24.0	36.9
34 – 41	33.0	13.0	39.4
42 – 49	0.0	0.0	0.0
Marital Status			
Married	100.0	38.0	38.0
Single	0.0	0.0	0.0
Educational Level			
None	0.0	0.0	0.0
Primary	0.0	0.0	0.0
Secondary	30.0	18.0	60.0
Tertiary	70.0	20.0	28.6
Religion			
Christianity	100.0	38.0	38.0
Islam	0.0	0.0	0.0
Parity			
1	35.0	10.0	28.6
2	25.0	10.0	40.0

3 and above	40.0	18.0	45.0
Gestation age			
First Trimester	1.0	0.0	0.0
Second Trimester	22.0	8.0	36.4
Third Trimester	77.0	30.0	39.0

Table 2: Prevalence of bacteria isolated from urine of pregnant women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State.

Organisms	No. Isolated	% Isolated
<i>Proteus</i> species	8.0	21.1
<i>Pseudomonas aeruginosa</i>	7.0	18.4
<i>Staphylococcus aureus</i>	6.0	15.8
<i>Klebsiella</i> species	3.0	7.9
<i>Escherichia coli</i>	14.0	36.8
Total	38.0	100.0

Table 3: Antibiotic susceptibility pattern of bacteria isolates from pregnant women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State.

Antimicrobial Average Agent	Strains sensitive to the antimicrobial agent				
	<i>E. coli</i> (n = 14)	<i>S. aureus</i> (n = 6)	<i>Klebsiella spp</i> (n = 3)	<i>P. aeruginosa</i> (n = 7)	<i>Proteus spp (%)</i> (n = 8)
Ceftazidime	11(79%)	6(100%)	1(33%)	3(43%)	4(50%) 5(61%)
Cefuroxime	7(50%)	2(33%)	2(67%)	2(29%)	2(25%) 3(41%)
Gentamicin	12(86%)	4(67%)	1(33%)	5(71%)	4(50%) 5(61%)
Ciprofloxacin	9(64%)	2(33%)	3(100%)	7(100%)	6(75%) 5(75%)
Ofloxacin	10(71%)	4(67%)	2(67%)	4(57%)	5(63%) 5(65%)
Nitrofurantoin	11(79%)	6(100%)	0(0%)	6(86%)	0(0%) 5(53%)
Cefixime	4(29%)	2(33%)	0(0%)	2(29%)	1(13%) 2(21%)
Augmentin	3(21%)	0(0%)	1(33%)	1(14%)	0(0%) 1(14%)

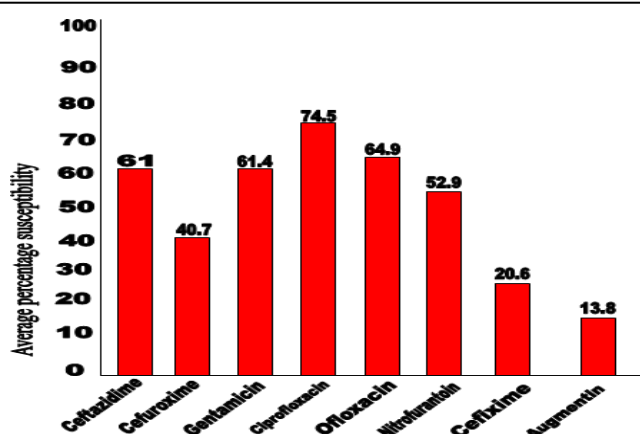


Figure 1: Average percentage susceptibility of different antimicrobial agents against bacteria isolated from urine sample of pregnant women attending antenatal care at Abia State University Teaching Hospital, Aba, Abia State.

DISCUSSION

The women involved in the study were mainly between 18 – 49 years of age. All women (100.0%) were married and this could be associated with the

higher chances of pregnancy being planned and thus presentation to antenatal care compared to singles. The literacy rate was quite high with 70.0% having tertiary education and 30.0% having secondary

education. The high literacy level of the respondents as observed in this study could be explained by the fact that higher educational attainment of both partners is one of the factors that have a positive influence on the utilization of antenatal service in Nigeria, as also reported in previous studies (9).

The women were also mainly of low parity (60.0%). These were both in keeping with other studies which found antenatal booking to be high in women with at least secondary school education and low parity (19;17). All the women (100.0%) were Christians. This may be explained by the fact that Abia State is a predominantly Christian community. Exactly 40.0% of the women were self employed, 18.0% were traders, 30.0% were civil servants and 12.0% were students. About 77.0% of the women were in their 3rd trimesters, 22.0% were in their 2nd trimester and only 1.0% was in 1st trimester. This could be explained by the fact that pregnant women in this environment tend to book for antenatal care late. This finding is similar to a study in Enugu, Nigeria that reported that 92.2% of women booked for antenatal care after the first trimester (12). Most pregnant women view antenatal care as curative rather than preventive and therefore do not understand why they should book early when they feel they do not have problems.

This study found 38.0 cases of significant bacteriuria among the 100.0 pregnant women screened giving a prevalence of 38.0%. This is higher than the reported prevalence from Lagos, Ibadan, Sagamu and Ile-Ife of 4.0%, 12.0%, 23.9% and 26.0% respectively (26,27,29,2). This high prevalence might be due to the fact that the women were around their peak gestational age. It was however lower than 86.6% reported by Akerele in Benin (3). These differences may be attributed to variation in population characteristics such as age, parity, socio-economic status and bacterial ecology. The most common organism isolated was *Escherichia coli* 14(36.8%) cases. This was followed by *Proteus* spp. 8(21.1%), *Pseudomonas aeruginosa* 7(18.4%), *Staphylococcus aureus* 6(15.8%) and *Klebsiella* spp. 3(7.9%). This was consistent with the findings by Oyeyipo in Port Harcourt (30) and Chiedozi in Benin (7) who also found *Escherichia coli* as the predominant isolate. The proximity of anal opening to the genital region and the multiple virulent factors expressed by *Escherichia coli* such as P fimbriae, S fimbriae, hemolysin, aerobactin, and serum resistance, may contribute to this organism well-suited to colonize the urinary tract (10,20,25).

Most of the organisms were very sensitive to Ciprofloxacin, Ofloxacin, gentamicin, ceftazidime, Nitrofurantoin, as seen in figure 1 which shows the

average percentage susceptibility of the isolates. Resistance to Augmentin and Cefexime were relatively high. These antibiotics were also found to be effective in studies by Mandara in Zaria (24), Ezeome in Enugu (12) and Turpin in Ghana (33). (33) stated that Nitrofurantoin is relatively safe in pregnancy and is effective against most urinary tract infections but may cause hemolysis in glucose-6-phosphate dehydrogenase deficient infants if used closed to term. There is some reluctance among doctors to prescribe Nitrofurantoin and this may be due to its side effect profile, but it is clearly an important drug for urinary tract infections.

Maternal age as observed in this study increased with prevalence of bacteriuria. This is in agreement with some studies which implicated maternal age as a significant risk factor for asymptomatic bacteriuria among pregnant women (5, 4,18) but at variance with a study in Iran that found lower maternal age significantly associated with bacteriuria in pregnancy(32).

Parity was a risk factor for asymptomatic bacteriuria in pregnancy from this study. This finding agrees with some previous studies that reported multiparity to be significantly associated with increased bacteriuria in pregnancy (5,4). Changes in the urinary tract, such as ureteral dilatation and decrease in bladder tone resulting in increased urinary stasis, occurring during each pregnancy and often not perfectly returning to normal even after delivery, perhaps makes multiparous women more prone to asymptomatic bacteriuria. In Ghana, however, though women with four or more children had a prevalence of 16.1% as against 3.7% in the nulliparous women, there was no statistically significant association between multiparity and bacteriuria (33). Prevalence of asymptomatic bacteriuria, in this study, decreased as the level of education of respondents increased, indicating that level of education is a risk factor. Same conclusion was also arrived at in a similar study in Pakistan (16) and in Nnewi, South Eastern Nigeria, where the least educated women had higher incidence of bacteriuria (28). In Iran, however, no particular trend was followed as prevalence of 2.6%, 7.1%, 6.1%, 6.5%, and 2.3% were reported for illiterates, primary education, secondary education, high school degree and higher education respectively (32). It is believed that improved hygiene that goes with higher level of education is responsible for the drop in prevalence of bacteriuria observed in this study.

CONCLUSION

Overall, the prevalence of asymptomatic bacteriuria in our locality at 38.0% is high. Therefore, screening

for and treatment of asymptomatic bacteriuria during pregnancy should be an integral part of obstetric care and should be included in all antenatal guidelines.

REFERENCE

1. Abdullah, A.A. and Al-Moslih, M.I (2005). Prevalence of Asymptomatic Bacteriuria in Pregnant Women in Sharjah, United Arab Emirates. *East Mediterr Health Journal*, 11:5–6.
2. Aboderin, A.O., Ako-Nai, A.K., Zailani, S.B., Ajayi, A. and Adedosu, A.N. (2004). A Study of Asymptomatic Bacteriuria in Pregnancy in Ile-Ife, Southwestern Nigeria. *African Journal of Experimental Microbiology*, 5:252-259.
3. Akerele, J., Abhulimen, P. and Okonofua, F. (2001). Prevalence of Asymptomatic Bacteriuria Among Pregnant Women in Benin City, Nigeria. *Journal Obstetric Gynaecology*, 21(2):141-144.
4. Akinloye O, Ogbolu DO, Akinloye OM, Terry Alli OA. (2015) Asymptomatic bacteriuria of pregnancy in Ibadan, Nigeria: A re-assessment: British journal of biomedical science 63(3):109-12 DOI: 10.1080/09674845.2006.11732734
5. Al Sibiani S (2010): Asymptomatic Bacteriuria in Pregnant Women in Jeddah, MB, BCH, CABOG, Department of Obstetrics and Gynecology. Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia J KAU: Med. Sci., Vol. 17 No. 1, pp: 29-42 (2010 A.D. / 1431 A.H.) DOI: 10.4197/Med. 17-1.4
6. Cheesbrough, M (2002): District Laboratory Practice for Tropical Countries Part 2: Cambridge University Press. pp 135-142.
7. Chiedozie, K.O., Victoria, A.W., Eziyi, I. K. and Victor, U.N. (2014). Asymptomatic Bacteriuria Among Antenatal Care Women in a Tertiary Hospital in Benin, Nigeria. *Nigeria Journal of Experimental and Clinical Biosciences*. 2(2):79.
8. Colgan r, Nicolle le, Mcglone a, Hooton tm. asymptomatic bacteriuria in adults. am fam physician. 2006 sep 15;74(6):985-90.
9. Dairo M. D. and Owoyokun K. E. (2010). Factors affecting the utilization of antenatal care services in Ibadan, Nigeria. *Benin Journal of Postgraduate Medicine*. 12(1).
10. Daniyan, S.Y., Dangana, A. and Abalaka, M.E. (2010). Incidence of Asymptomatic Bacteriuria in Antenatal Patients Attending General Hospital Minna, Niger State. *Journal of Microbiology*, 1:100 – 102.
11. Duarte G, Marcolin AC, Quintana SM, Cavalli RC: Urinary tract infection in pregnancy. Rev Bras Ginecol Obstet 2008; 30:93–100.
12. Ezeome, I.V., Ikeme, A.C., Okezie, O.A. and Onyebueke, E.A. (2006). Asymptomatic Bacteriuria in Pregnant Women in Enugu, Nigeria. *Tropical Journal of Obstetric Gynaecology*, 23:12-13.
13. Farr, W. R (1970). Observations on the origin of Urinary Tract Infections. Kinacid-smith, P.E. and Fairley, K. (eds). Renal infections, Cambridge. Cambridge University Press. 258-260
14. Fatima, N and Ishrat, S (2006): Frequency and risk factors of asymptomatic bacteriuria during pregnancy. *Journal of College of Physicians and Surgeons Pakistan*, 16(4): 273-75
15. Feltosa, D.C.A., Silva, M.G. and Parada, C.M.G.L. (2009). Accuracy of Simple Urine Tests for Diagnosis of Urinary Tract Infections in Low-risk Pregnant Women. *Review of Latino-am Enfermagem*, 17(4):507–513.
16. Haider G, Zehra N, Munir AA, Haider A. Risk factors of urinary tract infection in pregnancy. J Pak Med Assoc 2010; 60:213-6
17. Harrison, K.A. and Bergstrom, S. (2001). *Poverty, deprivation and unsafe motherhood*. In: Lawson, J., Harrison, K.A. and Bergstrom, S. (eds) Maternity Care in Developing Countries. 1st Edition. RCOG Press, London, pp1-19.
18. Imade, P.E., Izeke, P.E., Eghafona, N.O., Enabulele, O.I. and Ophori, E. (2010). Asymptomatic Bacteriuria Among Pregnant Women. *North American Journal of Medical Sciences*, 2:263–266.
19. Jimoh, A.A. (2003). Utilisation of Antenatal Services at the Provincial Hospital, Mongomo, Guinea Equatoria. African. *Journal of Reproductive Health*, 7(3):49-54.
20. Johnson, J.R. (1991). Virulence factors in Escherichia coli, urinary tract infection. *Clinical Microbiological Review*, 1 (4):80-128.
21. Kaye, C.M. and Santoro (1989). A ten-year study of bacteriuria in schoolboys, girls: Final report of Bacteriologic Urologic and Epidemic findings England Journal of infection Disease. 122: 382-390
22. Kunin, C.M. (1997). Urinary Tract Infection in Adults. *Urinary Tract Infection*, 139-144.
23. MacLean, A.B. (2001). Urinary Tract Infection in Pregnancy. *International Journal of Antimicrobial Agents*, 17 (40): 273-277.
24. Mandara, M.U, Shittu, S.O. (1999). Asymptomatic Bacteriuria in Antenatal Patients at Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. *Tropical Journal of Obstetric Gynecology*, 16:41-45.
25. Mobley, H.L., Island, M.D and Massad, G. (1994). Virulence determinants of uropathogenic Escherichia coli and Proteus mirabilis. *Kidney International Supplementary*, 47:129-136.
26. Nnatu, S., Essien, E.E., Akinkugbe, A. and Odum, C.U. (1989). Asymptomatic Bacteriuria in Pregnant Nigerian Patients. *Clinical Experimental Obstetric Gynecology*, 16(4):126-129.
27. Ojo, O.A. and Akinkugbe, O.O. (1996). The Significance of Asymptomatic Bacteriuria in Pregnancy in Ibadan. *West African Journal of Surgery*, 1:23-28.
28. Oli AN, Okafor CI, Ibezim EC, Akujiobi CN, Onwunzo MC (2010). The prevalence and bacteriology of asymptomatic bacteriuria among antenatal patients in Nnamdi Azikiwe University Teaching Hospital Nnewi; South Eastern Nigeria. Niger J Clin Pract ;13:409-12.
29. Olusanya, O., Ogunledun, A. and Fakoya, T.A. (1993). Asymptomatic Significant Bacteriuria Among

- Pregnant and Non-pregnant Women in Sagamu, Nigeria. *West African Journal of Medicine*, 12(1):27-33.
30. Oyeyipo, Olutimilehim, O. and Diamreya, O. (2013). Assessment of Asymptomatic Bacteriuria in Pregnant Women in PH, South Southern Nigeria. *Academia Arena*, 5(1):79.
31. Samad Hazhir.(2007) Asymptomatic bacteriuria in pregnant women, *Urology Journal* Vol 4 No1.
32. Samad, H. (2007). Asymptomatic bacteriuria in pregnant women. *Urology Journal*, 4:24-27.
33. Turpin, C., Minkah, B., Danso, K.A. and Frimpong, E.H. (2007). Asymptomatic Bacteriuria in Pregnant Women Attending Antenatal Clinic at Komfo Anokye Teaching Hospital, Kumasi, Ghana. *Ghana Medical Journal*, 41(1):26-29.