■ **Original Research Article**

# Asymptomatic Bacteriuria in Pregnant Women: A Community Survey in Ushafa

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## ABSTRACT

**Background:** Urinary tract infections are the most common bacterial infections in pregnancy. Untreated asymptomatic bacteriuria can lead to symptomatic urinary tract infections (UTI) in pregnancy with adverse maternal and perinatal effects. This was a community-based survey in the Federal Capital Territory, Abuja, Nigeria which aimed to determine the prevalence, risk factors, etiologic agents of asymptomatic bacteriuria and antibiotic sensitivity among pregnant women. **Methodology:** This was a cross sectional study in which 200 pregnant women with no clinical suggestion of UTI were recruited. Clean catch midstream urine samples were collected from each participant into sterile universal containers and subjected to microscopy, culture and sensitivity testing. Standard microbiological technique was used in the identification of isolates. **Result:** A total of 59 pregnant women (29.5%) had asymptomatic bacteriuria. There was statistical significance in the prevalence of asymptomatic bacteriuria with respect to age and social class (P < 0.05), while trimester and parity did not show any significant difference (P > 0.05). Escherichia coli was the most prevalent organism followed by Staphylococcus aureus. The fluoroqui-nolones were the most sensitive antibiotics, while Amoxicillin/Clavulanic acid and Co-trimoxazole were the most resisted. **Conclusion:** The prevalence of asymptomatic bacteriuria among pregnant women in Ushafa community was higher than what has been found in most Nigerian settings. Hence, it is suggested that advocacy programs be instituted to urge pregnant women to access antenatal services, and a policy to screen and treat all pregnant women is worth considering so as to avoid the complications associated with asymptomatic bacteriuria.

**Keywords:** Asymptomatic bacteriuria, UTI, pregnant women, prevalence, community survey.

## Introduction

Urinary tract infections (UTIs) represent the most common bacterial infection in pregnancy,[1] and can be either asymptomatic or symptomatic. Infectious Diseases Society of America guidelines define asymptomatic bacteriuria (ASB) in women as two consecutive clean-catch voided urine specimens with isolation of the same organism in quantitative counts of =105 cfu/mL.[2] Adverse maternal and perinatal consequences may occur if ASB is left undetected or untreated during pregnancy.[3] Studies have noted associations of ASB in pregnancy with socio-demographic and obstetric factors with varying significances.[4,5]

ASB occurs in 210% of all pregnancies globally.[6,7] Some of the recent observational studies in Nigeria have given various incidences with rates as high as 55%.[8-14] However, very unusually high rates of 86.6% and 78.7% were reported in 2001 and 2007 by Okonofua in Benin City and Amadi in Abakiliki respectively.

In most developed countries, screening for and treatment of ASB in pregnancy has become a standard of obstetric care[2,15] though the World Health Organization new antenatal care guidelines recommend that ASB screening and treatment should be based on preterm birth prevalence.[16]

Virtually all the published works on ASB in pregnancy were done in urban areas among women attending antenatal clinics.[8] There is less usage of antenatal care by women in rural areas in Nigeria.[7] This study was carried out to assess the prevalence of ASB in pregnant women in the rural community, including the unbooked women. It aimed to determine risk factors, etiologic agents and antibiotic sensitivity among pregnant women in Ushafa community, FCT, Abuja.

## Materials and Methods

- *Study Area*

    Ushafa is a community in Bwari Area Council. Bwari is one of the six area councils in the Federal Capital Territory (FCT). The FCT is located in the North Central geo-political zone of Nigeria, occupying a land area of 7,315 square kilometers with a population of 1,406,239 out of which 673,067 are females.[18] The FCT falls within latitude 8.25$^0$ and 9.2$^0$ north of the equator and longitude 6.45$^0$ and 7.35$^0$ east of the Greenwich meridian. Bwari Area Council has a population of 229,274,[18] while the population of Ushafa community has been put at 25,000 of which 5,500 are females of age 15 to 49 years.

- *Study Design*

    This was a cross-sectional study carried out among pregnant women in Ushafa community between October and December, 2018. All consenting pregnant women within alternate households were interviewed by trained assistants fluent in the local languages (Gbagyi and Hausa) as well as English, using semi-structured questionnaire containing socio-demographic and obstetric information. Each woman in the study was allotted to one of the five social classes based on the scoring system designed by Olusanya et al.[19] Consenting pregnant women who were permanent residents in Ushafa community were included in the study. Pregnant women excluded from the study were those who declined consent to participate, with symptoms of urinary tract infection at the time of the study, with previously treated urinary tract infections in index pregnancy, on antibiotics or had taken antibiotics during the course of the index pregnancy or with Diabetes mellitus. Ethical clearance was obtained from the Health Research and Ethics Committee of the Federal Capital Territory, Abuja.

- *Sample Size Determination*

    Sample size was calculated using the statistical formula of Fischer: $n=z^2 pq/d^2$,[20] where:

    n = the desired sample size,

    z = the standard normal deviation, usually 1.96, which corresponded to the 95% confidence interval,

    p = best estimate of prevalence, using prevalence from Gwagwalada (12.8%),[10] which was close to the

study area.

q = complementary proportion, (1-p) which is 1- 0.128 = 0.872.

d = degree of accuracy desired (absolute precision) = 0.05. n = 171.5, an attrition rate of 15% was allowed, making the minimum 198.

200 pregnant women were recruited for the study.

### Specimen Collection and Processing

During the survey, after each participant completed the questionnaire, random blood sugar sampling was done using the glucometer (Accu-Chek, manufactured by Roche, India, REF-05060290001). The side of the participant's middle or ring fingertip was cleaned with methylated spirit and pricked gently using a sterile micro-point lancet to get capillary blood. Random blood sugar results were thereafter recorded on each woman's study questionnaire, excluding from the study, those pregnant women whose values were greater than or equal to 11.0mmol/L. The eligible pregnant women were provided with pre-labelled wide mouthed sterile screw-capped universal containers, and taught how to collect clean-catch midstream urine sample by first thorough front to back swabbing of the vulva with clean water before urine collection. Thereafter, they were to remain holding the labia apart and then allow the first drops of urine into the toilet. They then passed the remaining urine into the sterile universal container ensuring no contact with the vulva, to about half the volume (10-15mls). The collected urine specimens were placed in a cold box away from sunlight and transported to the medical microbiology laboratory as soon as feasible for further processing, where microscopy, culture and sensitivity were done.

Each specimen was examined for quality, in terms of amount, sterility and presence or absence of debris.[10] The urine was initially inoculated on blood and Cysteine Lactose Electrolyte Deficient (CLED) agar plates using a standard calibrated wire loop, and then divided into two equal parts. Urine obtained from the first part (uncentrifuged

urine) was used for dipstick urinalysis, while the second part (centrifuged urine) was micro-scopically examined for the presence of pus cells. Pus cells > 10 per high power field were considered significant for infection.[21] The inoculated plates were incubated aerobically, at 37°C overnight with adequate moisture. In further analysing, presence of colony counts that yielded bacterial growth of greater than or equal to 105/ml of pure isolates of urine on blood or CLED agar plates were considered significant bacteriuria. Also, the isolated organisms from the plates were identified by standard laboratory techniques.[22] Antimicrobial in-vitro susceptibility testing was performed using agar disc diffusion method. The National Committee for Clinical Laboratory Standard (NCCLS) operating procedure was followed.[23]

### Data Analysis

Data was analysed using the Statistical Package for Social Sciences (SPSS) computer software version 22.0 for windows. Descriptive statistics were computed for all relevant variables. Association between asymptomatic bacteriuria and socio-demographic and obstetric factors were ascertained by the Chi-square test, with p-values less than or equal to 0.05 considered statistically significant.

### Results

A total of 200 respondents with a mean duration stay of 12.1 ± 5.2 years in Ushafa community were studied. The mean age of the participants was 30.6 ± 10.3 years with a range of 17 - 39 years. Most of them had secondary level of education and belonged to the middle socio-economic class. The overall prevalence rate of ASB amongst pregnant women in Ushafa community in all age groups was found to be 29.5%.

The socio-demographic characteristics of the pregnant women in Ushafa community and its association with ASB are shown in Table 1. The age group 20 -24 years had the highest prevalence rates of ASB, and was found to be statistically significant (p = 0.002). The respondents in social class 4 had the highest prevalence of ASB (46.7%), followed by

social class 3 and 5. The differences observed were found to be statistically significant (p= 0.026). Religion and ethnicity were not associated with ASB. The obstetric characteristics; gestational age and parity of the pregnant women in Ushafa community showed no association with ASB, as shown in Table 2.

Table 3 shows that Escherichia coli was the most isolated organism 35 (59.3%); followed by Staphylococcus aureus 9 (15.2%); and Klebsiella species 7 (11.9%). Tables 4 and 5 show the antibiotic susceptibility patterns of the individual bacterial pathogens. The gram-negative organisms showed Ofloxacin to be the most effective antibiotic, followed by Levofloxacin and Gentamycin,

while the gram-positive organisms showed Amoxicillin/Clavulanic acid, Ciprofloxacin and Tetracycline to be effective. Generally, there was a high degree of antibiotic resistance among the bacteria isolated from the urine cultures of pregnant women in Ushafa community, with some bacteria exhibiting as much as 71.4% resistance. The most resistant organism was Escherichia coli, while the least resistant was the Enterococcus spp.

Co-trimoxazole and Amoxicillin/Clavulanic acid were the most resisted antibiotics while Ofloxacin had the least resistance.

**Discussion**

The prevalence of asymptomatic bacteriuria among pregnant women in this study population

**Table 1: Socio - Demographic Characteristics and Association with Asymptomatic Bacteriuria among Pregnant Women in Ushafa Community**

| Characteristics | Response | Frequency | Positive Culture (N) | Percentage | P-Value* |
|---|---|---|---|---|---|
| Age (years) | <20 | 6 | 1 | 16.7 | p = 0.002 |
| | 20-24 | 62 | 29 | 46.8 | $x^2$ = 16.6 |
| | 25-29 | 66 | 14 | 21.2 | df = 4 |
| | 30-34 | 46 | 14 | 30.4 | |
| | 35-39 | 20 | 1 | 5.0 | |
| Education Level | No formal education | 14 | 4 | 28.6 | p = 0.088 |
| | Primary | 33 | 14 | 42.4 | $x^2$ = 6.55 |
| | Secondary | 109 | 34 | 31.2 | df = 3 |
| | Tertiary | 44 | 7 | 15.9 | |
| Social Class | Class 1 | 5 | 0 | 0 | p = 0.026 |
| | Class 2 | 55 | 10 | 18.2 | $x^2$ = 11.03 |
| | Class 3 | 71 | 21 | 29.6 | df = 4 |
| | Class 4 | 45 | 21 | 46.7 | |
| | Class 5 | 24 | 7 | 29.2 | |
| Religion | Christianity | 135 | 38 | 28.1 | p = 0.669 |
| | Islam | 57 | 20 | 35.1 | $x^2$ = 0.8 |
| | Traditional | 3 | 0 | 0 | df = 3 |
| | Others | 5 | 1 | 20.0 | |
| Ethnicity | Igbo | 37 | 9 | 24.3 | p = 0.836 |
| | Yoruba | 40 | 11 | 27.5 | $x^2$ = 0.858 |
| | Hausa | 21 | 7 | 33.3 | df = 3 |
| | Others | 102 | 32 | 31.3 | |
| Number of Sexual Intercourse (Week) | <1 | 40 | 7 | 17.5 | p = 0.024 |
| | 1-2 | 104 | 28 | 26.9 | $x^2$ = 7.4 |
| | >2 | 56 | 24 | 42.9 | df = 2 |

**Table 2: Obstetric Characteristics and Relationship with Asymptomatic Bacteriuria among Pregnant Women in Ushafa Community**

| Characteristics | Response | Frequency | Positive Culture (N) | Percentage | P-Value* |
|---|---|---|---|---|---|
| Estimated | <13   (1st Trimester) | 6 | 3 | 50.0 | p = 0.495 |
| Gestational Age | 14-26 (2nd Trimester) | 84 | 26 | 30.9 | $x^2$ = 1.4 |
| | 27-36 (3rd Trimester) | 110 | 30 | 27.3 | df = 2 |
| Parity | Grand Multipara | 6 | 3 | 50.0 | p = 0.291 |
| | Multipara | 95 | 33 | 34.7 | $x^2$ = 3.74 |
| | Primipara | 42 | 11 | 26.2 | df = 3 |
| | Primigravida | 57 | 12 | 21.1 | |

**Table 3: Isolated Organisms Associated with Asymptomatic Bacteriuria among Pregnant Women in Ushafa Community**

| Bacteria | | Number | Percentage |
|---|---|---|---|
| Gram - negative | *Escherichia coli* | 35 | 59.3 |
| bacteria | *Klebsiella spp* | 7 | 11.9 |
| | *Pseudomonas aeroginosa* | 4 | 6.8 |
| | *Proteus spp* | 1 | 1.7 |
| Gram - positive | *Staphylococcus aureus* | 9 | 15.2 |
| bacteria | *Enterococcus* | 1 | 1.7 |
| Fungi | *Candida albicans* | 2 | 3.4 |

**Table 4: Antimicrobial Susceptibility Pattern of Gram  negative Bacteria Isolated from Urine Culture of Pregnant Women in Ushafa Community**

| Antibiotics | | | E.coli (%) | Klebsiella spp(%) | P. Aeruginosa (%) | Proteus spp (%) |
|---|---|---|---|---|---|---|
| | | | n=35 | n=7 | n=4 | n=1 |
| AMC | 30mcg | S | 5(14.3) | 2(28.6) | 1(25.0) | 0(0) |
| | | R | 25(71.4) | 3(42.9) | 2(50.0) | 0(0) |
| CTR | 30mcg | S | 7(20.0) | 3(42.9) | 2(50.0) | 0(0) |
| | | R | 2(5.7) | 0(0) | 0(0) | 0(0) |
| COT | 25mcg | S | 7(20.0) | 0(0) | 0(0) | 0(0) |
| | | R | 8(22.9) | 4(57,1) | 2(50.0) | 0(0) |
| LE | 5mcg | S | 28(80.0) | 4(57.1) | 3(75.0) | 0(0) |
| | | R | 0(0) | 0(0) | 0(0) | 0(0) |
| NET | 30mcg | S | 24(68.6) | 4(57.1) | 3(75.0) | 0(0) |
| | | R | 0(0) | 0(0) | 0(0) | 0(0) |
| TE | 30mcg | S | 28(80,0) | 3(42.9) | 2(50.0) | 0(0) |
| | | R | 2(5.7) | 1(14.3) | 2(50.0) | 0(0) |
| OF | 5mcg | S | 31(88.6) | 4(57.1) | 4(100.0) | 0(0) |
| | | R | 0(0) | 0(0) | 0(0) | 0(0) |
| GEN | 10mcg | S | 24(68.6) | 5(71.4) | 3(75.0) | 1(100.0) |
| | | R | 1(2.9) | 0(0) | 0(0) | 0(0) |

Abbreviations: AMC-Amoxyclav, CTR-Ceftriaxone, COT-Co-trimoxazole, LE-Levofloxacin, NET-Netillin, TE-Tetracycline, OF-Ofloxacin, GEN-Gentamycin, *E.coli-Escherichia coli, P.aeruginosa -Pseudomonas aeruginosa,* S-Sensitive, R-Resistance

**Table 5: Antimicrobial Susceptibility Pattern of Gram positive Bacteria Isolated from Urine Culture of Pregnant Women in Ushafa Community**

| Antibiotics | | | S. aureus (%) | Enterococcus (%) |
|---|---|---|---|---|
| | | | n=9 | n=1 |
| AMC | 30mcg | S | 5(55.6) | 0(0) |
| | | R | 2(22.2) | 0(0) |
| CN | 10mcg | S | 1(11.1) | 1(100.0) |
| | | R | 1(11.1) | 0(0) |
| CTR | 30mcg | S | 1(11.1) | 0(0) |
| | | R | 0(0) | 1(100.0) |
| CIP | 10mcg | S | 5(55.6) | 1(100.0) |
| | | R | 0(0) | 0(0) |
| CD | 2mcg | S | 1(11.1) | 1(100.0) |
| | | R | 1(11.1) | 0(0) |
| COX | 1mcg | S | 1(11.1) | 1(100.0) |
| | | R | 3(33.3) | 0(0) |
| COT | 25mcg | S | 2(22.2) | 1(100.0) |
| | | R | 4(44.4) | 0(0) |
| E | 15mcg | S | 3(33.3) | 1(100.0) |
| | | R | 2(22.2) | 0(0) |
| TE | 30mcg | S | 5(55.6) | 1(100.0) |
| | | R | 2(22.2) | 0(0) |

Abbreviations: AMC-Amoxyclav, CN-Cefalexin, CTR-Ceftriaxone, CIP-Ciprofloxacin, CD-Clindamycin, COX-Cloxacillin, COT-Co-trimoxazole, E-Erythromycin, TE-Tetracycline, *S.aureus-Staphylococcus aureus*, S-Sensitive, R-Resistance

was 29.5%. This was higher when compared with rates reported in previous African studies in Ghana (5.5%)[6] and Uganda (12.2%),[7] as well as rates from some centres in Nigeria such as Lagos (14.6%),[9] Kano (9%)[11] and Gwagwalada (12.8%).[10] It is noteworthy that these studies were conducted among pregnant women attending antenatal clinics in tertiary health facilities where regular antenatal education is more likely to be offered. In contrast, the prevalence observed was lower than the two studies conducted in Benin, in a rural primary healthcare setting (45.3%)[14] and at a traditional birth home (55%).[8] This observed prevalence was similar to studies done within Port-Harcourt (29.5%)[12] and Abakaliki (24.7%).[13] The study done in Abakaliki observed a higher proportion of ASB among pregnant women dwelling in the rural areas.

This study showed significant relationship between age and ASB, as the highest prevalence of ASB was in women aged 20 - 24 years, with just one positive culture each among age groups <20 years and >35 years. This is contrary to previous reports in which advancing maternal age was linked with a high prevalence of ASB. However, closer scrutiny of the literature reveals that the effects of age and ASB are poorly characterized, as some studies showed that the prevalence of ASB increased with age, [6,12] while others found it more with a younger age group.[10,14] The younger aged women were more likely to be sexually active which increased the risk of infection by meatal trauma, urethral massage and facilitation of colonisation of the urinary tract by normal vaginal flora.[6]

Pregnant women with lower socio-economic classes and lower levels of education had a higher prevalence of ASB as reported by other authors.[5,24] In this study, social class 4 had the highest (46.7%) prevalence of asymptomatic bacteriuria, followed by those in social class 3 and social class 5. Out of

the five pregnant women noted to be in social class 1, none of them had asymptomatic bacteriuria. Social class is derived from the educational level of the woman, and education improves the beliefs and behaviour of women.[13] Religion or tribe did not have any significant influence on the prevalence of asymptomatic bacteriuria in this study.

This study found no association between gestational age, parity and ASB. This is contrary to findings in some previous studies.[8,10,24] This finding may be due to the relative lower proportion of women in their first trimester and the grand-multiparas, compared to the larger proportion of women in their third trimester and the multiparas, which could have led to a population bias. An equal representation of the different gestational ages and parities would have probably resulted in different findings.

The most prevalent organism observed in this study was Escherichia coli with 59.3% followed by Staphylococcus aureus with 15.2%. The other organisms isolated included Klebsiella species, Pseudomonas aeruginosa, Candida albicans and Proteus specie. The leading role of Escherichia coli in ASB among pregnant women is in agreement with several studies.[7,8,14] Escherichia coli is well-suited to colonise the urinary tract, as it is of anorectal origin, with the proximity of the anal opening to the urogenital region, coupled with poor hygiene, plus the serum resistance and multiple virulent factors it expresses. This finding is however in contrast with a few studies.[9,11,13]

This study revealed that Ofloxacin, Levofloxacin, Gentamycin and Ceftriaxone were effective against most of the gram-negative urinary isolates, while Amoxicillin/Clavulanic acid, Ciprofloxacin, Tetracycline and Erythromycin were effective against the gram-positive isolates. The fluoroquinolones were the most active anti-bacterial agents observed in this study. They have been found to have favourable outcomes with use in pregnancy, are relatively safe, with no human studies observing impaired cartilage development as seen from animal studies, but they are best avoided in the first trimester.[25] This effectiveness

could be attributed to the fact that these drugs are relatively expensive when compared to most antibiotics frequently used, which probably had restricted their procurement and subsequent indiscriminate use, therefore making the organisms susceptible to them. This is similar to other reports where the fluoroquinolones were the most effective choice.[8,9,14] On the other hand, the isolated organisms especially the gram-negative showed remarkable resistance to commonly prescribed antibiotics such as Amoxicillin/ Clavulanic acid, Co-trimoxazole and Cloxacillin. This could be attributed to prescription of antibiotics without laboratory guidance, over-the-counter sales of antibiotics without prescription, low cost and self-medication being practiced in many developing countries including Nigeria.

Some limitations recognised in this study include the selection bias of the participants, making the findings not attributable to the whole rural populace of the FCT, Abuja. There was also a limited study period, as with greater study duration, more patients could have been enrolled strengthening the power of the study.

## Conclusion

This community-based study has shown that the prevalence of asymptomatic bacteriuria in pregnancy is high and was significantly affected by age and social class. Although symptoms are good markers of UTI during pregnancy, care of pregnant women should be directed at urine examination to discover asymptomatic cases. There is therefore the need for sensitization of pregnant women, strengthening of the public health system especially at the primary healthcare level, antenatal attendance and routine urine culture test in areas of observed high prevalence. This would aid in detection of susceptibility of specific pathogens, assist clinicians in the rational choice of antibiotic therapy and prevent abuse of antibiotics. Similar community studies using larger population sizes are recommended in different regions of the country to provide more data.

## References

1. Kalinderi K, Delkos D, Kalinderis M, Athanasiadis A, Kalogiannidis I. Urinary tract infection during pregnancy: current concepts on a common multi-faceted problem. J Obstet Gynaecol. 2018;38(4): 448-453.

2. 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. Clin Infect Dis. 2005;40(5):643-54.

3. Smaill FM, Vazquez JC. Antibiotics for asymptomatic bacteriuria in pregnancy. Cochrane Database of Systematic Reviews. 2015;(8),Cd000490. DOI: 10.1002/14651858.CD000490.pub3.

4. Schnarr J, Smaill F. Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. Eur J Clin Invest. 2008;38(S2):50-7.

5. Turck M, Goffe BS, Petersdorf RG. Bacteriuria of pregnancy. Relation to socioeconomic factors. N Engl J Med. 1962;266:857-60.

6. Labi AK, Yawson AE, Ganyaglo GY, Newman MJ. Prevalence and Associated Risk Factors of Asymptomatic Bacteriuria in Ante-Natal Clients in a Large Teaching Hospital in Ghana. Ghana Med J. 2015;49(3):154-8.

7. Mayanja R, Kiondo P, Kaddu S, Ogwang F, Andrew C, Ngonzi J et al. The Prevalence of Asymptomatic Bacteriuria and Associated Factors among Women Attending Antenatal Clinics in Lower Mulago Hospital, Uganda. ASRJETS. 2016;25(1):131-48.

8. Oladeinde BH, Omoregie R, Oladeinde OB. Asymptomatic urinary tract infection among pregnant women receiving ante-natal care in a traditional birth home in Benin City, Nigeria. Ethiop J Health Sci. 2015;25(1):3-8.

9. Olamijulo JA, Adewale CO, Olaleye O. Asymptomatic bacteriuria among antenatal women in Lagos. J Obstet Gynaecol. 2016;36(6):722-25.

10. Ibrahim AH, Yunusa T. Asymptomatic Bacteriuria among Pregnant Women Attending Antenatal: Evaluation of Screening Test. IOSR Journal Of Pharmacy. 2015;5(8):41-7.

11. Aminu KY, Aliyu UU. Asymptomatic Bacteriuria in Pregnant Women in the Antenatal Booking Clinic at Aminu Kano Teaching Hospital, Kano, Nigeria. Open Journal of Obstetrics and Gynecology. 2015;5:286-97.

12. Izuchukwu KE, Oranu EO, Bassey G, Orazulike NC. Maternofetal outcome of asymptomatic bacteriuria among pregnant women in a Nigerian Teaching Hospital. Pan Afr Med J. 2017;27:69-74.

13. Onu FA, Ajah LO, Ezeonu PO, Umeora OU, Ibekwe PC, Ajah MI. Profile and microbiological isolates of asymptomatic bacteriuria among pregnant women in Abakaliki, Nigeria. Infect Drug Resist. 2015; 8:231-5.

14. Imade PE, Izekor PE, Eghafona NO, Enabulele OI, Ophori E. Asymptomatic bacteriuria among pregnant women. North American Journal of Medical Sciences 2010;2(6):263-66.

15. National Collaborating Centre for Women's and Children's Health. Clinical Guidelines 6. Antenatal Care. Routine care for the healthy pregnant woman. London: National Institute for Clinical Excellence; 2003.

16. WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience. Geneva: World Health Organization; 2016. Executive summary. Available at: www.who.int/reproductivehealth/ publications/maternal_perinatal_health/anc-positive-pregnancy-experience/en/.

17. Dairo M, Owoyokun K. Factors Affecting the Utilization of Antenatal Care Services in Ibadan, Nigeria. ARD Journal. 2010;12(1):3-13.

18. Nigeria Demographic and Health survey 2013 Preliminary report. National Population Commission Abuja. Nigeria measure DHS ICF International Claverton, Maryland.

19. Olusanya O, Okpere E, Ezimokhai M. The importance of social class in voluntary fertility control in developing countries. West Afr J Med. 1985;4:205-7.

20. Araoye MO. Subject selection. In: Araoye MO (ed.) Research methodology with statistics for Health and Social Sciences. First Edition. Nathadex Publishers; 2003:115-29.

21. Franz M, Horl WH. Common errors in diagnosis and management of urinary tract infection. I: patho-physiology and diagnostic techniques. Nephrol Dial Transplant. 1999;14(11):2746-53.

22. Cowan ST, Steel KJ. Manual for the identification of medical bacteria. 2nd edition. Cambridge: Cambridge University Press; 1974.

23. National Committee for Clinical Laboratory Standards. Performance Standards of Antimicrobial susceptibility testing. Ninth International Supplement. 1999:M100S9.

24. Jojan J, Davane M, Dawle C, Nagoba B. Asymptomatic Bacteriuria in Pregnant Women from Rural Area of Latur District of Maharashtra, India. JKIMSU. 2017;6(3):48-54.

25. Yefet E, Schwartz N, Chazan B, Salim R, Romano S, Nachum Z. The safety of quinolones and fluoroquinolones in pregnancy: a meta-analysis. Bjog. 2018;125(9):1069-76.