British Microbiology Research Journal
9(5): 1-10, 2015, Article no.BMRJ.18857
ISSN: 2231-0886

SCIENCEDOMAIN *international*
www.sciencedomain.org

Prevalence of Asymptomatic Bacteriuria among Antenatal Patients at University of Abuja Teaching Hospital, Gwagwalada, Nigeria

Habiba Ibrahim Abdullahi[1], Richard A. Offiong[1], Teddy E. Agida[1] and Yunusa Thairu[2*]

[1]Department of Obstetrics and Gynaecology, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria.
[2]Department of Microbiology and Parasitology, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author HIA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript and managed literature searches. Authors RAO, TEA and YT managed the analyses of the study and literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BMRJ/2015/18857
Editor(s):
(1) Lachhman Das Singla, Department of Veterinary Parasitology, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, India.
Reviewers:
(1) A. Papazafiropoulou, Department of Internal Medicine and Diabetes Center, Tzaneio General Hospital of Piraeus, Greece.
(2) Anonymous, Zagazig University, Egypt.
Complete Peer review History: http://sciencedomain.org/review-history/10285

Original Research Article

Received 13th May 2015
Accepted 22nd June 2015
Published 23rd July 2015

ABSTRACT

Introduction: Urinary tract infections pathogens are common among pregnant women but the detection and treatment of asymptomatic bacteriuria in pregnancy will prevents urinary tract infection and its consequences in pregnancy. Therefore, this research set out to determine the prevalence of asymptomatic bacteriuria and its socio-demographic characteristics amongst pregnant women attending antenatal clinic at the University of Abuja Teaching Hospital, Abuja.
Methodology: This was a descriptive cross-sectional study. One hundred and twenty-five consecutive asymptomatic pregnant women who attend antenatal clinic were recruited and were well informed to collect clean catch midstream urine aseptically.
Results: Urine samples of 125 asymptomatic pregnant women were examined and screened for

**Corresponding author: E-mail: samhaamal200@gmail.com;*

bacteria pathogens, 16 had positive urine cultures giving asymptomatic bacteriuria prevalence rate of 12.8%. Positive urine cultures were more common in women of low parity (81.5%) and those in the age group 30-34 years (50.0%). It was also most common in the second trimester of pregnancy (81.3%) and among women with tertiary education (68.8%). The bacteria isolated were sensitive to nitrofurantoin in 87.5% of cases and to amoxyclav in 6.3% of cases.
Conclusion: The prevalence of asymptomatic bacteriuria in our centre is relatively high. Laboratory investigations still remain relevant in corroborating the clinical entity despite no symptoms.

Keywords: Asymptomatic UTIs; prevalence rate; pregnancy; antibiogram; Gwagwalada.

1. INTRODUCTION

Urinary tract infections (UTIs) are common in pregnant women. By convention, UTI is defined either as a lower tract (acute cystitis) or upper tract (acute pyelonephritis) infection [1] and this is usually encountered in pregnancy but Obstetricians would rather start empirical treatment with antibiotics while awaiting laboratory evidence of bacteriuria. Asymptomatic bacteriuria is common among women and this could be explained by the short course of the female urethra and its proximity to the vagina and anus [1,2,3]. Exposure of the urogenital system to bacteria during intercourse and incomplete emptying of bladder in women compared to men may also contribute to the increased risk of asymptomatic bacteriuria [4].

Asymptomatic bacteriuria is a major risk factor for developing symptomatic urinary tract infection and may be associated with adverse effects on maternal and foetal health [4]. Asymptomatic bacteriuria is associated with increased maternal and perinatal morbidity and mortality. Maternal complications include respiratory insufficiency, septicaemia, renal dysfunction, anaemia, hypertension, pre-eclampsia and chorioammionitis [5,6]. In the pre-antibiotic era, acute pyelonephritis was associated with 20-50% incidence of preterm labour [6,7].

Results of meta-analysis of seventeen cohort studies showed a strong association between asymptomatic bacteriuria and preterm birth and low-birth weight [7]. In this study Romero et al reported that women with asymptomatic bacteriuria had a 54% higher risk of low birth weight neonates and twice the risk of preterm delivery compared with non-bacteriuric women [7-14].

Escherichia coli (*E. coli*) is the most common pathogen associated with asymptomatic bacteriuria in most studies representing 80% of the isolates [15,16]. Although staphylococcus is not considered as a typical uropathogen, it was however, the commonest pathogen isolated in Ibadan, Benin City and Port Harcourt [17,16,15]. The most common pathogen isolated in Enugu was *E. coli* [18]. *E. coli* was also the most common organism isolated in Kumasi, Ghana [19] and virtually all studies from America, United Kingdom and Middle East [20,21,22].

The prevalence of asymptomatic bacteriuria is generally between 2–10% of all pregnancies and is similar to that observed among non-pregnant women [1,2]. The prevalence of asymptomatic bacteriuria among men is <1% [4]. The prevalence of UTIs can be affected and influence by the socioeconomic status of the family, the patient's ethnical and cultural background. These factors increases the risk of maternal and feotal outcome [1,2,23,24]. In an American study, the prevalence was found to be higher among Afro-American multiparous women with AS genotype, and low among the affluent white American women [25]. In North America the prevalence is 4–7% [20], while it is 2-5% in the United Kingdom [21], 1.7% in Jeddah Saudi Arabia [22] and 7.3% in Ghana [19].

While prevalence rates from most studies including observational studies from developing countries fall within the general range of 2-10%, in Nigeria the prevalence of asymptomatic bacteriuria varies from centre to centre. In Kano and Sokoto the prevalence is 8% [26,27], 10.7% in Ibadan [15], 15.1% in Enugu [18] and 86.6% in Benin City [16]. Screening for asymptomatic bacteriuria in pregnancy has become a standard obstetric care in developed countries and most ante natal care guidelines include screening for and treatment of asymptomatic bacteriuria [14,28,29]. The result of this study will determine the prevalence of asymptomatic bacteriuria in this centre which will serve as a guide to deciding whether routine screening for asymptomatic bacteriuria in pregnancy is beneficial or not. Therefore, the aim of this study was to determine the prevalence of asymptomatic bacteriuria

among pregnant women accessing antenatal care at the University of Abuja Teaching Hospital (UATH), Gwagwalada, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Background

The study was conducted at the Department of Obstetrics and Gynaecology; and subjects were recruited only from antenatal clinic, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Federal Capital Territory (F.C.T), Nigeria. The Federal Capital Territory had a projected population of 1,406,239 inhabitants in the year 2006, of which 157770 (11.22% approximately) inhabitants reside in Gwagwalada [30]. The Hospital has an average of 3,000 deliveries annually, and annual attendees at the booking antenatal clinic well over 5,000.

2.2 Study Population

The subjects were recruited from pregnant women attending the antenatal clinic. The population was a mixture of rural and urban dwellers. Those who consented to participate in the study were enrolled and were informed about the need for this work using the study tools (questionnaire and consent form).

2.3 Inclusion Criteria

i) All pregnant women with no symptom who gave consent
ii) All women booked for antenatal care in the hospital

2.4 Exclusion Criteria

i) Patient that discontents to be part of the study.
ii) History of diabetes mellitus, renal disease or sickle cell anaemia
iii) All pregnant women who are diagnosed of parasitic plasmodiasis.

2.5 Study Design

The study was a prospective, cross sectional, hospital based study.

2.6 Study Sample Size

The sample size was calculated using the statistical formula of Fischer [31]:

$$n = z^2 p q / d^2$$

Where:

n = minimum sample size
Z = standard deviation at 95% confidence interval= 1.96
P = prevalence of asymptomatic bacteriuria (8%) [26] as local prevalence
N= the minimum sample size = 113

Therefore, the sample size was 125.

2.7 Methods

This study was conducted in conjunction with the Clinical Microbiologist in the Department of Medical Microbiology. The purpose of this study was explained to the subjects before their consent to participate was sought. The consent form was filled by the investigator and the subjects recruited signed the form. Interviewer-administered, structured questionnaires were used as the study tool. The questions outlined in the data forms were explained to the subjects and completed forms which contained information that included the bio-demographic data (such as subject age, gravid age, parity, educational status), provisional diagnosis and laboratory processes, such that the eventual result was noted in the data forms and communicated to the Obstetrician and the patients.

3. SPECIMEN COLLECTION, TRANSPORTATION AND PROCESSING

All the subjects were given plastic universal sterile transparent container with screw cap and were enlightened to clean the genital area three times with lukewarm water and allowed to air dry, avoiding chemicals. In addition, the cleaning should be anterior to posterior in unidirectional with the labial majora and minora held apart. Clean catch midstream urine was collected and submitted to the microbiology and immunology research laboratory where macroscopy, microscopy, cultural characterization and antibiogram were performed.

The type and quality of specimens submitted to the laboratory usually determines the success of isolating the bacteria. Each specimen received should therefore be examined for quality, in terms of amount, sterility and presence or absence of debris [32].

The urine specimen was macroscopically examined for turbidity, presence of blood and divided into two equal parts. Urine obtained from the first part (uncentrifuge urine) was used for urinalysis and Gram's stain procedure while urine from the second container were aseptically centrifuged at 3000 rpm for 5 minutes, with the supernatant discarded and the residue used in inoculating blood agar and Cysteine Lactose Electrolyte Deficient (CLED) and the remaining residue was microscopically examined, presence of pus cells was noted. Calibrated wire loop with internal diameter of 5mm that delivers 0.002 ml was used to inoculate the samples on those media. The cultures were incubated at 37°C for 18-24 hours with adequate moisture. Positive nitrite on urinalysis and presence of pus cells were considered features suggestive of urinary tract infection but the presence of at least one Gram organism per oil-immersion field in uncentrifuged urine or colony count of greater than 10^5/µl of urine from overnight growth on blood agar plate was considered significant bacteruria. After overnight incubation on the CLED, the growth characteristics were noted and pure growth was Gram stained [32,33]. Colonies that were Gram positive were further characterized using the catalase, coagulase and novobiocin disc tests. Those with Gram negative were further characterized using the API 20 (Oxoid, 211667 Hampshire, UK). Gram negative identification and iMMVPC test (indole, motility, methyl red, voges-proskeuer and citrate) [33].

Antibiotics susceptibility pattern was determined using the Muller-Hinton mediaby the disk diffusion method. Materials used were; Muller-Hinton media, Petri dish, Antibiotics disks (oxoid, Hamsphire, UK), Mac falance standard, sterile swab stick, control strains (*Staphylococcus aureus* ATCC 29213, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Enterococcus faecalis* ATCC 29212) [24].

3.1 Data Analysis

Data were analysed using SPSS 16.0 software. The chi square-test and Fischer exact test was used to perform and establish any statistical difference. Probability values of <0.05 was considered as statistically significant.

3.2 Ethical Considerations

The study was approved by the Ethical Committee of University of Abuja Teaching Hospital (U.A.T.H).

4. RESULTS

A total of 125 consecutive consenting women who met the inclusion criteria were screened for asymptomatic bacteriuria. The socio-demographic characteristics of the women are shown on Table 1. Their ages ranged between 19 and 41 years with a mean of 28.9 years ±4.2. The median and modal ages were 28 and 30 years respectively. Most of the women were married (98.4%) while 1.6% were single. Majority of the women (55.2%) had tertiary education; 35.2% had secondary education, 8.8% had primary education while only 1.6% had no formal education. Seventy-eight (77.6%) of the women were Christians while the rest were Muslims.

Their parities ranged between 0 and 6 with a modal parity of 0. There were 49 nullipara (39.2%), 24(19.2%) were Para 1, 28 (22.4%) were Para 2, 12 (9.6%) were Para 3, 6 (4.8%) were Para 4 and 6 (4.8%) were grand multipara. The gestational age ranged between 5 and 37 weeks with a modal gestational age of 30 weeks and mean of 20.6±8.1 weeks. Table 1 also showed that 16.8% were in the 1st trimester 52% in the second and 31% in the 3rd trimester.

Table 1 also showed that 32% of the women were civil servants, 31% were house wives, 22.4% were traders, 11.2% were students and 3.2% constituted others. Majority of the women were Igbo (40%), while 17% were Yoruba, 6.4% were Hausa and 40% were other tribes mostly from the north central Nigeria.

Table 1 shows that out of 125 urine samples examined, 16 women had positive cultures, giving a prevalence rate of 12.8% for asymptomatic bacteriuria. The highest frequency ratio (relative ratio) was among age group <20 years (0.33) and the lowest was among age group 25-29 years (0.06). The association was not statistically significant (p=0.245).

Women with parity 3-4 had the highest frequency ratio (0.17), followed by para 1-2 (0.14) and nullipara (0.12) while there was no bacteriuria among the grand multipara. The Chi square test of association between parity and significant bacteriuria showed no significant difference (p=0.764).

Table 1 also showed that the relative ratio for asymptomatic bacteriuria was highest in the 3rd trimester (0.19) followed by that of the 2nd trimester (0.17) and lowest in the 1st trimester (0.10). The highest absolute rate was however

found in the 2nd trimester (81.3%). This association was found to be statistically significant (p=0.374).

Asymptomatic bacteriuria was also highest among civil servants (56.3%) and lowest among housewives (1%) and farmer (0%). The relative ratios were 0.23, 0.14 and 0.03 for civil servants, traders and housewives respectively. The x^2 was 7.703 and the p-value was 0.173 and not statistically significant.

The prevalence was highest among married women as all the 16 positive cases were among the married women (100%) with a p value of 0.585 which is however not statistically significant. It was commonest among women with tertiary education (68.8%) with a relative ratio of 0.16 and lowest among those with no formal education and primary education, 0% and 6.3% respectively but the association was not statistically significant (p= 0.678).

Majority of the positive cases were Christians (87.5%) while 12.5% were Muslims with relative ratios of 0.14 and 0.07 respectively. It was however not statistically significant (p=0.309).

Table 2 shows the bacterial pathogens isolated from 16 women with asymptomatic bacteriuria.

Table 1. Socio-demographic characteristics of respondents

Variables	**Subjects (%)**	**Significant bacteriuria**	%	**Relative ratio**
Maternal age(years)				
<20	3 (2.4%)	1	6.3	0.33
20-24	13 (10.4%)	1	6.3	0.08
25-29	50 (40.0%)	3	18.8	0.06
30-34	45 (36%)	8	50.0	0.18
≥35	14 (11.2%)	3	18.8	0.22
Total	125 (100%)	16	100.0	X^2=5.090 P =0.245
Parity	**Subjects (%)**	**Significant bacteriuria**	**%**	**Relative ratio**
0	49 (39.2%)	6	37.8	0.12
1-2	52 (41.6%)	7	43.8	0.14
3-4	18(14.4%)	3	18.8	0.17
≥5	6(4.8%)	0	0.0	0
Total	125 (100%)	16	100.0	X^2 = 1.156 P= 0.764
Gestational age	**Subjects (%)**	**Significant bacteriuria**	**%**	**Relative ratio**
1st trimester	21 (16.8%)	1	6.3	0.10
2nd trimester	65 (52%)	13	81.3	0.17
3rd trimester	39 (31.2%)	2	12.5	0.19
Total	125 (100%)	16	100.0	X^2 =5.090 P= 0.374
Occupation	**Subjects (%)**	**Significant bacteriuria**	**%**	**Relative ratio**
Housewife	39 (31.2%)	1	5.3	0.03
Civil servant	40 (32.0%)	9	56.3	0.23
trading	28 (22.4%)	4	25.0	0.14
Farming	1 (0.8%)	0	0.0	0.0
Student	14 (11.2%)	2	12.5	0.13
Others	3 (2.4%)	0	0.0	0.0
Total	125 (100%)	16	100.0	X^2=7.703 p=0.173
Marital status	**Subjects (%)**	**Significant bacteriuria**	**%**	**Relative ratio**
Single	2 (1.6%)	0	0	0.0
Married	123 (98.4%)	16	100.0	0.13
Total	125 (100%)	16	100.0	X^2=0.298 P= 0.585

E. coli was the commonest bacteria isolated (56.3%), followed by beta haemolytic streptococcus (18.3%), *Klebsiella pneumoniae* (12.5%) and staphylococcus (12.5%).The overall sensitivity of all the bacteria to the tested antibiotics was as follows: Nitrofurantoin 87.5%, meticillin 68.5%, ciprofloxacin 31.3%, erythromycin 31.4%, gentamicin 37.5%, amoxyclav 6.3%, cotrimoxazole 12.5%, ceftriaxone 56.3% and ofloxacin 68.8%.

Table 2. Isolated bacterial pathogens

Bacteria	Number (%)
E. coli	9 (56.3)
Klebsiella spp	2 (12.5)
Streptococcus spp	3 (18.8)
Staphylococcus spp	2 (12.5)
Others	0 (0.0)
Total	16 (100.0)

Table 3 shows the sensitivities and resistance patterns of various antibiotics to the individual bacteria. The table showed that 100% of the *E. coli* were sensitive to ofloxacin while 88.9% were sensitive to meticillin, ceftriaxone and gentamicin. Fifty percent (50%) of *E. coli* were sensitive and 50% resistant to ciprofloxacin while 44.4% were sensitive to and 44.4% resistant to amoxyclav. In 11.2% of *E. coli*, the sensitivity for amoxyclav was not tested. Only 22.2% of *E. coli* were sensitive to cotrimoxazole, 55.6% were resistant and 11.1% were not tested. Only 22.8% of *E. coli* was sensitive to erythromycin while 77.8% were resistant. Nitrofurantoin was sensitive against 89.0% of *E. coli* while 11.1% were resistant to it. The sensitivities of *streptococcus* to antibiotics were as follows: Nitrofurantoin (100%), gentamicin (88.9%), ceftriaxone (100%), methicillin (88.9%), ciprofloxacin (66.7%), erythromycin (33.3%) and cotrimoxazole (33.3%). *Klebsiella pneumoniae* were 100% sensitive to meticillin, cotrimoxazole, ofloxacin, nitrofurantoin, gentamicin, ciprofloxacin and ceftriaxone. They were however 50% sensitive and 50% resistant to amoxyclav. The *staphylococci* were 100% resistant to amoxyclav and cotrimoxazole, while they are 100% sensitive to ciprofloxacin and erythromycin. They were however 50% sensitive and 50% resistant to nitrofurantoin.

5. DISCUSSION

The prevalence rate for asymptomatic bacteriuria of 12.8% in this study was higher than rates reported from Kano, Sokoto and Ibadan [18-20]. It was also higher than the general prevalence of 2-10% from the Cochrane review by Smail and Vazquez [1]. It is however lower than rates from Enugu and Benin-city [21,22]. This difference could be due to the more heterogeneous study population in this study.

The prevalence rate of asymptomatic bacteriuria was higher among the 30-34 and ≥35 year age groups with relative ratios of 0.18 and 0.22 respectively. This is consistent with findings from similar studies from cochrane review, Jeddah, Ghana, Kano, Ibadan and Enugu which showed that the prevalence of asymptomatic bacteriuria increases with age [1,16-21]. The study revealed that the prevalence was highest in the second trimester with a rate of 81.3% in this centre. This finding was also consistent with findings from similar studies from Kano, Sokoto, Enugu, and Ibadan [18-21]. It is however in contrast with the finding from Nnewi where the prevalence was highest in the third trimester [34].

This study showed that asymptomatic bacteriuria is commoner among women of low parity (0-2) with a prevalence of 82.1% which is in keeping with studies from Ibadan [20] and Ilorin [35]. This finding is however in disagreement with similar study in Ghana where the highest prevalence was found among women with high parity [17]. The prevalence of the condition in this study was lowest among grand multipara which is similar to the finding from Ilorin [35] but not in keeping with results from other studies which showed higher prevalence rate among higher parity [3].

The close association between asymptomatic bacteriuria and low socioeconomic class has been documented by various researchers [35,36,37]. However, from this study, the highest prevalence of asymptomatic bacteriuria was found among women with tertiary education (68.8%). The reason for this could not be explained but this finding was in agreement with similar studies from Ibadan and Ilorin where a higher proportion of cases of asymptomatic bacteriuria was found among women with tertiary eduction [36]. Civil servants had the highest prevalence of 56.3% while housewives and other occupation had low prevalence of 6.3% and 0% respectively. This could be due to infrequent voiding of urine by civil servants either due to the tight schedule of work or non conducive toilets resulting in prolonged retention of urine in the bladder which promotes bacterial growth.

Researchers have associated sexual activity with asymptomatic bacteriuria [1,2,4]. This study

Table 3. Antibiotic sensitivity and resistance of isolates

Bacteria	Meticillin	Amoxyclav	Cotrimoxazole	Ofloxacin	Nitrofurantoin	Gentamicin	Erythromycin	Ciprofloxacin	Ceftriaxone
E. coli	88.9% S 11.1%	44.4% S 44.4% R 11.1 NT	22.2% S 55.6% R 22.2% NT	100% S	88.9% S 11.1% R	88.9% S 11.1% R	22.2% S 77.8% R	50% S 50% R	88.9% S 11.1 R
Klebsiella spp	100% S	50% S 50% R	100% S	100% S	100% S	100% S	100% S	100% S	100% S
Strept. spp	88.9% S 11.1R	100% R	33.3% S 66.7% R	66.7% S 33.3% R	100% S	88.9% S 11.1% R	33.3% S 67.7% R	66.7% S 33.3% R	100% S
Staph spp	NT	100% R	100% R	NT	50% S 50% R	NT	100% S	100% S	NT

S= Sensitive; R= Resistant; NT= Not Tested

revealed that all the cases of asymptomatic bacteriuria were among married women and none of the unmarried ones had bacteriuria. The two unmarried women were actually junior secondary school students who conceived through their fellow school mates. This could be due to the fact that sexual intercourse among the married women is likely to be more regular compared to the young unmarried women in this study.

The Christians had a higher prevalence of 87.5% compared with the Muslims with a prevalence of 12.5%. Similar finding was reported in Ibadan and Ilorin [20,32]. The possible reason may be due the regular vulval and anal washing after urination or defaecation among the Muslims [20,35]. However the population of the Christians among the subjects was much higher than that of the Muslims in this study. From the analysis there was ethnic variation in the study.

E. coli was the commonest pathogen isolated in this study (56.3%) and this was consistent with most studies from within and outside Nigeria [1,16-19,21]. *E. coli* were predominantly (88.9%) sensitive to nitrofurantoin, levofloxacin, ceftriaxone and gentamicin. These findings are consistent with findings from several studies including Ghana, Ibadan, kano, Sokoto, Ibadan, Enugu [16-21]. Erythromycin and amoxyclav (amoxicillin / clavulanic acid) were poorly sensitive to *E. coli*. Streptococcus, klebsiella and staphylococcus were highly sensitive to nitrofurantoin, levofloxacin, ceftriaxone and gentamicin. Gentamicin is however nephrotoxic and levofloxacin has an effect on foetal bone development.

6. CONCLUSION

The prevalence rate for asymptomatic bacteriuria in this centre (12.8%) was high. Asymptomatic bacteriuria was more common among civil servants, women with tertiary education, Christians, low parity, during second trimester of pregnancy and married women compared to their unmarried group. The Igbo had the highest absolute number but the Yoruba tribe had the highest relative (frequency) ratio of asymptomatic bacteriuria.

The commonest bacteria isolated were *E. coli* with a proportion of 56.3% followed by group B haemolytic streptococci (18.8%) and klebsiella and staphylococci with 12.5% each. Most of the bacteria isolated (87.5%) were sensitive to nitrofurantoin, ofloxacin (68.8%) and ceftriaxone (56.3%). The bacteria were least sensitive to amoxyclav (12.5%).

E. coli was highly sensitive to nitrofurantoin, gentamicin and ofloxacin, while Streptococcus was highly sensitive to nitrofurantoin, cotrimoxazole, ceftriaxone and ciprofloxacin. Klebsiella was highly sensitive to nitrofurantoin, cotrimoxazole, ofloxacin, gentamicin and ceftriaxone, while staphylococcus was sensitive to ciprofloxacin and erythromycin.

7. RECOMMENDATION

High prevalence rate for asymptomatic bacteriuria in this centre necessitates routine screening in the second trimester. The treatment for asymptomatic bacteriuria should be based on sensitivity testing and the safety profile of the antibiotic. If empirical treatment is considered then nitrofurantoin should be the antibiotic of first choice. A follow up study of the women with positive cultures after treatment is recommended, to evaluate the clearance and recurrence rates and the outcome of their pregnancies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Smail F, Vazquez JC. Antibiotics for asymptomatic bacteriuria in pregnancy. Cochrane Database of systematic Reviews. 2007;2:224.
2. Smail F. Asymptomatic bacteriuria in pregnancy. Best Practice and Research Clinical Obstetrics and Gynaecology. 2007;21(3):439-450.
3. Wadland WC, Plante DA. Screening for asymptomatic bacteriuria in pregnancy: A decision and cost analysis. J Fam Pract. 1989;29:372-376.
4. Patterson TF, Andriole VT. Detection, significance and therapy of bacteriuria in pregnancy: Update in the managed health era. Infect Dis Clin North Am. 1997;11: 593-608.
5. Rouse DS, Andrews WW, Goldenberg RL, Owen J. Screening and treatment for asymptomatic bacteriuria of pregnancy to prevent pyelonephritis; cost effectiveness

and cost benefit analysis. Obstet Gynaecol. 1995;86(1):119-123.
6. Hill JB, Sheffield JS, McIntire DD, Wendel GD. Acute pyelonephritis in pregnancy. Obstet Gynaecol. 2005;105:18-25.
7. Romeo R, Oyarzun E, Mazor M. Meta-analysis of the relationship between asymptomatic bacteriuria and preterm delivery/low birth weight Obstet Gynaecol. 1989;73:576-582.
8. Gandy MC, Daling JR, Peterson DR. Maternal urinary tract infections and adverse foetal outcome. AM J Obstet Gynecol. 1981;141:709-716.
9. Naeye RL. Urinary tract infections and the outcome of pregnancy. Adv Nephrol. 1986; 15:95-102.
10. Monif GRG. Intrapartum bacteriuria and post partum endometritis. Obstet Gynaecol. 1991;78:245-248.
11. Lumbiganon P, Laopaiboon M, Thinkhamrop J. Screening and treating asymptomatic bacteriuria in pregnancy. Curropin Obstet Gynaecol. 2010;22(2):95-99.
12. Sobel JD, Kaye D. Host factors in the pathogenesis of urinary tract infections. Am J Med. 1984;76(5):122-130.
13. William F, Ganong MD. Physiology of reproduction in women. Dercheney AH, Nathan L, Goodwin TM, Laufer N (Eds). In: Current Diagnosis and Treatment Obstetrics and Gynecology. 10th Edition. McGraw Hill London. 2007;126-158.
14. U.S. Preventive services Task Force. Screening for asymptomatic bacteriuria. in: Guide to Clinical Preventive Services 2nd Edition; 1996. Available:http//www.ahcpr.gov/clinic/uspstfix.htm (Accessed: Feb. 2011)
15. Awonuga DD, Folawolu AO, Dada–Adegbola HO, Olola FA, Awonuga OM. Predictors of asymptomatic bacteriuria among obstetric population in Ibadan. Niger J Med. 2010;19(2):188-93.
16. Akerele J, Abhulimen P, Okonofua F. Prevalence of asymptomatic bacteriuria among pregnant women in Benin City, Nigeria. J Obstet Gynaecol. 2001;21(2): 141-4.
17. Odigie JO, Amgweje KC. Asymptomatic bacteriuria in pregnancy in Port Harcourt. Asian Pacific Journal of Tropical Medicine. 2010;3(7):580–583.
18. Ezeome VI, Ikeme CA, Okezie AO, Onyebueke AE. Asymptomatic bacteriuria (ASB) in pregnant women in Enugu, Nigeria. Trop J Obstet Gynaecol. 2006; 23(1):12-13.
19. Turpin CA, Minkah B, Danso KA, Frimpong EH. Asymptomatic bacteriuria in pregnant women attending antenatal clinic at komfo Anokye Teaching Hospital, Kumasi, Ghana. Ghana Med J. 2007;41(1):26-29.
20. Mc Lean AB. Urinary tract infection in pregnancy. Br J Urol. 1997;80 (1):10-13.
21. NICE. Antenatal care. Routine care for the healthy pregnant woman. CG62, NICE, London; 2008. (Accessed: 2011).
22. Al Sibiani SA. Asymptomatic bacteriuria in pregnant women in Jeddah, western region of Saudi Arabia: Call for re-assessment. JKAU Med Sci. 2010;17(1): 29-42.
23. Foxman B. The epidemiology of urinary tract infection. Nat Rev Urol. 2010;7(12): 653-60.
24. Kemper KJ, Avner ED. The case against screening for asymptomatic bacteriuria in children. Am J Dis Child. 1992;146(3):343-6.
25. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY. Renal and urinary tract disorders. Williams Obstetrics. 23rd Edition, McGraw Hill Medical London. 2010;1034–1036.
26. Omole-Ohonsi A, Nwokedi E. Asymptomatic bacteriuria in pregnancy in Kano, Northern Nigeria. Nigerian Hospital Practice. 2008;2(4):76-79.
27. Oyetunji JA, Ahmed Y, Nwobodo EI, Aierede LR, Ekele BA. Asymptomatic bacteriuria in pregnancy in Sokoto, Nigeria. Sahel Medical Journal. 2006;9(1): 1-6.
28. Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM. Infectious disease society association of America Guidelines for Diagnosis and Treatment of asymptomatic bacteriuria in adults. Clin Infect Dis. 2005;40:(5)643–654.
29. Royal College of Obstetricians and Gynaecologists (RCOG). Clinical Guideline: Antenatal care: Routine for the healthy pregnant woman. 2008;180-183.
30. The National Population Commission nigeriamuse@gmail.com last updated 10th Nov; 2007. (Accessed: 20th May, 2011).
31. Araoye OA. Research methodology with statistics for health and social sciences. 2nd ed. Ibadan, Nathadex Publishers. 2004; 120.
32. Washington CW, Elmer WK, Williams MJ. Konemans colour atlas and textbook of

diagnostic microbiology. 6th ed. Baltimore, Lippincott Williams & Wilkins. 2006;431-452.

33. Freeman R, Hawkey PM, Lewis DA. Bacteriology of normally sterile body fluids. In: (eds). Medical Bacteriology: Practical Approach. England, Oxford University Press. 1989;21-40.
34. Oli ON, Okafor CI, Ibezim EC, Akujiobi CN, Onwuzu MC. The prevalence and bacteriology of asymptomatic bacteriuria among pregnant antenatal patients in Nnamdi Azikiwe University Teaching Hospital Nnewi; south eastern Nigeria. Niger J Clin Pract. 2010;13(4):409-412.
35. Ajayi BA, Nwabuisi C, Aboyeji AP, Ajayi NS, Fowotade A, Fakeye OO. Asymptomatic bacteriuria in antenatal patients in Ilorin, Nigeria. Oman Med J. 2012;27(1):31-35.
36. Kehinde AO, Adedapo KS, Aimahku CO, Odukogbe AA, Olayemi O, Salako B. Significant bacteriuria among asymptomatic antenatal clinic attendees in Ibadan, Nigeria. Trop Med Health. 2011; 39(3):73-76.
37. Onwujekwe OE, Uzochukwu BC. Socio-economic differences and health seeking behaviour for diagnosis and treatment of malaria. Malarial Journal. 2008;7:5-9.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/10285