Asymptomatic Bacteriuria in Pregnancy: Much Ado about Nothing?

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Abstract

Objectives: To determine the incidence, influence of socio-demographic characteristics and trimesters on the incidence and pattern of bacterial infection at Aminu Kano Teaching Hospital, Kano, Nigeria.

Patients and Methods: This cohort study of asymptomatic bacteriuria among antenatal women was carried out between 1st January 2006 and 31st December 2006. The study variables of interest were the incidence and socio-demographic characteristics of the women that were followed up, incidence of asymptomatic bacteriuria in the three trimesters, and pattern of bacterial infection. The results obtained were recorded using tables and pie chart. Chi-square test and analysis for linear trend in proportions were used to determine association between qualitative variables, and a P-value of less than 0.05 was considered significant.

Results: The incidence of asymptomatic bacteriuria among the recruited pregnant women was 8.0%. Escherichia coli (E coli) and Klebsiella were the commonest microbial organisms that were isolated. Age ($X^2_{trend}= 94.91$, $P< 0.05$), parity ($X^2_{trend}= 21.28$, $P<0.05$), and trimesters ($X^2_{trend} = 56.24$, $P< 0.05$) showed direct correlation, while educational status ($X^2_{trend} = 9.97$, $P< 0.05$) showed inverse correlation with incidence of asymptomatic bacteriuria.

Conclusion and Recommendations: Asymptomatic bacteriuria in pregnancy is a common condition in our obstetric practice. Health education about personal hygiene should be emphasized in our antenatal clinics. Urine microscopy to screen for asymptomatic bacteriuria at booking, and in each of the trimesters should be recommended. Identified cases should be treated with appropriate antibiotic therapy based on sensitivity test..

Key words: *Asymptomatic bacteriuria, pregnancy, incidence, socio-demographic factors.*

Introduction

The presence of a significant quantity of bacteria in a urine specimen properly collected from a person without symptoms or signs of urinary tract infection (UTI) characterizes asymptomatic bacteriuria[1,2]. The prevalence of asymptomatic bacteriuria in pregnancy has been reported to be higher in developing countries compared to developed countries, because of higher standard of living in developed countries[2-6].

Because leukocyte esterase and nitrite tests have low sensitivity for identifying bacteriuria in women who are pregnant, these patients should be screened with urine culture[1,4], however, the optimal frequency of urine culture screening has not been established[7]. A single urine culture at the end of the first trimester generally is recommended based on clinical outcomes and cost-effectiveness[1]. Women with asymptomatic bacteriuria or symptomatic UTI during pregnancy should be treated, and should undergo periodic screening for the duration of their pregnancy[7]. The IDSA makes no recommendations for subsequent screening of pregnant women found to have no asymptomatic bacteriuria at the initial screen[1].

Asymptomatic bacteriuria is common in pregnancy due to the hormonal and physical changes that occur in the urinary tract[2]. The surge in progesterone causes a reduction in smooth muscle tone and peristalsis, with resultant dilatation of the ureters and urinary bladder, leading to increase in dead space (hydronephrosis of pregnancy)[5-8]. Together with compression of the

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ureters at the pelvic brim in late pregnancy, and subtle congenital renal anomaly, result in urinary stasis from delay in transit time and vesico-ureteric reflux[3]. Increase in glomerular filtration rate in pregnancy results in physiological glycosuria in about 60% of pregnant women[2], while the high level of serum estrogen and progesterone in pregnancy reduce the body's resistance to bacterial infection[8,9]. These encourages the proliferation of bacteria in the urine[2].

One of the commonest problems in pregnancy is urinary tract infection (UTI), majority of which are preceded by asymptomatic bacteriuria[4]. Neglecting the diagnosis and treatment of women with asymptomatic bacteriuria may result in maternal morbidity and mortality, because the condition may progress silently and lead to serious fetomaternal complications in about 40-50% of cases[2-4]. Early diagnosis and treatment is the hallmark of management in order to prevent sequelae like urinary tract infection, pyelonephritis, anaemia, preterm labour, intrauterine growth retardation, acute/chronic renal failure, intrauterine fetal death, and maternal and perinatal mortality[7-10]. Women with asymptomatic bacteriuria during pregnancy are more likely to deliver premature or low-birth-weight infants and have a 20- to 30-fold increased risk of developing pyelonephritis during pregnancy compared with women without bacteriuria[1,11].

Studies have consistently reported that treatment of asymptomatic bacteriuria in pregnancy decreases the risk of subsequent pyelonephritis from a range of 20 to 35 percent to a range of 1 to 4 percent[1]. Antimicrobial treatment of asymptomatic bacteriuria also improves fetal outcomes, with decreases in the frequency of low-birth-weight infants and preterm delivery[11].

The commonest pathogen that is associated with asymptomatic bacteriuria is E coli[2], and is cultured in about 70 to 80% of cases[2-4]. Other associated pathogens include Klebsiella pneumonia, Proteus mirabilis, Staphyloccus aureus, group-B β-Haemolytic streptococcus[2-6].

The cost of screening and treating asymptomatic bacteriuria in pregnancy in the United States of America is US$ 1605[10], which may not be affordable in developing countries like ours, and may make some health centres to omit screening for this silent condition in their routine tests.

This study was designed, to determine the incidence, influence of sociodemographic factors and trimesters on the incidence, and microbial aetiology of asymptomatic bacteriuria in pregnancy at Aminu Kano Teaching Hospital, Kano, so as to highlight its relevance, and make recommendations that will reduce its incidence and health implications in our community.

Patients and Methods

This cohort study of asymptomatic bacteriuria among antenatal women, who met the recruitment criteria, was carried out between 1st January 2006 and 31st December 2006, at Aminu Kano Teaching Hospital, Kano, Nigeria, The study variables of interest were the incidence and socio-demographic characteristics of the women that were followed up, incidence of asymptomatic bacteriuria in the three trimesters, and pattern of bacterial infection. The recruited women were the antenatal women booked in the first trimester, and were followed up till the third trimester.

For the purpose of this study, quantitative criteria for identifying significant bacteriuria in an asymptomatic pregnant woman was at least 100,000 colony-forming units (CFUs) per mL of urine, in a voided midstream clean-catch specimen[1,7]. The diagnosis of asymptomatic bacteriuria in pregnancy was made, only if the same species was present in quantities of at least 100,000 CFUs per mL of urine, in at least two consecutive voided specimens[1].

First trimester was taken as gestational age of less than 14 weeks, while second trimester was 14 weeks to less than 28 weeks, and third trimester 28 weeks till delivery.

The exclusion criteria were those women who booked after the first trimester, who had bacteriuria and symptoms (UTI), diabetes mellitus, hypertension or known renal disease. IDSA guidelines that screening for or treatment of asymptomatic bacteriuria in women with diabetes is not indicated, because women with diabetes show no difference between initially asymptomatic bacteriuric and nonbacteriuric women in the incidence of UTI[1].

After informed consent, the recruited women were made to collect a mid stream 'clean-catch' specimen of urine in sterile universal bottles in each of the three trimesters (first trimester was at booking, second was at 24-26weeks, and third at 34-36 weeks), under the supervision of trained female medical workers in the hospital. This was collected by the women standing with their legs and vulva parted and the vestibule was washed with sterile water, before the middle stream of the urine was collected in the sterile universal bottle. The first and last parts of the urine that was voided were discarded.

The urine samples were sent immediately to the laboratory for urinalysis with microscopic examination for bacteria. Those with significant bacteriuria were made to submit a second urine sample for microscopic examination. Plating of about 0.025mls of uncentrifuged urine samples on to cysteine-lactose-electrolyte deficient (CLED) media and MacConkey agar plates were done, followed by overnight incubation of the inoculated plates under aerobic condition at 37^0c. Species identification from the samples were done, and Stoke's disc diffusion technique was used to determine their antimicrobial sensitivities.

The results obtained were recorded using tables and pie chart. Chi-square test and analysis for linear trend in proportions were used to determine association between qualitative variables, and a P- value of less than 0.05 was considered significant.

Results

During the period of study, 518 antenatal women booked in the first trimester, among them 482 antenatal women were followed up till the third trimester and met the recruitment criteria. Following urine microscopy, 171 women were found to have asymptomatic bacteriuria, giving an incidence of 35.5% for asymptomatic bacteriuria among the women the recruited women.

The age range was between 15 to 42 years, with a mean age of 32.1 ± 7.8 years. Parity range was between 0 to 12, with a mean parity of 4.8 ± 1.9. Age ($X^2_{trend} = 94.9$, P< 0.05) and parity ($X^2_{trend} = 21.28$, P<0.05) showed significant association with occurrence of asymptomatic bacteriuria. There was increasing frequency of asymptomatic bacteriuria with increasing age and parity, with the highest frequency among the 35 to 39 years age group and Para 5 and above. Educational status ($X^2_{trend} = 9.97$, P< 0.05) showed significant association with occurrence of asymptomatic bacteriuria. Those who had no form of education had the highest frequency, followed by those who had Qur'anic education only. **(Table 1)**.

Trimesters showed significant association with occurrence of asymptomatic bacteriuria ($X^2_{trend} = 56.24$, P< 0.05). The incidence of asymptomatic bacteriuria increased with increasing trimesters. The least incidence was in the first trimester (percentage of frequency = 1.1), while the highest was in the third trimester (percentage of frequency = 4.8). **(Table 2)**.

Microbial aetiology showed significant association with asymptomatic bacteriuria ($x^2_{trend} = 152.31$, P< 0.05), with E coli (75.0%) being the commonest pathogen that was isolated. Others were Klebsiella pneumonia (9.0%), Staphylococcus aureus (7.0%), Streptococcus faecalis

(5.0%), Proteus mirabillis (4.0%). **(Fig. 1)**. All the women with positive urine culture were treated with antibiotics based on culture and sensitivity result. There was no recurrence of asymptomatic bacteriuria among the patients.

Discussion

The incidence of asymptomatic bacteriuria in pregnancy, in a cohort study among antenatal women in this study of 35.5%, 17.9% from Benin City[2], and 26.0% from Ile-Ife[4], all from Nigeria, are high rates compared to 8.1% that was reported from Turkey[12], and 6.1% from Iran[11]. This highlights the magnitude of the problem of this silent condition called asymptomatic bacteriuria in pregnancy, among our antenatal patients in Nigeria, and will necessitate urgent intervention, in order to ensure that screening throughout pregnancy, and especially in the third trimester of pregnancy, and proper treatment of cases in our antenatal clinic is made mandatory, in order to reduce the incidence of asymptomatic bacteriuria in pregnancy, which has been incriminated in several adverse outcomes of pregnancy[2].

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The incidence of asymptomatic bacteriuria in pregnancy has been shown in many studies to increase with increasing maternal age and parity, because of increasing incidence of medical disorders like diabetes mellitus with age, and relaxation of the urinary and genital tract with increasing parity[12]. This was also the findings in this study.

Onyemelukwe in Enugu[6], Nigeria, found that women in the low socioeconomic class and those with low literacy levels are more at risk of asymptomatic bacteriuria in pregnancy, because of poor standard of living, unsatisfactory personal hygiene and several personal behaviour[6]. This agrees with the findings of this study, and may also explain the great difference between rates of asymptomatic bacteriuria in pregnancy among developed and developing countries. The higher standards of living may contribute to the lower incidence rates of asymptomatic bacteriuria in pregnancy in the developed world[3,12].

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The incidence of asymptomatic bacteriuria was highest in the third trimester and least in the first trimester, which agree with the study from Ile-Ife[4] and Turkey[12], perhaps because the predisposing factors, which are mechanical and hormonal changes of pregnancy which lead to urine stasis, increases as the gestational age increases[4,5]. Also, increase in urinary estrogen and progesterone with increasing gestational age[4,5], may lead to lower immune status with decreased ability of the lower urinary tract to resist invading bacteria, and decreased urethral tone that possibly allow some strains of bacteria to selectively grow[11,12].

E. coli (75%) followed by Klebsiella (9%) were the commonest pathogenic organisms that were isolated, which agrees with the findings in other studies[6]. The high prevalence of gram negative bacteria in the urine cultures of women with asymptomatic bacteriuria in pregnancy, has been attributed to the proximity between the gastrointestinal and genitourinary tracts[12]. Recent studies from Ile-Ife[4] in Nigeria found Staphylococcus aureus to be the commonest aetiological agent, which did not agree with the findings of this study, probably because of sociocultural restrictions in our community[13]. The increasing importance of organisms other than enteric organisms in the bacterial aetiology of asymptomatic bacteriuria in pregnancy, has been attributed to permissive social behaviours[6].

Conclusion and Recommendations

Asymptomatic bacteriuria in pregnancy is a common condition at Aminu Kano Teaching Hospital, and gram negative organisms were the commonest bacterial aetiology. Health education about personal hygiene and social habits should be emphasized in our antenatal clinics to all pregnant women. Urine microscopy to screen for asymptomatic bacteriuria in pregnancy is

recommended at booking, and in each of the trimesters, particularly in the third trimester, especially among women with advanced maternal age, high parity and low literacy level. Pregnant women with asymptomatic bacteriuria, should be treated with appropriate antibiotic therapy based on sensitivity tests, so as to avoid feto-maternal complications.

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Table 1: Socio-demographic characteristics of the respondents

Variable	Frequency		% of positive culture
	Positive culture	Negative culture	
Age			
15-19	12	416	2.8
20-24	21	492	4.1
25-29	19	387	4.7
30-34	38	347	9.9
35-39	55	223	19.8
≥40	26	102	20.3
$X^2_{trend} = 94.9$, P< 0.05			
Parity			
0	21	514	3.9
1	27	443	5.8
2	19	323	5.6
3	27	272	9.0
4	31	226	12.1
≥5	46	189	19.6
$X^2_{trend} = 21.28$, P<0.05.			
Educational status			
No form	23	84	21.5
Qu'ranic only	83	1029	7.5
Western	65	854	7.1
$X^2_{trend} = 9.97$, P< 0.05			

Table 2: Incidence in the three trimesters

Trimester	Frequency		% of positive culture
	Positive culture	**Negative culture**	
First	23	2115	1.1
Second	46	2092	2.2
Third	102	2036	4.8

$X^2_{trend} = 56.24$, P< 0.05

Fig 1 Microbial pattern of organism isolated