Original article

Significant Bacteriuria Among Asymptomatic Antenatal Clinic Attendees In Ibadan, Nigeria

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Abstract: Untreated asymptomatic bacteriuria can lead to urinary tract infection (UTI) in pregnancy with devastating maternal and neonatal effects such as prematurity and low birth weight, higher fetal mortality rates and significant maternal morbidity. We carried out a two year (April 2007 to March 2009) cross-sectional epidemiological study to determine the prevalence of significant bacteriuria among asymptomatic antenatal clinic attendees at two antenatal clinics (ANCs) in University College Hospital and Adeoyo Maternity Hospital, both in Ibadan, Nigeria.

All consenting ANC attendees without UTI were enrolled in the study. Urine specimens of 5 to 10 ml collected from each subject were examined microscopically for white blood cells, red blood cells and bacteria. The specimens were further cultured on MacConkey agar using a sterile bacteriological loop that delivered 0.002 ml of urine. Colony counts yielding bacterial growth of more than 10^5/ml of pure isolates were considered significant.

Of the 473 subjects studied, 136 had significant bacteriuria, giving a prevalence rate of 28.8%. The highest age specific prevalence (47.8%) was found in the 25–29 year olds while only one (0.7%) was found in the teenage group. A large percentage (64.0%) of subjects with significant bacteriuria had tertiary education, compared with 4.4% who had no formal education but the association was not statistically significant ($X^2 = 0.47$, $p = 0.79$). The majority (75.8%) of subjects with significant bacteriuria had no previous history of abortion, while 20 (14.7%) had one previous abortion and only three (2.1%) admitted to three previous abortions ($X^2 = 5.16$, $p = 0.16$). The majority (69.8%) of those with significant bacteriuria presented at second trimester while 38 (28.0%) presented at third trimester ($X^2 = 6.5$, $p = 37$).

Only 22 (4.6%) of the studied subjects presented at first trimester, and 3 (13.7%) of these had significant bacteriuria. The prevalence of asymptomatic bacteriuria is high among this study population. Hence we suggest that advocacy programs be initiated to urge pregnant women to access ANC services early in pregnancy.

Key words: Asymptomatic, antenatal clinic, bacteriuria, Ibadan

INTRODUCTION

Several factors make urinary tract infection (UTI) a relevant condition of the gestational period with significant maternal and perinatal adverse effects [1]. Symptomatic and asymptomatic UTIs are common in pregnancy [1]. For many years, pregnancy has been considered a factor predisposing to all forms of UTI. Today, however, it is known that pregnancy as an isolated event is not responsible for a higher incidence of UTI [1].

Bacteriuria is defined as the presence of bacteria in urine. Diagnosis of asymptomatic UTI is conducted mainly by the microbiological method. A patient is said to have asymptomatic UTI when there is significant bacteriuria without obvious clinical manifestations. Significant bacteriuria is defined as a urine sample containing more than 10^5 colonies/ml of urine (10^8/L) in pure culture using a standard calibrated bacteriological loop [2].

The anatomical and physiological changes imposed on the urinary tract by pregnancy, as well as pressure on the ureters by the gravid uterus and the muscle relaxant effect of progesterone, predisposes women with asymptomatic bacte-

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riuria to UTI [1]. Undetected and untreated asymptomatic bacteriuria can lead to pyelonephritis later in pregnancy or during puerperium [2]. Patterson and Andriole [3] reported that most symptomatic UTIs develop in women with bacteriuria earlier in pregnancy and that treatment of bacteriuria is advocated in order to prevent symptomatic infections.

Globally, asymptomatic bacteriuria affects 2 to 10% of all pregnant women [1, 3], and approximately 30% of these will develop pyelonephritis if not properly treated [1]. In spite of this high disease burden, failure to identify asymptomatic bacteriuria during pregnancy is observed among health personnel managing pregnant women [1, 3].

Nigeria is the most populous black nation in the world and has one of the highest maternal and neonatal mortality rates in sub-Saharan Africa [4, 5]. Studies conducted in Nigeria showed an asymptomatic bacteriuria of 23.9% in Sagamu [6] while a higher rate of 86.6% was reported in Benin City [7]. Information on the prevalence of significant bacteriuria among asymptomatic antenatal clinic attendees in Ibadan is limited. Hence this study was undertaken to determine the prevalence of significant bacteriuria among asymptomatic ANC attendees at two ANCs in Ibadan, Nigeria.

MATERIALS AND METHODS

This two-year (April 2007 to March 2009) cross-sectional epidemiological study was carried out at two ANCs in Ibadan, Nigeria. These ANCs were the University College Hospital (UCH), a tertiary health care centre, and Adeoyo Maternity Hospital (AMH), a secondary health care facility. The two hospitals serve as health care facilities for middle and upper class patients in the population. Ethical approval was obtained from the University of Ibadan/UCH Joint Ethical Committee prior to recruitment of participants. Ante Natal Clinic attendees without dysuria, frequency and urgency of urination or other clinical symptoms of UTI were interviewed. Subjects who gave informed consent were enrolled into the study while those who refused participation were excluded. A standardized questionnaire was used to obtain demographic data, medical and social information as well as the gynaecological and obstetric history of the subjects. Subjects with gestational diabetes were excluded from the study because they are more prone to UTI, especially significant bacteriuria without pyuria [2].

Laboratory investigation

A well-labelled sterile universal container was given to each participant to collect about 5–10 ml of mid-stream urine. The specimen was promptly transported to the Department of Medical Microbiology and Parasitology, UCH, Ibadan for immediate processing. One drop of un-centrifuged urine

was aseptically placed on a clean grease- free well- labelled frosted slide and covered with a slip. It was then examined under a microscope using ×10 eye objective lens looking for white blood cells, red blood cells, yeast cells and various types of casts. This procedure was repeated using sediment obtained from about 10 ml of centrifuged urine.

All the urine specimens were cultured on MacConkey agar to test for significant bacteriuria. The approximate number of bacteria per ml of un-centrifuged urine was estimated using a sterile special calibrated wire loop (that can hold 1/500 ml i.e 0.002 ml of urine) for inoculation on sterile culture medium and incubated aerobically at 35°C to 37°C for 24–48 hours. The number of isolated colonies (colony forming units) on MacConkey medium was counted using a counting chamber and was then multiplied by a factor of 500 to estimate significant bacteriuria. A count more than 10^5 per ml of urine was taken as significant bacteriuria; less than 10^4 per ml was taken as not significant while counts between 10^4–10^5 per ml were considered doubtful and the urine samples were re-examined.

Statistical analysis

The computer data were studied using the statistical software SPSS version 10.0 (SPSS InC, Chicago, IL). Data exploration was done by examining the frequency of distribution of all the variables. Results were presented in the form of tables and charts. Chi square test was applied where necessary. Statistical significance was set at $p < 0.05$.

RESULTS

Total study population

Five hundred and fifty pregnant women were interviewed, out of which 473 (86.0%) were included in the study. Time constraints were the main reason why some of the participants refused participation. Table 1 shows the socio-demographic characteristics of the subjects by age, occupation, level of education, history of abortion, estimated gestational age and frequency of significant bacteriuria. More than half of the subjects were between 20 to 29 years of age with the oldest being 39 years. About half of the subjects seen were skilled professionals 241 (51.0%), while 136 (28.7%) were students and 32 (6.8%) were unemployed.

With regard to education, the majority, 325 (68.7%) had tertiary education, while 124 (26.2%) were secondary school leavers and 10 (2.1%) had no formal education. The majority of subjects (70.0%) gave no history of previous abortion, while 101 (21.4%) gave a history of one previous abortion and 10 (2.1%) admitted to having had three previous abortions. The majority of subjects (71.0%) were seen at the second trimester (14–26 weeks), while 22 (4.6%) and

Table 1. Socio-demographic characteristics by frequency of significant bacteriuria

Variable	Frequency of significant bacteriuria	
	Positive	
Age (yrs)	No	(%)
<20	01	0.7
20–24	40	29.4
25–29	65	47.8
30–34	21	15.4
35–39	09	6.7
Total	136	100.0
	Positive	
Occupation	No	(%)
Unemployed	06	4.4
Unskilled	19	14.0
Skilled	72	52.9
Student	39	28.7
Total	136	100.0
	Positive	
Level of education	No	(%)
No formal education	06	4.4
Primary	04	2.9
Secondary	39	28.7
Tertiary	87	64.0
Total	136	100.0
	Positive	
History of abortion	No	(%)
No previous abortion	103	75.8
One previous abortion	20	14.7
Two previous abortions	10	7.4
Three previous abortions	03	2.1
Total	136	100.0
	Positive	
Estimated gestational age (wks)	No	(%)
<13 (1st Trimester)	03	2.2
14–26 (2nd Trimester)	95	69.8
27–36 (3rd Trimester)	38	28.0
Total	136	100.0

115 (24.4%) were seen at the first and third trimesters, respectively.

Subjects with significant bacteriuria

Of the 473 subjects studied, 136 (28.8%) had significant bacteriuria. About half of these were in the age bracket of 25–29 years, while nine (6.7%) were aged 35–39 years and only one (0.7%) was a teenager. Furthermore, the majority of those who had significant bacteriuria were skilled professionals while a lesser percentage (14.0%) were unskilled workers ($X^2 = 9.65$, p = 0.47). More than half (64.0%) of the subjects who had significant bacteriuria

had tertiary education while only 4.4% had no formal education but the association was not statistically significant ($X^2 = 0.47$, p = 0.79). The majority (75.8%) of subjects who had significant bacteriuria had no previous history of abortion, while 20 (14.7%) had one previous abortion and three (2.1%) admitted to three previous abortions ($X^2 = 5.16$, p = 0.16). The majority (69.8%) of those with significant bacteriuria presented at second trimester while 38 (28.0%) presented in the third trimester ($X^2 = 6.5$, p = 37).

DISCUSSION

Urine culture is regarded as the gold standard for screening of asymptomatic bacteriuria among ANC attendees, especially at the first trimester of pregnancy [8, 9]. This study found 136 cases of significant bacteriuria among 473 asymptomatic ANC attendees in Ibadan, giving a prevalence rate of 28.8%. Lower rates of 4.0–7.0% were documented in Canada [9], Ghana [10] and Ethiopia [11]. We postulate that the high prevalence in this study may be ascribed to indiscriminate use of antibiotics resulting from self medications since antibiotic use is not regulated in Nigeria [10–12]. Inappropriate use of this class of antimicrobials may lead to subclinical infections including UTIs, but more importantly, may create an avenue for the development of resistant organisms in the community.

The highest prevalence rate (47.8%) was found among subjects aged 25 to 29 years. This was in contrast to the findings of Turpin et al. [13] whose highest rate of 13% was reported in the age group 35 to 39 years. No obvious reasons can be ascribed to this discrepancy, but it is more important, that attention be focused on urging all age groups to seek ANC services immediately after conception in order to reduce complications of asymptomatic bacteriuria during and after pregnancy. One of the limitations of this study is the lack of data on the previous history of UTI among ANC attendees.

The close association between asymptomatic bacteriuria and low socio-economic status has been documented by various researchers [9, 13, 14]. From this study, more than half of the subjects with significant bacteriuria were subjects of a relatively high socio-economic class consisting of skilled professionals and those with tertiary education. It is possible that this set of people can easily afford the antibiotics available from chemist shops even without a doctor's prescription and that this may predispose them to subclinical infections. However, a disproportionately greater number of ANC attendees at these centres are from a high social class as compared to national statistics [15]. Another factor may be the preference of this category of people to access tertiary and secondary hospital settings in their bid to

receive optimal ANC care. This may also be a bias in the present study. Another bias is the method of recruitment which does not allow testing of the association between significant bacteriuria and asymptomatic ANC attendees.

Furthermore, about three-quarters of subjects with significant bacteriuria had no previous abortion while only 2.1% had had three previous abortions. Our data do not support the hypothesis that previous abortions tend to be protective against significant bacteriuria. This is another limitation of the present study. Hence, further well-designed studies are required to evaluate the role of previous history of abortion or parous experience in the development of significant bacteriuria in pregnancy.

In our study only 22 (4.6%) of the studied subjects presented at first trimester, three (13.7%) of whom had significant bacteriuria. It has been documented that the first trimester is the best period to screen for significant bacteriuria [8].

In conclusion, a high rate of significant asymptomatic bacteriuria was seen among the study population falling between 20–29 years of age, among those of higher socio-economic class with no previous abortion, and among those who were in their second trimester of pregnancy.

CONFLICT OF INTEREST

The authors have no conflict of interest.

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