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Prevalence and Risk Factors of Asymptomatic Bacteriuria Among Apparently Healthy Women in Lagos, Nigeria

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Abstract: Asymptomatic bacteriuria is the presence of bacteria in the urine without the accompanying symptoms of urinary tract infection. The prevalence of asymptomatic bacteriuria is reported to increase with age, with the highest prevalence seen in postmenopausal women. However, data on the general prevalence of ASB in African women is not available. The main objective of this study was to evaluate the prevalence of asymptomatic bacteriuria and its associated risk factors among women in Lagos, Nigeria. This was a cross-sectional study involving 162 apparently healthy women at the outpatient clinic of the Lagos University Teaching Hospital, Lagos, Nigeria. A questionnaire was used to collect information on socio-demographic factors and hygienic practices, and midstream urine was collected to assay for significant bacteriuria. The result of the study showed an asymptomatic bacteriuria prevalence of 27.8%, with the prevalence higher in premenopausal women than in postmenopausal women, albeit not statistically significant. This prevalence was not significantly associated with educational status, marital status, ethnicity, past treatment of urinary tract infection, type of product used during menstruation, or even the method of washing the vagina. Considering that the treatment of asymptomatic bacteriuria is only recommended in pregnant women, and the prevalence of asymptomatic bacteriuria is similar among pregnant and non-pregnant women, we recommend that women be screened for asymptomatic bacteriuria immediately upon pregnancy, and that screening for asymptomatic bacteriuria be made one of the routine screening tests for pregnant women in Nigeria.

Keywords: Women, Asymptomatic Bacteriuria, Prevalence, Risk Factors, Hygiene

1. Introduction

Asymptomatic bacteriuria (ASB) is the isolation of bacteria in the non-contaminated urine of people without symptoms of urinary tract infection (Foxman, 2014). ASB can also be defined as the presence of one or more species of bacteria growing in the urine at a count of 10^5 colony-forming units [CFU]/mL or 10^8 CFU/L without symptoms of urinary tract infection [1]. ASB is generally prevalent in all populations. However, ASB is more prevalent in women when compared with men, across all ages, with the prevalence increasing with age. Apart from the influence of age, factors such as pregnancy, genitourinary tract abnormalities, sexual activity, prior urinary tract infection (UTI), HIV infection, obesity, and diabetes increase the risk of ASB [2, 3]. Generally, the prevalence of asymptomatic bacteriuria is about 1 to 6% in premenopausal women and about 22% in elderly women older than 80 years [4, 5].

With a few exceptions, screening and treatment of asymptomatic bacteriuria in the general population is not recommended. This is because there are no adverse consequences of ASB, no derived benefits from antibiotic use in the affected population, and inappropriate treatment may lead to the development of antimicrobial resistance and changes in the microbiome [4, 6]. According to the Infectious Diseases Society of America guidelines, non-pregnant pre- and postmenopausal women, patients with long-term in-dwelling catheters, spinal cord injuries, diabetes mellitus, and patients undergoing non-urological surgery, should not be screened and treated for asymptomatic bacteriuria [1, 3, 7]. However, screening and treatment for asymptomatic bacteriuria in pregnancy and in patients undergoing endo-urological procedures is recommended.

In Africa, asymptomatic bacteriuria is prevalent among pregnant women. This is due to physiologic changes such as dilatation of the renal pelvis, glycosuria and aminoaciduria, hydroureter, amongst others, which predispose them to bacterial infection. Worldwide, about 2% to 15% of pregnant women have asymptomatic bacteriuria [8]. However, a systematic review that pooled the prevalence of asymptomatic bacteriuria among pregnant women in different African studies reported a pooled prevalence of 11.1% in Africa [9]. In Nigeria, the prevalence of asymptomatic bacteriuria among pregnant women has been reported as being between 10% and about 25% [10–12]. Though there are a few reports of the prevalence of asymptomatic bacteriuria among pregnant women, there is, however, a paucity of data on the general prevalence of ASB among women in general. Studies have put the prevalence of asymptomatic bacteriuria at 6% in pre-menopausal women and about 22% in elderly women. Such prevalence information is not available in the African population [4, 5]. Hence, the aim of this study is to evaluate the prevalence of asymptomatic bacteriuria as well as the predisposing risk factors influencing this prevalence among women in Lagos, Nigeria.

2. Methods

2.1. Design and Location of the Study

This study was a cross-sectional carried out on women attending the outpatient clinic of the Lagos University Teaching Hospital (LUTH) in Lagos State, Nigeria.

2.2. Target Population and Inclusion Criteria

Women visiting the outpatient clinic of Lagos State University Teaching Hospital were included in this study. The main inclusion criteria are that the women must be 18 years old, must not be experiencing discharge or itching in the vaginal area, or have other signs or symptoms of UTI, and should not be currently undergoing treatment for UTI. Participants that had used antibiotics in the last three weeks were excluded from the study.

2.3. Sample Size Consideration

As there was no data found for the specific prevalence of ASB among women in Nigeria, the sample size was determined based on the prevalence rate of 10.3% of ASB in pregnant women as previously reported [11]. The sample size calculation was done using the formula. $N=Z^2\ P\ (1-P)/d^2$. Where N is the minimum sample size required, Z^2 is the standard normal variate at 5% type I error, 1.96, P is the expected proportion in the population based on previous studies, 10.3%, and d=absolute error or precision, 0.05. Based on this calculation, the expected sample size was 142 participants. However, 162 participants were recruited to allow for an incompletely filled questionnaire or a void specimen.

2.4. Ethical Consideration

Ethical approval was obtained from the Institutional Review Board of the Nigerian Institute of Medical Research. Before enrolling, written informed consent was collected from willing participants. Participants' information was kept strictly confidential, and no identifying information was collected from them.

2.5. Sample Collection

After obtaining informed consent, each of the participants was given a questionnaire. The first section of the questionnaire captured social demographic characteristics such as age, occupation, ethnicity, religion, marital status, and pregnancy status. Data was also collected on history of UTI, diagnosis and treatment of previous UTI or sexually transmitted infection (STI), and finally, information was collected on hygienic practices with questions on how they wash the vagina and what they use during menstruation.

As reported, urine culture has been established as the best method for detecting asymptomatic bacteriuria [4]. Hence, participants were instructed on how to collect clean-catch, mid-stream urine and on precautions to prevent or minimize specimen contamination. As recommended by the Infectious Disease Society of America (ISDA) guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults, two consecutive voided urine specimens were collected from each participant into sterile universal bottles [3, 7].

2.6. Sample Processing

The urine specimens were transported to the laboratory immediately and processed within 1 hour of collection. The samples were analyzed using microscopic and semi-quantitative methods.

To determine significant bacteriuria using the microscopic method, the urine specimen was mixed, 50 µl was deposited on a microscope slide and allowed to dry at room temperature, fixed by passing through the flame of a Bunsen burner, and stained using the gram staining technique. Microscopic examination of the smears was done at 20x magnification to confirm that the urine was evenly distributed, and then at 100x magnification. Positive results were read accordingly [13], and were defined as samples with 2 microorganisms distributed uniformly per oil immersion field after the examination of at

least 20 fields [13, 14].

For the quantitative urine culture, the calibrated loop method was used. A 10 µl inoculation loop was used to inoculate the urine onto cystine-lactose-electrolyte-deficient agar (Oxoid, UK), and colony counts were performed after overnight incubation at 37°C. The isolation of the same bacteria in quantitative counts of > 10^5 colony forming units (CFUs)/mL from two consecutive voided urine specimens from the same participant was taken as significant bacteriuria according to the guidelines of the Infectious Disease Society of America for the diagnosis of asymptomatic bacteriuria in women [3, 7].

2.7. Statistical Analysis

Data analysis was done using both descriptive and inferential statistics at the 95% confidence level using SPSS version 26.0. Tests of significance were done with χ^2 for the socio demographic factors and the presence of ASB. A stepwise logistic regression was used for the multivariate logistic regression to evaluate the predisposing risk factors of ASB among the women. A p-value of less than or equal to 0.05 was considered statistically significant. All variables were included in the analysis having adjusted for potential confounding variables. In the analysis, the comparison groups were women with and without asymptomatic bacteriuria.

3. Results

The two methods used in determining the presence of ASB gave identical results. Hence, of the 162 women enrolled in this study, only 45 (27.8%) were positive for ASB using both the microscopic methods and semi-quantitative methods. The age distribution of the participants showed that 19 (11.7%) were in the 18 - 24 age group, 36 (22.2%) were in the 25-31 age group and 103 (63.6%) were older than 31 years of age. The prevalence of ASB was 26.3%, 36.1%, and 24.3% in the 18-24, 25-31, to≥32 years, respectively. Though the prevalence was higher in the 25 to 31 age group, this prevalence was not statistically significant, χ^2=1.896, p=0.39. When the women were grouped into the premenopausal and postmenopausal age, 131 (81%) were of the premenopausal age while 27 (17%) were postmenopausal age. The prevalence of ASB was 29.8% in the pre-menopausal group and 17.4% in the postmenopausal group. Again, this increase in the prevalence of ASB in the premenopausal group was not statistically significant (χ^2=2.528, p=0.11).

One hundred and three (63.6%) of the women were married, and 97 (59.9%) had tertiary education, with only 11 (6.8%) having no form of formal education. The prevalence of ASB was 29.1% in the married population and 25.9% in single women. There was, however, no statistically significant difference in the prevalence of ASB based on the level of education of the participants χ^2=5.369, p=0.15, or due to marital status χ^2=0.584, p=0.75. The socio-demographic characteristics of the participants are presented in Table 1.

Table 1. *Socio-Demographic Characteristics of the Women.*

Variables	Bacteriuria (n=45 (%))	No bacteriuria (n=117 (%))	χ^2	p value
Age (years)*				
18 - 24	5 (11.6)	14 (12.2)		
25 - 31	13 (30.2)	23 (20.0)	1.896	0.39
≥32	25 (58.1)	78 (67.8)		
Premenopausal age	39 (90.7)	92 (80.0)	2.528	0.11
Postmenopausal age	4 (9.3)	23 (20.0)		
Mean Age**	35.37 (11.2)	38.80 (13.6)		
Educational status*				
Primary	3 (6.7)	11 (9.4)		
Secondary	16 (35.6)	24 (20.5)	5.369	0.15
Tertiary	25 (55.6)	72 (61.5)		
None	1 (2.2)	10 (8.5)		
Marital Status				
Married	30 (66.7)	73 (62.4)		
Single	15 (33.3)	43 (36.8)	0.584	0.75
Widowed	-	1 (0.9)		
Pregnancy Status				
Yes	2 (4.5)	2 (1.7)	1.042	0.31
No	42 (95.5)	114 (98.3)		
Tribe				
Yoruba	29 (64.4)	83 (70.9)		
Igbo	6 (13.3)	23 (19.7)	5.045	0.08
Others	10 (22.2)	11 (9.4)		

**Values as mean (SD); *Values as number (%) of women.

In terms of hygienic practices, 43 (26.5%) reported using water alone to wash their vagina, 45 (27.8%) used both water and soap, 25 (15.4%) reported using medicated soap, 21 (13%) reported using antiseptics, 25 (15.4%) used both medicated soap and antiseptics, and 3 (1.9%) reported using antiseptics and alum to wash their vagina. A total of 93 (57.4%) of the participants had previously experienced a UTI or a sexually transmitted infection (STI). However,

only 25.8% of these currently showed the presence of ASB, as against 30.9% with ASB that did not have a history of UTI/STI.

Multivariate analysis of the associated risk factors that may be responsible for the ASB prevalence seen after adjusting for potential confounding variables such as age, education, marital status, and pregnancy status showed no statistically significant association in the influence of past history of urinary tract infection or its symptoms or the treatment of such past UTI (whether by a qualified medical doctor, use of over-the-counter antibiotics, self-medication, or herbal treatment) on ASB (AOR: 1.54; 1.69). There was also no statistically significant relationship between the use of tampons, sanitary towels, or tissue paper during menstruation (AOR: 4.36), whether using water alone, medicated soap, or douching in the presence of ASB. The risk of ASB among women was not significantly associated with predisposing hygienic practices (AOR: 0.91).

Table 2. *Multivariate logistic regression analysis of predisposing risk factors of ASB among women.*

Risk factors	p-value	AOR	95% CI
Past history of UTI/or past symptoms of UTI	0.27	1.54	0.72 - 3.29
Type of treatment of past UTI symptoms	0.28	1.69	0.65 - 4.39
Hygienic practices	0.36	0.91	0.74 - 1.11
Products used during menstruation	0.18	4.36	0.50 - 37.72

4. Discussion

The prevalence of asymptomatic bacteriuria varies greatly with age, sex, and genitourinary abnormalities. Studies have shown that the prevalence of ASB increases with age, with the prevalence increasing to more than 20% in women over 80 years of age. The results of this study showed a prevalence of 27.8% of asymptomatic bacteriuria among apparently healthy women in Lagos, Nigeria. Most studies have reported a lower prevalence rate of ASB, ranging from 10.3 to 24.7% among pregnant women in Nigeria. As previously reported, the prevalence of ASB is similar among pregnant and non-pregnant women [3]. Hence, the high ASB prevalence is in line with the prevalence of 24.7% in the Eastern part of Nigeria previously reported [10].

The results of this study showed an increase in ASB prevalence from adolescence to adulthood, with the highest prevalence of ASB in the 25–31 age groups. Consequently, the prevalence of ASB decreased with age after the 25–31 age groups. This result corroborates the results obtained by Banda et al. in North-central Nigeria, which also recorded the highest ASB prevalence in the 24-33 age groups, with the prevalence decreasing with age [11, 12]. The results also showed a higher prevalence in premenopausal women when compared to post-menopausal women. This is contrary to reports of a higher prevalence of ASB in postmenopausal women [4, 5].

Socio demographic characteristics such as educational status, marital status and ethnicity did not play any significant role in ASB prevalence. A similar study in Ghana also did not find any significant association of educational status, parity, gestational age, marital status and the number of fetuses carried on the prevalence of ASB [15]. These factors may, therefore, not be considered as risk factors of ASB in Africa. In addition to age, a history of UTI or STI has been linked to an increased risk of ASB [2, 3]. In this study, however, there was no statistically significant difference in ASB prevalence between those who had a history of UTI and those who did not. The majority of participants' demonstrated high hygienic practices, indicating that the majority of women are informed about the use of water only in washing their vagina, as the use of harsh substances could cause an imbalance in the vagina microflora, making them susceptible to pathogenic organisms and leading to infection.

5. Conclusions

This study provides information on the prevalence of asymptomatic bacteriuria among apparently healthy women. Though the general acceptable guidelines are to avoid screening and treating asymptomatic bacteriuria in other populations aside from pregnant women, the high prevalence of asymptomatic bacteriuria in women of child bearing age means that ASB should be screened for upon pregnancy and should be made one of the routine screening tests for pregnant women in Nigeria.

Further studies can be carried out to identify the most common pathogenic bacterial isolates associated with asymptomatic bacteriuria and the antimicrobial susceptibility pattern of these bacteria.

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