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Bacterial Vaginosis Among Pregnant Women in Burkina Faso

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Objectives: **Bacterial vaginosis (bv) is a common cause of abnormal or altered vaginal discharge in women of childbearing age. Its association with obstetric and gynecologic complications and HIV are increasingly recognized. Few population-based surveys of BV have been conducted in Africa. The objective of the study was to examine the role of genital infections including Herpes simplex virus type 2 (HSV-2) and demographic factors on the prevalence of BV among pregnant women in Burkina Faso.**

Methods: **Consenting pregnant women from Burkina Faso answered a face-to-face interview on their demographic characteristics. Then, genital and blood swabs were collected and tested for BV and other genital infections. Univariable and multivariable models were used to investigate the risk factors of BV.**

Results: **Among the 2133 women included in the analyses (over 2284 enrolled), the prevalence of BV was 6.4% [95% confidence interval (CI), 5.5%–7.6%], ranging from 3% to 12% between regions. In multivariable analyses, HSV-2 [odds ratio (OR), 1.64; 95% CI 1.04–2.59) was the only genital infection that remained significantly associated with BV. Other factors related to BV were history of abortion (OR, 1.57; 95% CI, 1.01–2.43) and geographical origin. HIV infection (OR, 1.98; 95% CI, 0.90–5.20) and polygamy (OR, 1.48; 95% CI, 1.00–2.36) tended to be associated with BV without reaching statistical significance.**

Conclusion: **The prevalence of BV among pregnant women was lower than expected, with large geographical disparities. Our data confirm the potential interaction between BV and HSV-2.**

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BACTERIAL VAGINOSIS (BV) IS a common cause of an abnormal vaginal discharge in women of reproductive age[1]; however, more than 50% of women with bacterial vaginosis have no symptom. BV is particularly common in sub-Saharan Africa with prevalence ranging from 20% to 49% among women presenting to STD clinics with vaginal discharge in East Africa,[2,3] from 29% to 52% among pregnant women attending antenatal clinics in Central and West Africa,[4–6] and from 37% to 51% in community-based studies.[7,8] In urban Burkina Faso, 13% of pregnant women[9] and 20% of women attending STI clinics[10] had BV in cross-sectional surveys.

Although BV has long been considered as a harmless infection, several complications such as preterm delivery or intrauterine infection[11,12] and postcesarean endometritis[13] have been associated with this infection. Moreover, BV has been associated with increased susceptibility to acquisition of other sexually transmitted diseases, including HIV.[14] BV prevalence varies with geographical areas, which may be related with the presence of some cofactors such as vaginal hygiene,[15] age,[16] sexual behaviors,[16] or HIV infection.[17]

In Africa, few studies have investigated the prevalence and factors associated with BV. These studies were conducted among sex workers only or they were based on small sample sizes.[4–6]

In most West African countries, there is no particular focus on BV management during antenatal consultations, whereas this infection may cause some complications during pregnancy. Moreover, the uncertainties around the role of BV on HIV acquisition and its potential association with STIs such as herpes simplex virus 2 (HSV-2) infection[18,19] and trichomoniasis[19] require a better knowledge of the epidemiology of this infection in Africa. We, therefore, conducted a cross-sectional study among rural and semi-rural pregnant women to determine the prevalence and correlates of BV in Burkina Faso.

Methods

The study was part of a national survey that aimed at estimating the sexual behaviors and the prevalence of STI and HIV among the general population.

The study was conducted from May to July 2003 in 4 geographically distant provinces of Burkina Faso (Boulgou, Poni, Seno, and

Yatenga) that harbored the HIV sero-surveillance sentinel sites. The study took place in all primary health facilities from these provinces. After information on the study provided by heads of Antenatal Care (ANCs) a few days before the visit of the study team, consenting women were recruited just before their prenatal consultation. A standardized face-to-face questionnaire was administered to collect demographic characteristics and obstetric background. Women underwent a clinical and genital examination with collection of vaginal and cervical swabs for the diagnosis of genital infections. Finally, a blood sample was collected for the diagnosis of *Treponema pallidum*, HSV-2, and HIV infections. Blood samples were tested anonymously for HIV. Women were offered appropriate treatment for genital infections using the national syndromic algorithms. All women were advised to consult the local HIV voluntary and counseling testing centers for free, as no HIV testing results could be given as part of the study. In case of asymptomatic infections such as active syphilis, the results were sent as soon as possible to the primary health care facilities for prompt and free appropriate treatment, including the partner(s).

Laboratory Methods

The diagnosis of BV was done according to the Nugent scoring method.[20] The In Pouch TM TV (Biomed Diagnostics, San Francisco, CA) was used to diagnose *Trichomonas vaginalis* infection. The presence of *Candida albicans* was detected on Gram staining on vaginal smear. Slides of endocervical swab were read for detection of *Neisseria gonorhoeae.* HSV-2 infection was diagnosed using a specific IgG HSV-2 ELISA test (Kalon Biological, Ltd., Surrey, UK), which showed the best serologic performance among a panel of ELISA tests applied to African serums.[21] The diagnosis of HIV infection was done according to a decisional algorithm using a combination of 3 ELISA tests.[22] All reactive sera with rapid plasma reagin slide test (Newmarket Laboratories Ltd., Germany) were then tested with the treponema pallidum hemagglutination assay test (Newmarket Laboratories Ltd.) for confirmation of syphilis.

Syphilis serology and genital slides for the diagnosis of genital infections were analyzed on the day of collection by 2 technicians from Centre Muraz, under the supervision of a senior biologist. In case of discordant results between the 2 technicians, the senior biologist read of the slide for final diagnosis. In addition, the latter reanalysed (at random) 20% of stored slides from each province. HIV and HSV-2 serology were conducted after study completion at the Centre Muraz laboratory in Bobo-Dioulasso, the second city of Burkina Faso.

Statistical Analysis

Data were analyzed using SPSS statistical software (version 12; SPSS). All statistical tests were 2-sided and a P value <0.05 was considered as significant. Potential risk factors for BV were included in multiple logistic regression models using a stepwise selection procedure based on the Akaïke information corrected criterion.[23]

All variables with a univariate P value ≤ 0.15 were included in the multivariable model. Forward and backward selection procedures were used and results were crossed; variables selected with both procedures were considered as significantly and independently associated with presence of BV.

Results

A total of 2284 pregnant women were enrolled from 98 antenatal clinics in the 4 provinces, but only 2133 (93.4%) had data available on both plasma serology and genital infections. All analyses were based on these 2133 women with a fair distribution between provinces; 505 (24%) from Boulgou, 561 (26%) from Poni, 470 (22%) from Seno, and 597 (28%) from Yatenga. The demographic characteristics and obstetrical background of participants are summarized in Table 1. The mean age of women was 25 years with a median of 24 years (range, 14–49 years). Nearly all women were living in a couple relationship at the time of the visit (88.6%), and 87.3% of them were housewives. Education level was quite low because only 19% of the participants ever went to school, with the lowest rate (11%) observed in the province of Seno. About half (45%) of the women were engaged in a polygamous relationship. Islam was the predominant religion in 3 of the 4 provinces.

A minority (22.9%) of women were at their first pregnancy, whereas approximately one-third of participants (32.3%) reported 5 or more previous pregnancies. The median gestational age was 6 months (range, 1–9 months). Abortion remains a major problem in this country; approximately a quarter (24.2%) of participants reported a previous spontaneous abortion, whereas 13.6% of pregnant women experienced stillbirth previously. Most women (81.7%) did not use any contraception before being pregnant.

The majority of participants had a normal vaginal flora, and 6.4% (95% CI, 5.5%–7.6%) had a diagnosis of BV (scores from 7–10). The prevalence of BV varied markedly with provinces and was higher for the 25 to 29 years age group (Table 2) The prevalence of HSV-2, HIV, syphilis, and trichomoniasis was 17.9% (362/2020), 2.5% (53/2, 133), 1.8% (38/2, 133), and 1.5% (32/2, 133), respectively, and only 2 cases of *N. gonorhoeae* were diagnosed overall. Vaginal candidiasis was the most common genital infection (6.3%).

In univariable analyses (Table 2), polygamy, provinces, history of abortion, use of contraception before pregnancy, and HSV-2 infection tended to be associated with BV, whereas being married or cohabitated tended to be protective. A slightly higher proportion of HIV-positive women had BV (11.3%) compared with HIV uninfected women (6.3%), but this difference was not significant ($P = 0.14$).

In the final multivariable model, BV was significantly associated with history of abortion, HSV-2 infection, and some provinces. The findings regarding polygamous marriage are of borderline significance. HIV infection tended to be associated with BV (OR = 1.98) but without reaching statistical significance.

Discussion

Our study reports a low prevalence of BV among pregnant women in Burkina Faso, with important geographical disparities. Our data also suggest that HSV-2 infection and previous abortion were associated with BV.

The prevalence of BV seems lower in our study population than in other African countries. In Bangui, BV prevalence in pregnant women was estimated to be of 29.1%.[4] In Senegalese sex workers[24] and in Kenyan women recruited in the STI clinics,[16] the prevalence of BV was 28.8% and 44%, respectively. A review of STI data from 1990 to 2000 in the city of Bobo-Dioulasso confirmed the large difference in BV prevalence between population groups, even within the same city.[25]

This low prevalence in Burkina Faso may be related to the low national HSV-2 prevalence, or to vaginal hygiene practices and sexual behaviors,[15] which are the main determinants of BV most likely to vary between populations and geographical locations. Within the country, the differences in BV prevalence observed in Poni, Boulgou, Yatenga, and Seno were striking.

TABLE 1. Demographic and Obstetric Characteristics and Genital Infections of the Study Participants

Characteristics	Province				
	Boulgou (n = 505)	Poni (n = 561)	Seno (n = 470)	Yatenga (n = 597)	P*
Mean age in years	25 ± 7	26 ± 7	24 ± 6	25 ± 7	0.001
Age categories					0.06
≤19 y	115 (22.3)	115 (20.4)	104 (22.1)	128 (21.4)	
20–29 yr	261 (52.0)	264 (44.1)	264 (56.2)	314 (52.6)	
30–39 yr	113 (22.5)	156 (27.8)	89 (18.9)	136 (22.8)	
≤40 yr	16 (3.2)	26 (4.6)	13 (2.8)	19 (3.2)	
Marital status					<0.001
Single	5 (1.0)	30 (5.3)	2 (0.4)	19 (3.2)	
Cohabitating	57 (11.3)	77 (13.7)	8 (1.7)	45 (7.6)	
Married	443 (87.7)	454 (80.9)	456 (97.9)	531 (89.2)	
Scholarship					<0.001
Yes	106 (21.0)	119 (21.2)	53 (11.3)	136 (22.8)	
No	399 (79.0)	442 (78.8)	417 (88.7)	461 (77.2)	
Religion					<0.001
Animists	2 (0.4)	320 (57.0)	3 (0.6)	4 (0.7)	
Christians	107 (21.2)	125 (22.3)	11 (2.4)	24 (4.0)	
Moslem	389 (77.0)	113 (20.1)	451 (96.8)	568 (95.1)	
Other	7 (1.4)	3 (0.6)	1 (0.2)	1 (0.2)	
Ethnicity					<0.001
Dagari/Lobi	0 (0.0)	365 (65.1)	1 (0.2)	1 (0.2)	
Fulfuldé/Peulh	17 (3.4)	16 (2.9)	344 (73.2)	27 (4.5)	
Mossi	117 (23.2)	49 (8.7)	33 (7.0)	543 (91.0)	
Bissa	363 (71.9)	2 (0.4)	5 (1.1)	0 (0.0)	
Other	8 (1.6)	129 (23.0)	87 (18.5)	26 (4.4)	
Parity					0.07
1 pregnancy	125 (2.8)	132 (23.5)	95 (20.2)	129 (21.6)	
2 pregnancies	93 (18.4)	83 (14.8)	101 (21.5)	99 (16.6)	
3 and more pregnancies	287 (56.8)	346 (61.7)	274 (58.3)	369 (61.8)	
Vaginal flora (Nugent score)					<0.001
Normal (0–3)	438 (86.7)	449 (80.0)	407 (86.6)	515 (86.3)	
Intermediate (4–6)	50 (9.9)	44 (7.8)	27 (5.7)	65 (10.9)	
Bacterial vaginosis (7–10)	17 (3.4)	68 (12.1)	36 (7.7)	17 (2.8)	
Trichomoniasis	2 (0.4)	8 (1.4)	2 (0.4)	20 (3.3)	<0.001
HSV-2 serology	86 (17.0)	123 (22.0)	51 (14.2)	102 (17.3)	0.02
Candidiasis	36 (7.1)	22 (3.9)	23 (4.9)	54 (9.0)	0.002
HIV serology	18 (3.6)	14 (2.5)	6 (1.3)	15 (2.5)	0.16
Syphilis serology	3 (0.6)	10 (1.8)	17 (3.6)	8 (1.3)	0.003

*ANOVA, F test, or χ^2 test.
Data are mean ± SD, median and range or numbers (%) of subjects.

The various techniques (water, soaps, antiseptic, detergents, lemon, herbs, etc) used to clear the vagina of its natural secretions may contribute to alter the vaginal flora,[26] and may thus explain this finding. Dry sex is a common practice in Poni where most people are animists. In this province, traditional vaginal practices, such as cultural or religious values and ideas that describe women's bodies as contaminated or impure influence women's perceptions of their own bodies and sexual behaviors, are usually taught to young women by their older female relatives or by other women from the community. The practice of dry sex is promoted, in part, by a widespread belief that fertilization can only take place in a clean, dry environment. Societal or personal perceptions of vaginal lubrication, discharge, or menstrual blood as "dirty" or "unclean" might compel women to engage in practices to alter or remove vaginal fluids to demonstrate good personal hygiene and adherence to sociocultural norms.[27]

Because prevalence of BV is high in the province of Poni and because vaginal douching and sexual behaviors are significant cofactor of STI and BV,[15] we think this argument may explain the difference between provinces. Unfortunately, we could not collect these data to confirm this hypothesis.

Our data also suggest an association between BV and previous spontaneous abortion after adjustment for other variables. BV was also associated with a marked increased risk of spontaneous abortion (OR, 9.91; 95% CI, 1.99–49.34) in a large meta-analysis that included 18 studies and 20,232 patients.[12] Ralph et al[28] found that BV was associated with an increased risk of miscarriage in the first trimester in women undergoing in vitro fertilization, independent of other risks factors such as smoking or old age. An increasing miscarriage rate was observed with increasing abnormality of the vagina flora; 18.5% in women with normal flora, 23.3% in women with intermediate vaginal flora, and 36.1% in women with BV, suggesting a cause-effect relation.[28] As some women tend to show the same pattern of BV recurrences over time, the association between BV and previous spontaneous abortion raises concern that part of the latter condition may be because of BV. If this were confirmed, the role of BV detection and treatment in antenatal clinics to prevent abortions should be investigated in African settings.

TABLE 2. Factors Associated With BV Among Pregnant Women in Burkina Faso, in Univariate and Multivariate Analyses

	Total N	BV-Positive n (%)	Unadjusted OR (95% CI)	Adjusted* OR (95%CI)	*P* for Adjusted OR
Age(yr)					
≤19	462	29 (6.3)	1		
20–24	631	37 (5.8)	0.92 (0.54–1.57)		
25–29	470	34 (7.2)	1.16 (0.67–2.00)		
≥30	570	38 (6.6)	1.07 (0.63–1.81)		
Marital status					
Married or cohabitating	2066	132 (6.4)	1		
Single	55	5 (9.1)	1.06 (0.59–1.92)		
School					
No	1719	105 (6.1)	1		
Yes	414	32 (8.0)	1.33 (0.87–2.04)		
Polygamous status					
No	1140	59 (5.2)	1	1	
Yes	930	73 (7.9)	1.58 (1.11–2.53)	1.48 (1.00–2.36)	0.05
Province					
Yatenga	597	17 (2.8)	1	1	
Poni	561	68 (12.1)	4.83 (2.73–8.65)	3.33 (1.88–5.91)	<0.001
Boulgou	505	17 (3.4)	1.13 (0.54–2.38)	0.85 (0.41–1.80)	0.68
Seno	470	36 (7.7)	2.86 (1.54–5.39)	2.65 (1.37–5.11)	0.004
Parity					
≤2 pregnancies	861	45 (5.2)	1		
≥3 pregnancies	1273	93 (7.4)	1.43 (0.98–2.10)	0.77 (0.47–1.27)	0.31
Current age of pregnancy					
First trimester	167	15 (9.0)	1		
Second trimester	996	68 (6.8)	0.74 (0.40–1.39)		
Third trimester	789	44 (5.6)	0.56 (0.29–1.08)		
History of abortion					
No	1237	75 (6.1)	1	1	
Yes	408	37 (9.1)	1.53 (1.12–2.28)	1.57 (1.01–2.43)	0.043
Contraception before pregnancy					
No	1744	105 (6.0)	1	1	
Yes	390	33 (8.5)	1.44 (0.96–2.17)	1.45 (0.90–2.33)	0.13
Trichomoniasis					
No	2101	135 (6.5)	1		
Yes	32	2 (6.3)	0.97 (0.25–3.76)		
HSV-2 serology					
No	1651	96 (5.8)	1	1	
Yes	362	34 (9.6)	1.73 (1.15–2.59)	1.64 (1.04–2.59)	0.034
Candidiasis					
No	1998	131 (6.6)	1		
Yes	135	6 (4.4)	0.66 (0.29–1.52)		
HIV serology					
No	2076	131 (6.3)	1	1	
Yes	53	6 (11.3)	1.90 (0.72–4.72)	1.98 (0.90–5.20)	0.13
Syphilis serology					
No	2093	134 (6.4)	1		
Yes	38	3 (7.9)	1.24 (0.38–4.10)		

*Adjusted for all variables with a univariate $P < 0.15$.

Our study showed an independent association between HSV-2 infection and BV, which was also reported in few African studies,[29,30] including in Burkina Faso,[18] and in India[31] or in the United States.[32] Although cross-sectional studies cannot ascertain the sequence of events, a possible explanation is that the imbalance of vaginal flora could increase HSV-2 acquisition.[19] The reduction of lactobacilli may lead to a reduction of hydrogen peroxide and other antimicrobial substances that protect against pathogenic agents and HIV. On the other hand, intermittent genital shedding among HSV-2-infected women could disrupt the vaginal flora or could be linked to hormonal changes or both, which could in turn trigger BV episodes.[18] This finding could have important implications about HIV infection. The observed association between BV and HIV acquisition in several studies[14,17] could be confounded by HSV-2 infection that was not accounted for in the analyses.[18]

Several limitations of this study must be considered. The survey was designed to assess prevalence of HIV infection in pregnant women and did not examine all potential risk factors for BV, such as vaginal douching or sexual behaviors. Moreover, the sample of pregnant women in this study may not represent all pregnant women, as some of them do not consult antenatal clinics during pregnancy. Therefore, caution should be adopted when these findings are generalized to all women from a general population.

In conclusion, the prevalence of BV among pregnant women was lower than expected in Burkina Faso. Our study confirmed the wide heterogeneity of BV in different locations within the same country. HSV-2 is certainly an important factor associated to BV. This finding deserves further investigations more specifically on the role of HSV-2 asymptomatic shedding in the physiopathology of BV, and to elaborate potential simple interventions such as detection and prompt treatment of BV in antenatal clinics.

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