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Research Article

Sociodemographic determinants of Bacterial Vaginosis risk among pregnant women in southern Cross River State, Nigeria

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Abstract: Studies have suggested a link between sociodemographic factors and the occurrence of bacterial vaginosis in the early and mid-trimesters of pregnancy. This paper sought to determine the contributions of sociodemographic factors to the occurrence of bacterial vaginosis in late pregnancy. This cross sectional study recruited pregnant women who attended antenatal clinic in two healthcare facilities between November, 2015 and February 2016. Diagnosis of bacterial vaginosis was made using the Nugent scoring system following collection of vaginal secretions and subsequent Gram staining of smears. A total of 138 participants at 35-37 weeks gestation were sampled. The mean age was 29 years (range = 18-39), 52.3% were urban dwellers, 52.2% had tertiary education while 17.4% were housewives. Testing indicated that 52.2% had bacterial vaginosis, 29.0% were negative while 18.8% were intermediate. Our study shows a high prevalence of BV in late pregnancy in women attending antenatal clinics in southern Cross River State. As this may have implications for negative obstetric outcomes, early detection and treatment is needed. Socioeconomic factors were not directly associated with presence or absence of bacterial vaginosis and may therefore be poor predictors of bacterial vaginosis risk in these women.

Keywords: Bacterial vaginosis, Gardnerella vaginalis, Clue cell, Whiff test, Nugent score, Sociodemographic determinants, Cross River State.

INTRODUCTION

Bacterial vaginosis (BV) is the most frequent cause of malodorous vaginal discharge in women of reproductive age (Sobel JD, 1997; Marrazzo J, 2003). It occurs from an imbalance in the ecology of the normal vaginal flora, characterized by depletion of protective Lactobacilli with resulting proliferation of anaerobes (Fredricks DN *et al.*, 2005). Lactobacilli are commensal gram positive bacteria believed to innately promote a healthy vaginal ecosystem, through competitive inhibition of potentially pathogenic anaerobic bacteria such as *Gardnerella vaginalis*, *Mobiluncus species*, *Peptostreptoccocus species*, *Prevotella species*, *Mycoplasma hominis* and *Atopobium vaginae* (Vásquez A *et al.*, 2002; Verhelst R *et al.*, 2004). This inhibition is achieved by the antimicrobial effects of hydrogen peroxide, lactic acid and bacteriocins produced by species of lactobacillus (Vallor AC *et al.*, 2001; Aroutcheva AA *et al.*, 2001). Bacterial vaginosis would therefore result, when massive reduction in Lactobacilli population occur (Verhelst R *et al.*, 2004). Clinically, it characteristically manifests as the presence of foul smelling, grayish, thin, homogenous vaginal discharge (Laxmi U *et al.*, 2011). Addition of 10 percent potassium hydroxide to this alkaline vaginal secretion produces a fishy "whiff" which results from the release of aromatic amines such as triethylamine, putriscine and cadavarine, which are volatile at basic pH (Amsel R *et al.*, 1983; Larson B, 1993).

While the prevalence of BV varies between countries and populations (Kenyon C *et al.*, 2013), some of the highest estimates have been reported from rural sub-Saharan Africa. A systematic review of women attending antenatal facilities showed pooled BV prevalence estimates of 51% in East/Southern Africa and 38% in West/Central Africa (Chico RM *et al.*, 2002). In Nigeria, prevalence rates between 3.9-43.2%

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have been found in pregnant women (Abudu DO *et al.*, 1985; Sunday-Adeoye I *et al.*, 2006; Bello H *et al.*, 2014).

Bacterial vaginosis during pregnancy has been shown to increase the risk of adverse obstetric outcomes. Chorioamnionitis, premature rupture of membranes, preterm labour and birth, spontaneous abortion, low birth weight delivery, postpartum endometritis, and gynaecologic conditions including pelvic inflammatory disease and infertility have all been reported (Paige DM *et al.*, 1998; Wolrath H *et al.*, 2001; Peipert JF *et al.*, 1997; Mania-Pramanik J *et al.*, 2009). This has raised the subject of BV screening in pregnancy, especially when considered that as many as 50% of all patients are asymptomatic (Yudin MH *et al.*, 2008; Ferris DG, 1998). Screening however, can only be practical when targeted at potentially high risk groups. Some epidemiological studies have suggested a link between socioeconomic factors such as young age, unemployment, low educational status, poor housing etc and the occurrence of BV in pregnancy (Kalinka J *et al.*, 2002; Kamara P *et al.*, 2000). These findings were however made in early and mid-pregnancy. The objective of this study was to determine the contribution of sociodemographic factors in the causation of BV in late pregnancy.

MATERIAL AND METHODS

Study Design

This was a prospective cross sectional study conducted between November, 2015 and February, 2016.

Study Area

Cross River is a coastal state in Southern Nigeria, occupying a land mass of 20,156 square kilometers consisting largely of arable rainforest. It shares boundaries with Cameroon Republic in the east, the Atlantic Ocean in the south, and Ebonyi and Benue States in the North. It has 18 local government councils and its people are mostly civil servants, artisans and farmers.

Subject Recruitment

We recruited women presenting at two healthcare facilities offering antenatal care within the Southern senatorial zone of Cross River State. One facility located within a rural community (Akamkpa) offering secondary healthcare services while the other located within an urban area (Calabar) offering tertiary healthcare services. Consecutive consenting antenatal clinic attendees of good physical and mental health at 35-37 weeks gestation as defined by abdominal ultrasound or manual estimation were recruited from these rural and urban settings. Demographic data was obtained from participants by research assistants using a structured questionnaire.

Sample Collection and Laboratory Method

After an initial physical assessment, vaginal secretion was collected from the posterior and lateral fornices of each subject using a cotton-tipped swab during a speculum (Cusco's) examination with patient in lithotomy position. The specimen was immediately smeared on two appropriately labeled, clean grease-free glass slides, allowed to air dry and placed in a slide box for subsequent microscopic assessment. Off-site smears were then heat-fixed, Gram stained, viewed under an oil immersion objective (X100) and scored following the Nugent criteria (Nugent RP *et al.*, 1991), by an experienced Technician and reviewed by a Pathologist. The following scheme was used: 1+, <1 per field; 2+, 1 to 4 per field; 3+, 5 to 30 per field; 4+, >30 per field. Large Gram-positive rods were taken as lactobacillus morphotypes, small Gram-negative to Gram-variable rods were considered as *Gardnerella vaginalis* and Bacteroides species morphotypes while curved Gram variable rods were considered as Mobiluncus species morphotypes. With total score on a scale of 1-10, a score of 0-3 was interpreted as BV negative or normal, 4–6 meant intermediate microbiota while 7–10 was BV positive.

Biases were minimized by blinding Nugent's score interpretation and scoring was given strictly based on the criteria.

Data Analysis

We analyzed data using the Statistical Package for Social Sciences (SPSS), version 20 (IBM, Ca. USA). Summary statistics were presented using percentages and frequencies, means and standard deviations as appropriate. Pearson's Chi-square tests or Fisher's exact tests were used to compare relationships between categorical variables. A 5% significance level was used for all tests. For Logistic Regression analysis, BV was the outcome, and independent variables were tested to determine how well they predicted the outcome. Variables (independent) with *p*-values <3 in the univariate analysis were entered into the logistic regression model.

Ethical Consideration

Ethical clearance was obtained from the Cross River State Health Research Ethics Committee (Rec No: RP/REC/2015/268). Participation in the study was voluntary and subject to a signed written informed consent obtained from all participants. Information provided by participants was kept confidential.

RESULTS AND DISCUSSION

Overall, 150 participants were recruited, out of which 12 had unreadable slides. Therefore, 138 pregnant women with a mean age of 29 years and a range of 18-39 years were assessed. There were 52 (37.7%) rural dwellers and 86 (52.3%) urban dwellers. Ten (7.2%) women had primary education, while 56

(40.6%) and 72 (52.2%) had secondary and tertiary education respectively. Over 51% of women were self-employed, while 21%, 17.4% and 10.1% were civil servants, housewives and students respectively. Bacterial vaginosis was identified in 72 (52.2%) women while 26 (18.8%) and 40 (29.0%) others were assessed as intermediate and negative respectively. Table 1. Parity was the only statistically significant (p = 0.016) risk for BV in the univariate analysis, women within their first and third pregnancies had decreased odds (0.229) for BV. Table 2. Among rural dwelling women, 30 (57.7%) had BV compared to 42 (48.8%) urban dwellers. While this difference was not statistically significant (p = 0.28), urban dwellers were 1.071 times more likely to be positive for BV. Table 3. There also were no statistically significant associations between age (p = 0.23), educational status (p = 0.32) and occupation (p = 0.28) in the univariate analysis, however being within the 18-25 years age group decreased the odds of being BV positive by 0.628 times as compared to those 34 and above. In addition, the odds of having BV increased by a factor of 1.803 for house wives compared to civil servants. Furthermore, other factors such as alcohol consumption and contraceptive use did not show any associations.

The prevalence of BV in this study was 52.2%. This is much higher than a 14-18% prevalence rate found in late pregnancy (Gravett *et al.,* 1996). These authors advocated screening and treatment of BV not later than in early second trimester of pregnancy, if late miscarriages and preterm births were to be avoided. While the high prevalence found in our study could be due to a difference in methodology, as they presumptively diagnosed BV by gas-liquid chromatographic identification of microbial organic acid metabolites, it may suggest failure of detection or appropriate treatment for these women during early and mid-pregnancy in a resource poor environment such as ours. Also, it is in keeping with the conclusions of two previous studies which found that vaginal colonization with bacteria with potential to cause BV was more common in black women than Caucasians or Asians (Royce RA *et al.,* 1999; Goldenberg RL *et al.,* 1996). Bacterial vaginosis has been suggested to be generally more common in populations of socially underprivileged women (Kamara P *et al.,* 2000). While this may explain the high prevalence seen in our study as compared to those from developed economies (Gravett MG *et al.,* 1986), it however could not discriminate for BV risk within our sample population. Low educational status for instance, was not found to be associated with increased BV risk in our study, and this was in agreement with reports from other studies (Kalinka J *et al.,* 2002; Martinez-de-Tejada B *et al.,* 1998). It however has been said to be a strong risk factor for BV among non-pregnant women (Holzman C *et al.,* 2001). Kamara *et al* revealed in their study of 269 pregnant Jamaican women, that those employed were less likely to have BV than those unemployed (Kamara P *et al.,* 2000). This was also in keeping with our finding that being a housewife increased the odds of having BV by 1.8 times more than being a civil servant in multivariate analysis. Our study also showed no association between place of residence and BV risk by univariate analysis; however pregnant rural women were 1.7 times more likely to have BV in the multivariate analysis. This may be explained by the fact that douching, as a hygiene practice, is common among pregnant rural women in Nigeria (Ajayi V *et al.,* 2016). Young age at pregnancy has been associated with increased BV risk, as women below 20 years of age presented a slightly higher risk than those 21–25 years (Kalinka J *et al.,* 2002). In our study however, age was not a significant risk factor, though in the multivariate analysis, being 18-25 years of age was rather protective against BV compared to being above 33 years. There was no significant association between the presence of BV and the number of pregnancies a woman had borne in our study, though in the multivariate analysis fewer numbers of pregnancy seemed protective. This finding was similar to that reported in a pregnant Spanish population (Martinez-de-Tejada B *et al.,* 1998). Previous contraceptive use was not associated with the presence of BV in our study. This is however contrary to reports of other studies where hormonal contraceptive use and inconsistent use of condoms where associated with recurrent BV (Bradshaw CS *et al.,* 2013; Calzolari E *et al.,* 2000). This disagreement may have arisen due to the small number of affirmative respondents for contraceptive use, as public acknowledgement of its use in our environment is still not yet popular.

CONCLUSION

Our study shows a high prevalence of BV in late pregnancy in women attending antenatal clinics in southern Cross River State. As this may have implications for negative obstetric outcomes, early detection and treatment is needed. Socioeconomic factors were not directly associated with presence or absence of BV and may therefore be poor predictors of BV risk in these women.

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Table 1: Sociodemographics and descriptive analysis of the participants

Factors	Numbers	% (Mean ±SD)
Age Group		
18-25	35	25.4
26- 33	76	55.0
34 +	27	19.6
Age (years)	138	29.36 (±4.840)
Place of residence		
Rural	52	37.7
Urban	86	62.3
Educational status		
Primary	8	5.8
Secondary	57	41.3
Tertiary	73	52.9
Occupation		
House wife	24	17.4
Student	14	10.1
Self-employment	71	51.4
Civil Servant	29	21
Alcohol use		
No	103	74.6
Yes	35	25.4
Previous use of contraceptives		
No	122	88.4
Yes	16	11.6
Gravidity/No of pregnancies		
1 - 3	94	68.1
4-6	38	27.5
7+	6	4.3
Bacterial vaginosis		
Negative	41	29.7
Intermediate	26	18.8
Positive	71	51.4

Table 2: Univariate analysis of variables in relation to developing Bacterial Vaginosis

Variables	X^2	p-value
Age	3.722	0.223
Educational status	2.168	0.353
Number of pregnancies	10.672	0.016*
Place of residence	1.775	0.206
Occupation	4.874	0.280
Previous contraceptive use	0.578	0.375
Alcohol intake	0.619	0.367

X^2 = Chi-square *Significant p-value < 0.05

Table 3: Multivariate analysis of variables in relation to developing Bacterial Vaginosis

Variables	Odds Ratio	Confidence Interval	p-value
Age			
18 - 25	0.628*	0.145 – 2.719	0.534
26 - 33	0.934*	0.271 – 3.218	0.914
34 + (Ref)			
No of Pregnancies			
1 - 3	0.229*	0.022 –2.404	2.19
4 - 6	0.766*	0.066 – 8.960	0.832
7+ (Ref)			
Place of Residence			
Rural	1.701	0.646 – 4.477	0.282
Urban (Ref)			
Occupation			
House wife	1.803	0.471 – 6.903	0.389
Student	1.401	0.282 – 6.964	0.680
Self-employed	1.195	0.412 – 3.463	0.743
Civil service (Ref)			

Ref = Reference category* = B coefficients have negative values, implying that the predicted variable decreases, rather than increases by a factor given by the stated odds ratio.

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