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Factor Associated to Bacterial Vaginosis in Non-pregnant Women of North Indian Population

Singh Hari Om[1]*, Singh Amita[2], Dhole TN[1] and Sumitra Nain[3]

[1]Department of Microbiology, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India
[2]Department of Obstetrics and Gynaecology, CHC, Sarai Akil, Allahabad, India
[3]Department of Pharmacy, Banasthali University, Banasthali, Rajasthan, India

Abstract

Bacterial vaginosis is currently the most prevalent cause of vaginal infection and vaginal discharge among the sexually active women. Bacterial vaginosis is a complex microbiological disease. Therefore, we aimed to determine the association of risk factors for bacterial vaginosis patients. In the prospective study, we enrolled a total of 300 non-pregnant women. One hundred and twenty six women were positive for bacterial vaginosis, confirmed by Amsel's criteria and Nugent's scoring. One hundred and seventy four women were unrelated control. Frequency of intrauterine contraceptive device differed significantly between bacterial vaginosis and healthy individuals (29.4% versus 17.2%, p=0.017; OR=1.70). Individuals with a sexual transmitted disease in partners was conferred significantly higher risk for bacterial vaginosis (p=0.001, OR=8.28). However, use of contraception, vaginal douching, and use of condom did not modulate the risk of bacterial vaginosis. Individuals with the use of intrauterine contraceptive device and presence of sexual transmitted disease in partners conferred a higher risk for bacterial vaginosis.

Keywords: Bacterial vaginosis; Genitourinary disease; Intrauterine contraceptive device; Risk factor; Sexual transmitted infection; Vaginal infections

Abbreviations: BV: Bacterial Vaginosis; STI: Sexually Transmitted Infections; IUCD: Intrauterine Contraceptive Device; ORs: Odds ratios; 95% CI: 95% Confidence Interval

Introduction

Bacterial vaginosis (BV) is one of the most common vaginal infections worldwide. It is characterized by vaginal flora changes. BV has been associated with a variety of adverse health outcomes, including preterm delivery, intrauterine infection [1], pelvic inflammatory disease (PID) [2], other gynecological complications [3] and reproductive outcomes, including endometriosis [4]. In sub- Saharan Africa, the prevalence of BV is very high, ranging from 30–51% in community based studies [5,6]. A high prevalence has also been reported among African-American women with estimates of up to 50% in population-based surveys [7]. The prevalence of bacterial vaginosis in India varies from 32.8% and 13.33% among women in Delhi and Gujarat respectively [8,9]. Studies have revealed that bacterial vaginosis can be intermittent [10] that up to 35% of women with bacterial vaginosis lack symptoms, and the prevalence can exceeds up to 25% in certain population subgroups [11,12].

Preventive strategies target the risk factors or behaviors for disease. The etiology and pathogenesis of bacterial vaginosis remains poorly understood [13], although sexual activity and vaginal hygiene practices have been associated with BV [14-18]. Reproductive hormones are also thought to play a role in the regulation of vaginal flora [19,20]. Previous studies have identified a number of risk factors and behaviours associated with BV, including the number of lifetime male sexual partners, recent partner change, lower age of first intercourse, having a female sexual partner in the past 12 months, being unemployed, being unmarried, working as a sex worker, smoking, and failure to use condoms or less frequent use of condoms, more frequent episodes of receptive oral sex, use of multiple partner at time, spermicide use, more frequent vaginal intercourse, sexually transmitted diseases (STD), use of intrauterine contraceptive device (IUCD), race and vaginal douching ([21-25]. Numerous studies have investigated the association of risk factors and bacterial vaginosis but there are inconsistencies in results [20,24,26-29]. However, many previous studies have been reported, but lack of reporting on association of bacterial vaginosis with its risk factors in Indian populations. Therefore, the present study was carried out to determine the potential risk factors associated with bacterial vaginosis in a North Indian population.

Materials and Methods

Subjects

A total of 300 sexually active non pregnant women between period of July 2007 to July 2009, attending OPD of obstetrics and gynecology, CHC, Sarai Akil, Allahabad, Uttar Pradesh, India, with complaints of vaginal discharge were recruited. One hundred twenty six women of a reproductive age group (15-25 year) with complaints of white discharge with or without other symptoms as itching were screened for bacterial vaginosis, confirmed by Amsel's clinical criteria and interpretation of Gram staining is done by Nugent's Scoring (Table 1). One hundred seventy four bacterial vaginosis negative (healthy unrelated females) was also recruited who accompanied patients seeking treatments for minor ailments at OPD of Obstetrics and Gynecology, CHC, Sarai Akil, Allahabad, Uttar Pradesh. All of them underwent screening for Amsel's clinical criteria and Nugent's scoring. Females negative for both the criteria were included as controls in the study. The study was approved by the local ethics committee of the Institute. After obtaining informed consent, all individuals were personally interviewed using

***Corresponding author:** Hari Om Singh, Department of Molecular Virology, National AIDS Research Institute (ICMR), GOI, 73 'G' Block, MIDC, Bhosari, Pune -411026, India, Tel: +91-020-27331200 (1244--O); Fax: + 91-020-272121071; E-mail: hsingh@nariindia.org or hariomsgpgims@gmail.com

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a predetermined questionnaire. Information on age, age of marriage, use of IUCD, oral contraception, vaginal douching, the use of condom, number of sexual partners, STD in partners, occupation, region of origin were recorded.

Statistical analysis

Descriptive statistics of patients and controls were presented as mean and SDs for continuous measures while frequencies and percentages were used for categorical measures. Differences in genotype frequencies between patients and controls were estimated by Pearson chi-square test. The risk factors associated with developing bacterial vaginosis were estimated as odds ratios (OR) with 95% confidence intervals (CI). All statistical analysis was performed using SPSS software version 15 (SPSS, Chicago, IL, USA). The tests of statistical significance were two-sided and differences were taken as significant when *P*-value was less than 0.05. The desired power of our study was set 80%.

Bacterial morpho type	None	Points 1+	Scored 2+	Per 3+	Morpho Type 4+
Large Gram positive rode (lactobacillus) (0-4)	4	3	2	1	0
Small Gram positive/ variable rods (G. vaginalis) (0-4)	0	1	2	3	4
Curved Gram negative/ variables rods. (Mobiluncus) (0-2)	0	1	1	2	2

Source of 0-3 points= Normal, 4 to 6= intermediate, 7 to 10= bacterial vaginosis.

Table 1: Nugent scoring of Gram smears for diagnosis of bacterial vaginosis.

Variables	Bacterial Vaginosis (n= %) N	Healthy controls (n= %) N
Number	126	174
Mean age ±SD	27.90 ± 4.25	27.92 ± 5.35
Age at marriage		
Age 14-17 year	34(27.0)	40 (23.0)
Age 18-21 year	71(56.3)	111(63.8)
Age 22-25 year	23((18.3)	29(16.7)
IUCD	37 (55.2)	30 (44.8)
Vaginal douching	32 (25.4)	33 (19.0)
Contraception	20 (15.9)	3(1.7)
Condom	75 (59.5)	92(52.9)
Multisexual partner	8(6.7)	16 (9.2)
STD in Partners	12 (9.5)	2 (1.1)

*Data is missing

Table 2: Demographic profile of bacterial vaginosis cases and healthy controls.

Results

The study population consisted of 126 cases with bacterial vaginosis and 174 controls. The mean age and standard deviation were 27.90 (4.25 and 27.92 (5.35 for bacterial vaginosis causes and controls respectively. Demographic profile of bacterial vaginosis patients and healthy controls are shown in Table 2.

IUCD, Contraception and STD in partners and bacterial vaginosis

The frequency distributions of IUCD, Contraception and STD in partners are shown in Table 3. Frequency of IUCD user was found to be higher in bacterial vaginosis patients (29.4%) as compared to healthy controls (17.2.0 %) and the difference was significant (p=0. 017, OR=1. 70; 95%CI: 1.1-2.6). Use of Contraception frequency was lower in the bacterial vaginosis patients (16.6 %) as compared to healthy controls (31.61%). The frequency of an STI in partners was also higher in bacterial vaginosis patients and the difference was also significant (p=0.001, OR=8.28; 95%CI: 1.8-36.3).

Vaginal douching and condom and bacterial vaginosis

We analyzed the association of vaginal douching and condom with bacterial vaginosis. As shown in Table 4, the frequency of vaginal douching was higher in bacterial vaginosis patients, but the difference was not significant (p=0.20, OR=1.33, 95%CI: 0.8-2.0). The association between risk factors associated with developing bacterial vaginosis was analyzed but a low risk was observed in condom user patients.

Use of IUCD	Bacterial Vaginosis (+ve)	Healthy controls (-ve)	*p*-value	OR (95%CI)
	n (%)	n (%)		
Absence of IUCD	89 (70.6)	144 (82.8)	-	1(Reference)
Presence of IUCD	37 (29.4)	30 (17.2)	**0.017**	1.70(1.1-2.6) #
Use of contraception				
Absence of contraception	105(83.33)	119(68.39)	-	1(Reference)
Presence of contraception	21(16.6)	55(31.61)	0.11	0.62 (0.34-1.11) #
STD in partners				
Absence of STD in partners	114(90.5)	172(98.9)	-	1(Reference)
Presence of STD in partners	12 (9.5)	2 (1.1)	**0.001**	8.28(1.8-36.3) #

Absence of IUCD, Use of contraception and STD in partners were taken as reference group for statistical analysis. Significant *p*-value showed in bold.

Table 3: Frequency distribution of IUCD, Use of contraception and STD in partners in bacterial vaginosis cases and healthy controls.

Vaginal douching	Bacterial Vaginosis	Healthy controls	*p*-value	OR (95%CI)
	n (%)	n (%)		
Absence of vaginal douching	94(74.6)	141(81.0)	-	1(Reference)
Presence of vaginal douching	32 (25.4)	33 (19.0)	0.20	1.33(0.8-2.0) #
Condom				
Absence of condom	51(40.5)	82(47.1)	-	1(Reference)
Presence of condom	75 (59.5)	92(52.9)	0.29	1.12(0.9-1.3) #

Absence of vaginal douching and condom were taken as reference group for statistical analysis.

Table 4: Frequency distribution of vaginal douching and condom in bacterial vaginosis cases and healthy controls.

Discussion

Bacterial vaginosis is a common cause of malodorous vaginal discharge in women [30]. Three million symptomatic cases are reported annually in the United States, but millions more remain unreported or unrecognized [31,32].

The present study attempts to assess the risk factors associated with bacterial vaginosis. Our study showed that individuals using an intrauterine contraceptive device (IUCD) were at significant increased risk of bacterial vaginosis (p=0.017; OR= 1.70). Since, the contribution of IUCD used to trigger vaginal flora changes that will lead to the development of bacterial vaginitis and it may have risk of bacterial vaginosis. Earlier studies have found a significant association with the IUCD user bacterial vaginosis cases than controls in populations of the UK; p = 0.04, 27% cf. 14% [33], Indonesia, USA; 47.2% and 29.9% [34], Turkey; $p < 0.05$ [35]. However, some previous studies showed contradictory results and found no significant difference of IUCD user bacterial vaginosis cases in the populations of India [36], United States [37] and Chile [38].

In the present study, patient using oral contraception was at protection of BV (p=0.11; OR=0.62). The estrogen increases the glycogen content of vaginal epithelial cell activity; in turn inhibiting the in vitro growth of certain bacteria, which may result in low risk for bacterial vaginosis [19]. Our findings were supported with previous studies done in population of UK [27], Sweden [39], Netherlands [40], USA [20,41,42], turkey [43].

The epidemiological profiles were consistent with trichomoniasis and bacterial vaginosis being sexually transmitted diseases [24]. In the present study, an association was observed between STI in partners and risk of bacterial vaginosis, which suggest that sexually transmitted role of bacterial vaginosis is its occurrence in virginal females and its colonization of the rectum in virginal boys and girls. More studies with larger sample size are required to confirm the influence of STI in partners on the risk of bacterial vaginosis.

Various studies have pointed out relationship between vaginal douching and modulation of risk in bacterial vaginosis in the populations of USA, Kenya and Thailand [7,41,44,45]. Our findings suggest that the effect of vaginal douching may modulate the risk of bacterial vaginosis (OR=1.33 fold) but could not reach statistical significance probably due to limited sample size of the study. Earlier studies of Onderdonk et al. [46] reported that douches containing providine-iodine had a more profound inhibitory effect on vaginal *Lactobacillus* than did douches containing saline or acetic acid. So, it is plausible that vaginal douching may not alter the vaginal ecology and propel vaginal organisms up through the cervical OS, and it may not be associated with risk of bacterial vaginosis. The association between vaginal douching and bacterial vaginosis is inconsistent, perhaps reflecting the heterogeneity of the techniques and substances used. Previous studies have found that no significant differences in between users and non-users of vaginal douching and did not increase risk for altered vaginal flora or BV in vaginal douche users in population of Brazil [47], USA [26], UK [27].

In this study, we also analyzed the effect of condom with low protection of the bacterial vaginosis, but found no significant association (p=0.29; OR= 1.12).We hypothesized that condom user women have not been in direct contact of vaginal epithelial cells and condom act as barrier for bacterial cytotoxins. Therefore, condom may play a role in protection of BV. Previous studies have also found that bacterial vaginosis was less prevalent among women who always used condoms during sexual intercourse and is supported by studies in populations of USA and India [41,42,48-50].

In summary, study suggests that use of IUCD and presence of STD in partners may confer higher risk for bacterial vaginosis. Vaginal douching may also influence the risk of bacterial vaginosis. Further studies in larger sample size will be required to screen the risk factors associated with bacterial vaginosis.

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