Journal of Pregnancy and Child Health
ISSN: 2376-127X

Research Article Open Access

Bacterial Vaginosis among Antenatal Patients in Jos University Teaching Hospital (JUTH)

Yahaya-Pam S, Ohihoin AG, Kiladejo A, Okechukwu A*, Musa J and Sagay A

Nigerian Institute of Medical Research, Nigeria

Abstract

Introduction: Bacterial vaginosis is the commonest cause of abnormal vaginal discharge among women of child bearing age. This study determined the prevalence of bacterial vaginosis in antenatal attendees as well as investigated the relationships between bacterial vaginosis status, previous adverse obstetric outcome and present HIV status.

Methods: Study was cross-sectional using interviewer administered questionnaires. Vaginal samples were collected by physicians and diagnosis made using Amsel criteria. Data analysis was by EPI-INFO 3.5.3. Categorical variables were compared using Chi square and continuous variables using the student t-test. Statistical significance was placed as $p<0.05$.

Result: Of the 252 subjects studied, 20 were positive for bacterial vaginosis giving a prevalence rate of 7.9%. Of the 23 subjects that had a previous adverse pregnancy outcome, 2 were positive for bacterial vaginosis. Of the 9 subjects that were positive for HIV, Only 1 was positive for bacterial vaginosis.

Conclusion: The associated social and behavioural factors studied did not show any statistically significant association with bacterial vaginosis. The number of HIV positive subjects was low and therefore this study lacked sufficient power to draw conclusions on an association between positive bacterial vaginosis status and HIV status.

Keywords: Bacterial vaginosis; Pregnancy; HIV; Nigeria

Introduction

Bacterial vaginosis (BV) is a genital tract infection that is characterised by an overgrowth of predominantly anaerobic organisms (*Gardnerella vaginalis*, *Prevotella* spp., *Mycoplasma hominis* and *Mobilincus* spp.) in the vagina leading to a replacement of Lactobacilli and an increase in the vaginal pH from less than 4.5 to as high as 7.0 [1-3]. It is the commonest cause of abnormal vaginal discharge in women of child bearing age [1,2,4,5]. The reported prevalence rates vary from as low as 3.5% to as high 55%. These rates include 6.4% in Burkina Faso, 3.5% in Yorkshire, 25% in Baltimore, 47.7 % in Uganda, 14.2% in Benin city, 17.5% in Jos and 25% in Osogbo, Nigeria [1,4,6-11].

The main symptom is an offensive fishy smelling vaginal discharge which is characteristically thin, homogenous and adherent to the walls of the vagina. However, almost 50% of affected women are asymptomatic [1-3]. Bacterial vaginosis can be diagnosed clinically in several ways. Consideration is given to availability of methods, the cost and the experience of the clinician. Clinical diagnosis made with the Amsel (Composite) criteria is based upon the presence of any 3 of the following, clue cells on gram stain or wet mount of the vaginal discharge, an anterior fornix vaginal pH of greater than 4.5, the release of a fishy smell on addition of an alkali (10% Potassium Hydroxide) and the presence of the characteristic thin homogenous vaginal discharge.

The Nugent scoring system uses the Gram stain method. It ranges from normal with predominantly lactobacilli to bacterial vaginosis where there is a large number of Gram positive and Gram negative cocci with few or absent Gram positive bacilli (hydrogen peroxide producing lactobacilli) [1,5,12].

The drug treatment includes oral and topical metronidazole and clindamycin [13]. Bacterial vaginosis is associated with obstetric and gynaecological complications which include post-partum endometritis, second trimester miscarriage and pre-term delivery. Bacterial vaginosis is also associated with an increased susceptibility to sexually transmitted diseases including Human Immunodeficiency virus infection [9,10,14,15].

Despite the impact of BV on obstetric outcome, screening for BV has not been instituted into routine ANC in Nigeria. So, only limited studies have been done in Nigeria to evaluate the impact of BV on obstetric outcome.

The study aimed to determine the prevalence of bacterial vaginosis in antenatal attendees at the Jos University Teaching Hospital, as well as investigate the relationships between the bacterial vaginosis status and previous adverse obstetric outcome and present HIV status.

Methods and Materials

The study was carried out between 1st July to 30th September 2013 at the Jos University Teaching Hospital which is a five hundred bed facility located in Jos, the capital city of Plateau state in the middle belt region of Nigeria in West Africa. There are four antenatal clinics held each week from Monday through Thursday during which an average of one hundred patients are seen every day. Antenatal care patients are drawn from all over the state but particularly from residents in the Jos and Bukuru Metropolis. All pregnant women who had ever carried a pregnancy beyond twenty eight weeks gestation were invited to participate. Informed consent was obtained from participants. Women who had been treated with antibiotics two weeks prior to attending the clinic and all primigravida were excluded from the study.

The sample size was calculated using Fishers sample size determination formula putting the prevalence of bacterial vaginosis at

***Corresponding author:** Okechukwu A, Medical Officer, Nigerian Institute of Medical Research, Nigeria, Tel: +2348028425806; E-mail: patriscy@gmail.com

Received: May 07, 2019; **Accepted:** June 11, 2019; **Published:** June 18, 2019

Citation: Yahaya-Pam S, Ohihoin AG, Kiladejo A, Okechukwu A, Musa J, et al. (2019) Bacterial Vaginosis among Antenatal Patients in Jos University Teaching Hospital (JUTH). J Preg Child Health 6: 416.

17.5% [10]. The study design was cross-sectional. Participant selection was by systematic random sampling where every third patient on the antenatal care list who fulfilled the inclusion criteria and was willing to participate in the study was selected. An average of twenty patients were selected each day and eighty patients each week. Selected patients had the study explained again to them after which they signed an informed consent form. Patients that were not literate thumb printed the consent form after an explanation of the study had been made to them in their own language. The questionnaires were pre-tested at the antenatal clinic of the Jos University Teaching Hospital. It was an interviewer administered questionnaire subdivided into three sections which includes Socio-demographic characteristics, questions assessing risk factors for developing BV and Foetal outcome. The questions were used to elicit information about the patient's parity, ethnicity, marital status, educational qualification and social habits. Specific questions about vaginal douching, contraceptive history, menstrual protection methods, past obstetric history and history of sexually transmitted infections were also included. The questionnaire was clearly written in English Language.

Asides from the administration of questionnaires, a vaginal examination was performed to collect genital samples. Under good illumination,the labia were parted and a sterile non-lubricated Cusco's speculum was introduced into the vagina. Two sterile cotton tipped swabs were used to take swabs from the posterior vaginal fornix. The swabs were immediately rolled on the 2 clean glass slides. One slide had a drop of isotonic saline placed on it to make the wet preparation which was later read under the microscope at x400 magnification to observe for clue cells. The other slide was allowed to air dry. The speculum was then removed and the physical appearance of the vaginal fluid on the speculum was noted and recorded. The pH dipstick was applied to the discharge on the speculum to obtain the pH. The whiff test was then performed on the vaginal fluid on the speculum by the application of two drops of potassium hydroxide. No bimanual examination was done. The air dried slide was transported in a covered container to the laboratory where it was heat fixed and gram stained and observed under oil immersion at x1000 magnification. The swabs were analysed in conjunction with laboratory scientists from the departmental research laboratory.

The diagnosis was based on the Amsel (composite) criteria where the presence of 3 of the 4 aforementioned criteria gives a positive diagnosis. All patients who fulfilled the criteria for bacterial vaginosis were treated with oral metronidazole at a dose of 400 mg 12 h for 7 days. HIV testing was done by a third person who was blinded to the questionnaire and vaginal examination findings using double rapid test with pre and post test counselling.

The data was double entered into the statistical software package EPI-INFO 3.5.3 which was used for analysis. Continuous variables were compared using student t test. Categorical variables were compared using the chi square test and where the numbers were small Fisher exact test was used. Differences were considered significant if $p<0.05$.

Results

Socio-demographic characteristics of the study participants

Two hundred and fifty two (252) women were recruited for the study of which 20 were positive for bacterial vaginosis, giving a bacterial vaginosis prevalence rate of 7.9%. There were no significant differences in the mean age, mean parity, religious affiliation, level of education and occupation between the two groups.

The mean gestational age at recruitment into the study for the BV positive group (37.5 ± 7.1 weeks) was not significantly different from that for the BV negative group (27.3 ± 8.2 weeks) (Student t-test=0.09, p=0.93).

Analyses of factors known to be associated with the acquisition of bacterial vaginosis

There were 23 subjects with previous adverse pregnancy outcome. No significant difference in the history of previous adverse pregnancy outcome was detected between the two groups. There were 9 subjects who tested positive for HIV giving an HIV prevalence rate of 3.6%. There was no significant difference in the prevalence of HIV infection between BV positive and BV negative groups.

Women who were BV positive were just as likely to be in a polygamous marriage and to have practised vaginal douching as those who were BV negative. The proportions of study subjects that reported a previous history of vaginal discharge or vaginal discharge in the index pregnancy were comparable across both groups of BV status. There was no significant difference in the prevalence of a past history of miscarriage between the two groups and neither was there any difference in the type of menstrual protection they had used. There was no significant difference between the two groups in the use of contraception and among those who had used contraception there was no significant difference, between the two groups, in the use of IUCD as opposed to other forms of contraception.

Outcome to babies of previous adverse pregnancy outcomes

The mean gestational age at previous adverse pregnancy outcome for the BV positive group (29.0 ± 1.4 weeks) was not significantly different from that of the BV negative group (31.6 ± 2.4 weeks) (student t test=1.47, p=0.15). There are no significant differences between the BV positive and negative groups as regards their demographic characteristics. 38% of the subjects were primipara while 54% of the subjects were multipara. The rest were grand multipara.

Discussion

This study shows a prevalence of bacterial vaginosis of 7.9%. This is at variance with prevalence rates seen in other studies carried out in pregnant and none pregnant women [3,6-11]. A study in Burkina Faso showed a prevalence of 6.4% while another in Uganda showed a prevalence of 47.7% [4,8]. In Benin city, Nigeria, a study showed a prevalence rate of 14.2%, that study however involved healthy non pregnant volunteer attendees at a reproductive health care service center [9]. In Jos, Nigeria, a study which aimed to determine the risk factors for HIV among pregnant women at the antenatal care clinic, showed a prevalence rate of bacterial vaginosis of 17.5% [16].

The prevalence rate in this study is however in keeping with the prevalence of 7.6% seen in a study in Jos which looked at abnormal vaginal discharge and their causative agents in an antenatal population. The variance in the reported prevalence rates may be attributed to the fact that bacterial vaginosis shows a wide heterogeneity as seen in the study in Burkina Faso where the prevalence rate varied among different locations in the same country [17]. The difference in prevalence rates may also be due to method of diagnosis [18-22]. The Nugent's criteria was used in most of the aforementioned studies as opposed to the Amsel criteria which was used in this study. The Amsel criteria has been described as subjective and therefore prone to inter observer error and results from the same study population may differ [23-25].

Previous adverse outcome of pregnancy in this study was taken as a history of preterm birth and or pre labour rupture of membranes. Preterm delivery is a major cause of perinatal morbidity and mortality and there is increasing evidence that ascending infection from the lower genital tract is an important causative factor [2,26]. The most powerful predictor of preterm delivery is a prior history of such a delivery [2]. In this study, there is no statistically significant association between previous preterm birth or miscarriage and present BV status suggesting that women with a previous adverse pregnancy outcome are not at any increased risk of having BV. Study findings by Hay et al. have shown that an abnormal outcome in pregnancy was associated with a previous preterm delivery [27]. Their study population was found to have a low prevalence of sexually transmitted infections and therefore bacterial vaginosis in that population was considered to be without confounders. The effect of the abnormal vagina flora was also seen to be an independent predictor of preterm delivery and late miscarriage (16-24 weeks). Bacterial vaginosis is often a chronic recurrent condition. [2,4]. If there is an association between BV and preterm delivery, it can therefore be inferred that a weaker association with abnormal vaginal flora and a previous preterm delivery may be expected. This may also be expected for spontaneous abortions [2,4]. If in this study, an association had been detected, it may have been an indication that the previous adverse pregnancy outcome may have had a relationship with BV status but such an inference cannot be drawn from a cross sectional study which lacks the power to ascertain the sequence of events. A large scale prospective study with sufficient power will however be required to study that association effectively [28]. This is especially so if the association is a weak one or the difference is small. Perhaps the timing of the screening for BV is important in order to establish an association. Women who are positive for BV detected early in pregnancy in the first trimester have a greater chance of having an abnormal pregnancy outcome [2,4,22]. Majority of the women in this study were recruited in the third trimester. It is a possibility that those likely to have chronic recurrent BV which may have affected the outcome of their previous pregnancy, will be positive in the first trimester and such a population may demonstrate an association between present BV status and previous adverse outcome of pregnancy. Those that reported a previous adverse pregnancy outcome may also have had other conditions that resulted in the adverse outcome and BV may not have been implicated. There is paucity of research on the relationship between the present BV status and previous adverse pregnancy outcome and it remains to be investigated.

Studies have shown that there is a significant association between abnormal bacterial colonisation detected early in pregnancy and preterm delivery and late miscarriage [2,4,22].

In contrast, a study in Osogbo, Nigeria did not demonstrate any significant adverse effect on pregnancy outcome despite a high prevalence rate of BV of 25% [29-32]. The sample size of that study was however small (204 subjects) compared to the aforementioned studies and a larger sample size may detect a conflicting result.

This study found no significant association between HIV status and BV status. This is at variance with several studies which have shown that there is an increased risk of acquisition of BV in the HIV positive woman [33]. The HIV prevalence in this study population was 3.6% which is less than 7.7% sero-prevalence in plateau state but close to the national sero-prevalence of 4.1% [34-37].

The lower prevalence of HIV seen may be attributed to the difference in time since the data on the sero-prevalence in Plateau state was collected. The difference in prevalence may therefore signify a drop over the past two years owing to an uptake of HIV prevention strategies. Also, the study population being attendees of the antenatal clinic, may also reflect those with a positive health seeking behaviour which may translate to safer sexual health practices. The study was also open to volunteers and those already aware of their HIV positive status may have opted to stay out of the study. The number of HIV positive subjects in the study is however too small to draw a conclusion from this result.

In this study, sexual and other behavioural factors which have been known to be associated with BV were not found to have a statistically significant association with BV status. In a study in Burkina Faso, an association between polygamy and the use of contraception and positive BV status was found in contrast to a study in Gambia where there was no association between BV status and polygamy [38-40]. In another study in Gambia, however, which looked at subjects with vaginal discharge syndrome, there was no association between BV and HIV, douching and menstrual hygiene [41]. A study among pregnant African American women found an increased risk of acquisition of BV among those who douche in pregnancy [7]. In another United States based study of pregnant women with a predominantly African American population, douching was not found to be associated with BV positivity whereas numerous sexual partners and a history of a sexually transmitted disease was associated with BV positivity [36]. IUD users have been found to have a higher frequency of episodes of BV as opposed to users of oral contraceptives. It has been suggested that studies on pregnant women are silent on sexual behaviour as risk factors for B [7].

Of the BV positive patients who had a previous adverse outcome of pregnancy, these events occurred in early third trimester and resulted in 100% neonatal death. In those that were BV negative, the events also occurred in the third trimester but resulted in 42.3% neonatal death. The risk of preterm birth is higher if BV is diagnosed before the 16th week of gestation [22]. Selective screening of women with a history of preterm labour or second trimester miscarriage is recommended [13]. BV detected early in the second trimester is strongly associated with late miscarriage and preterm birth, it is suggested that treatment for BV should be instituted no later than the beginning of the second trimester. Screening and treating beyond 16 weeks will miss some potentially preventable late miscarrriages, early treatment may therefore be more effective [2,22].

There is still no evidence that screening and treating all women with BV in the antenatal period will have a major impact on the consequences of preterm birth, there is however a suggestion that early treatment may be more effective. It is suggested that there is a potential but unclear benefit of treating some women at high risk of preterm delivery.

Routine screening of all women with a previous adverse pregnancy (preterm labour) outcome in our environment may therefore not be of benefit in preventing preterm labour. However selective screening of high risk women with a previous history of preterm birth and or preterm pre labour rupture of the membranes may be of benefit. For such women who present for antenatal care before 16 weeks of gestation, screening may be of benefit as the risk of an adverse outcome of pregnancy is higher when BV is diagnosed before the 16th week of gestation [13,22].

Limitations of study

- Relatively small sample size. A larger sample size would have yielded a stronger inference.
- Prior risk factors of BV were not assessed.

Conclusion

The prevalence of bacterial vaginosis in the antenatal population studied is 7.9%. There is no significant association between previous adverse pregnancy outcome and BV status. It may therefore not be of benefit to routinely screen all high risk antenatal patients with a previous history of preterm birth and or preterm prelabour rupture of membranes for bacterial vaginosis. The number of HIV positive subjects was low and therefore this study lacked sufficient power to enable conclusions to be drawn on an association between positive BV status and HIV status. Sexual behaviour and other behavioural factors known to be implicated in BV, showed no association with positive BV status in this study.

References

1. Campbell S, Monga A (2000) Infections in gynaecology. Gynaecology by ten teachers. 17th edition, London: Arnold. Pp: 186-187.
2. Hay P, Lamont R, Taylor-Robinson D, Morgan D, Ison C, et al. (1994) Abnormal bacterial colonisation of the genital tract and subsequent pre-term delivery and late miscarriage. BMJ 308: 295-298.
3. Ainbinder SW, Ramin SM, DeCherney AH (2007) Sexually transmitted diseases and pelvic infections. In: DeCherney AH, Nathan L, Goodwin TM, Laufer N (Eds), Current diagnosis and treatment obstetrics and gynaecology. 10th edition, New York: Mc Graw-Hill. p: 670.
4. Samadoulougou FK, Nagot N, Defer MC, Yaro S, Meda N, et al. (2008) Bacterial vaginosis among pregnant women in Burkina Faso. Sex Transm Dis 35: 985-989.
5. Paavonen J, Molander P (2003) Pelvic inflammatory disease. In: Shaw RW, Soutter WP, Stanton SL (Eds), Gynaecology. 3rd edition, London: Churchill Livingstone. p: 892.
6. Akinbiyi AA, Watson R, Feyi-Waboso P (2008) Prevalence of Candida albicans and bacterial vaginosis in asymptomatic pregnant women in South Yorkshire, United Kingdom. Outcome of a prospective study. Arch Gynecol Obstet 278: 463-466.
7. Trabert B, Misra DP (2007) Risk factors for bacterial vaginosis during pregnancy among African American Women. Am J Obstet Gynecol 197: 477e1-8.
8. Tann CJ, Mpairwe H, Morison L, Nassimu K, Hughes P, et al. (2006) Lack of effectiveness of syndromic management in targeting vaginal infections in pregnancy in Entebbe Uganda. Sex Transm Infect 82: 285-289.
9. Anukam KC, Osazuwa EO, Ahonkai I, Reid G (2006) Lactobacillus vaginal microbiota of women attending a reproductive health care service in Benin city, Nigeria. Sex Transm Dis 33: 59-62.
10. Sagay AS, Kapiga SH, Imade GE, Sankale JL, Idoko J, et al. (2005) HIV infection among pregnant women in Nigeria. Int J Gynaecol Obstet 90: 61-67.
11. Adekanle DA, Opaleye OO, Fayemiro SA, Taiwo SS, Oboro VO, et al. (2007) Bacterial vaginosis and pregnancy outcome in Osogbo, Nigeria. Res J Sci 1: 195-198.
12. Yen S, Shafer MA, Moncada J, Campbell CJ, Flinn SD (1998) Bacterial vaginosis in sexually experienced and non-sexually experienced young women entering the military. Obstet Gynecol 1: 927-933.
13. Hay P (1998) Therapy of bacterial vaginosis. J Antimicrob Chemother 41: 6-9.
14. Maclean A, Dina R (2003) Benign disease of the vulva and the vagina. In: Shaw RW, Soutter WP, Stanton SL (Eds), Gynaecology. 3rd edition, London: Churchill Livingstone. Pp: 599-614.
15. Oduyebo OO, Anorlu RI, Ogunsola FT (2009) The effects of antimicrobial therapy on bacterial vaginosis in non-pregnant women. Cochrane Database Syst Rev 3: CD006055.
16. Anoutcheva A, Gariti D, Simon M, Shott S, Faro J, et al. (2001) Defense factors of vaginal lactobacilli. Am J Obstet Gynecol 185: 375-379.
17. Josey WE, Schwebke JR (2008) The polymicrobial hypothesis of bacterial vaginosis causation: A reassessment. Int J STD AIDS 19: 152-154.
18. Lamont R, Sobel J, Akins R, Hassan S, Chaiworapongsa T, et al. (2011) The vaginal microbiome: New information about genital tract flora using molecular based techniques. BJOG 118: 533-549.
19. Mijac VD, Dukic SV, Opavski NZ, Dukic MK, Ranin LK (2006) Hydrogen peroxide producing lactobacilli in women with vaginal infection. Eur J Obstet Gynecol Reprod Biol 129: 69-76.
20. Martinez RC, Franceschini SA, Patta MC, Quintana SM, Nunes AC, et al. (2008) Analysis of vaginal lactobacilli from healthy and infected Brazillian women. Appl Environ Microbiol 74: 4539-4542.
21. Blackwell AL (1999) Vaginal bacterial phaginosis? Sex Transm Infect 75: 352-353.
22. Guaschino S, DeSeta F, Piccoli M, Maso G, Alberico S (2006) Aetiology of preterm labour: Bacterial vaginosis. BJOG 113: 46-51.
23. Keane FEA, Ison CA, Taylor-Robinson D (1997) A longitudinal study of the vaginal flora over a menstrual cycle. Int J STD AIDS 8: 489-494.
24. Forbes BA, Sahn DF, Weissfeld AS (1998) Genital tract infection. In: Forbes BA, Sahn DF, Weissfeld AS (Eds), Bailey and Scott's diagnostic microbiology. 10th edition, St. Louis: Mosby Company. Pp: 363-369.
25. Donati L, DiVico A, Nucci M, Quagliozzi L, Spagnuolo T, et al. (2010) Vaginal microbial flora and outcome of pregnancy. Arch Gynecol Obstet 281: 589-600.
26. Tebes CC, Lynch C, Sinnott J (2003) The effect of treating bacterial vaginosis on preterm labor. Infect Dis Obstet Gynecol 11: 123-129.
27. Hay P (2005) Life in the littoral zone: Lactobacilli losing the plot. Sex Transm Infect 81: 100-102.
28. Krohn MA, Hillier SL, Eschenbach DA (1989) Comparison of methods for diagnosing bacterial vaginosis among pregnant women. J Clin Microbiol 27: 1266-1271.
29. Leopold S (1953) Hertofore undescribed organism isolated from genitourinary system. US Armed Forces Med J 4: 263-266.
30. Gardner HL, Dukes CD (1955) Haemophilus vaginalis: A newly defined specific infection previously classified nonspecific vaginitis. Am J Obstet Gynecol 69: 962-976.
31. Drukenberg WE, Skaggs R, Kelloggs DS (1970) A study and new description of *Corynebacterium vaginale*: Haemophilus vaginalis. Am J Clin Pathol 53: 370-377.
32. Deane C, Smith CD, Fykes T, Sampson CC (1972) *Corynebacterium vaginale*: An analysis of 68 isolations. Med Ann Dist Columbica 41: 4-5.
33. Greenwood JR, Pickettt MJ (1980) Transfer of the *Haemophilus vaginalis* gardner and dukes to a new genus *Gardnerella*: *G vaginalis* (Gardner and Dukes) comb. nov. Int J Syst Bacteriol 30: 170-178.
34. Hillier SL, Krohn MA, Rabe LK, Klebanoff SJ, Eschenbach DA (1993) The normal vaginal flora, H_2O_2 producing lactobacilli and bacterial vaginosis in pregnant women. Clin Infect Dis 1: 273-281.
35. Forsum U, Holst E, Larsson PG, Varquez A, Jakobsson T, et al. (2005) Bacterial vaginosis-a microbiolgical and immunological enigma. APMIS 113: 81-90.
36. Uscher-Pines L, Hanlon AL, Nelson DB (2009) Racial differences in bacterial vaginosis among pregnant women: The relationship between demographic and behavioral predictors and individual BV-related microorganism levels. Matern Child Health J 13: 512-519.
37. Turovsky Y, Noll SK, Chikindas ML (2011) The aetiology of bacterial vaginosis. J Appl Microbiol 110: 1105-1128.
38. Rajamanoharan S, Low N, Jones SB, Pozniak AL (1999) Bacterial vaginosis ethnicity and use of genital cleaning agents: A case control study. Sex Transm Dis 26: 404-409.
39. Goldeberg R, Klebanoff M, Nugent R, Krohn M, Hillier S (1996) Bacterial colonisation of the vagina during pregnancy in four ethnic groups. Am J Obstet Gynecol 174: 1618-1621.
40. Stock RJ, Stock ME, Hutto JM (1973) Vaginal douching, current concepts and practices. Obstet Gynecol 42: 141-146.
41. Demba E, Morison L, Loeff MSVD, Awasana AA, Gooding E, et al. (2005) Bacterial vaginosis, vagina flora patterns and vaginal hygiene practices in patients presenting with vaginal discharge syndrome in the Gambia, West Africa. BMC Infect Dis 5: 12.