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Research Article

Study on types of vaginitis and association between bacterial vaginosis and urinary tract infection in pregnant women

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Abstract

Introduction: Infectious vaginitis which includes bacterial vaginosis (BV), vulvovaginal candidiasis (VVC) and trichomoniasis are common disorder in women. Both vaginitis and urinary tract infection (UTI) during pregnancy have risk to lives of both the mother and fetus. Present study was done to assess type of vaginitis and to evaluate the risk of UTI in pregnant women with BV.

Methods: Cross sectional descriptive study of 230 pregnant women was done from 1st July to 30th December 2010 at Paropakar Maternity and Women's Hospital Thapathali, Kathmandu, Nepal. Duplicate High Vaginal Swab and urine sample were collected from each patient. BV was diagnosed using Amsel's criteria. VVC was determined by culture on Sabouraud Dextrose Agar and *Candida albicans* was identified by Germ tube test. Trichomoniasis was detected by observing motile trophozoites under microscope. Diagnosis of UTI was made when there were at least 10^5 organisms/ml of urine.

Results: Out of 230 patients, 92 were positive for infectious vaginitis and 32 had UTI. Among 92 infected patients, BV and VVC were found in 36(39.13%) and 28(30.43%) respectively while mixed infection was found in 28(30.43%) of the infected patients. UTI was more than twice common among in pregnant women with BV than without it ($p<0.05$).

Conclusion: Hence, BV was the most common vaginitis among pregnant women and women with BV are at increased risk for UTIs. We recommend all pregnant women during antenatal checkup should be screened for the presence of BV and UTI.

Keywords: Bacterial Vaginosis, Urinary Tract Infection, Vulvovaginal candidiasis, Pregnancy

1. Introduction

Vaginitis is the inflammation and infection of vagina.[1] Bacterial vaginosis (BV), vulvovaginal candidiasis (VVC) and Trichomoniasis are the three common types of vaginitis. BV is a condition characterized by raised vaginal pH and milky discharge in which normal vaginal flora (Lactobacilli) is replaced by a mixed flora of aerobic, anaerobic and microaerophilic species. Anaerobic organisms like *Gardnerella vaginalis*, *Prevotella* spp., *Mycoplasma hominis, Mobiluncus* spp. colonize vagina predominantly in BV. In case of aerobic vaginitis facultative intestinal pathogens like *Escherichia coli*, group B streptococci, and *Staphylococcus aureus* replace lactobacilli in vagina.[2] This colonization by pathogenic bacteria is favored by different host behavioral factors and mainly due to increase in the vaginal pH as a result of BV.[3] BV is diagnosed when 3 of 4 Amsel's criteria[4] were present: homogeneous white adherent vaginal discharge, vaginal pH >4.5, fishy amine odor from vaginal fluid when mixed with 10% KOH, and the appearance of clue cells in at least 20% of epithelial cells on a saline solution wet mount. Prevalence of BV varies from 10-65% and approximately 10-30% of pregnant women experience BV during pregnancy.[5,6] VVC is a fungal infection and *Candida albicans* accounts for 85% to 90% of cases.[7,8] Both BV and VVC are not considered to be Sexually Transmitted Disease(STD).[9,10]

BV is not sexually transmitted but is considered to be sexually associated as altering the vaginal pH by repetitive alkalinisation can contribute to its development.[11] The association between BV and UTI in pregnant women probably begins with an increase vaginal pH because of the reduction of vaginal lactobacilli producing lactate and H_2O_2.[12] The cost of BV-related pregnancy complications in the United States alone is nearly $1 billion annually.[13] One in three women wants consultation for vaginal discharge in Nepal.[14] It is very difficult for women to get treatment for vaginal discharge/infection due to the lack of proper diagnosis in the OPD in much hospital of Nepal.[15] Obstetric complications of BV include preterm labor and delivery, preterm rupture of membranes, chorioamnionitis, pelvic inflammatory disease, posthysterectomy cuff infection and postpartum endometritis.[16,17,18] Vaginitis and UTI during pregnancy have risk to both the mother and fetus and a single step of early diagnosis and treatment can save the lives of both. This study may also provide a data base for planning and effective case management and also fulfills the gap in research carried out in the field of vaginitis.

2. Materials and methods

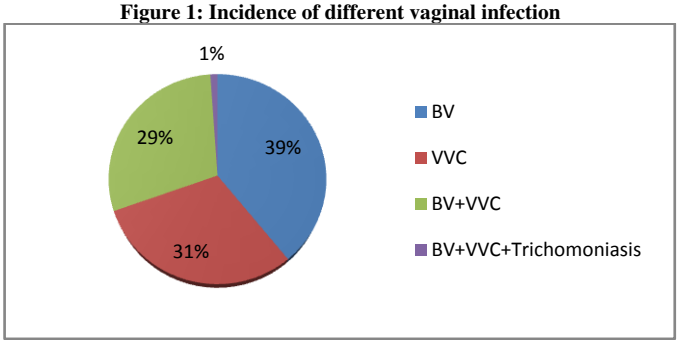
Cross sectional descriptive study was done in collaboration with Central Department of Microbiology, Tribhuvan University and Paropakar Maternity and Women's Hospital Thapathali, Kathmandu, Nepal. During the six months periods from 1st July to 30th December 2010, a total of 230 HVS were collected from the pregnant women visiting for antenatal care. Questionnaires were used to collect demographic data, symptomatic condition, smoking habits and history of the patient. Midstream urine sample and duplicate HVS were taken from each patient one for whiff test and pH determination and another for wet mount, gram stain and culture on MacConkey Agar and Blood Agar. BV was diagnosed on the basis of Amsel's criteria.[4] VVC was determined by the culture on Sabouraud Dextrose Agar. *Candida albicans* was identified by Germ tube test by inoculating 0.5ml of serum with a loopful of the test strain incubating at 37ºC for 3 hours and observed for the tube like appendages indicating germ tube test positive for *C. albicans*. Trichomoniasis was detected by observing motile trophozoites in vaginal discharge under

microscope. A diagnosis of UTI was made when there were at least 10^5 organisms/ml of urine. The isolates were identified by biochemical test and their Antimicrobial Susceptibility Test (AST) was done by Kirby Bauer disk diffusion technique. The results obtained were analyzed using statistical software SPSS version 16.0 and version $\chi 2$-test was applied at 5% level of significance.

3. Results

Among the 230 pregnant women, 92(40.00%) were positive for infectious vaginitis and 32(14.00%) had UTI. BV and VVC were found in 36(39.13%) and 28(30.43%) respectively while mixed infection was found in 28(30.43%) of the infected patients (Figure 1). *C. albicans* was responsible for 66.0% of VVC while other *Candida* species accounted for 34.0% of VVC.

Figure 1: Incidence of different vaginal infection



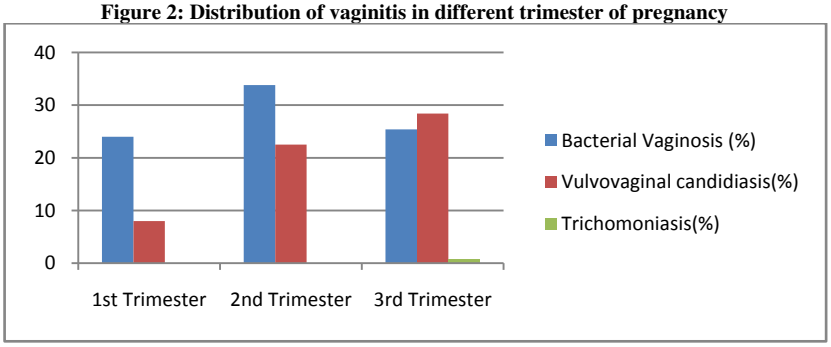
Infection rate was high among the age group 20 to 29 (68.47%) and least infected group was 40 and above (1.09%). Both BV and VVC were found high in age group 20-29. A single case of mixed infection by all three was seen in age group 30-39. (Table 1)

Table 1: Age wise distribution of vaginitis among infected women

Age category	Total	Infection				Positive	Statistic Chi-square test
		BV	VVC	BV+VVC	BV+VVC+ Trichomoniasis		
<20	24	1(2.78)	6(21.43)	0(0.0)	0(0.0)	7(7.61)	P-value >0.05
20-29	142	29(80.56)	16(57.14)	19(70.37)	0(0.0)	63(68.48)	
30-39	59	5(13.89)	6(21.43)	8(29.63)	1(100.00)	21(22.83)	
40 and above	5	1(2.78)	0(0.0)	0(0.0)	0(0.0)	1(1.09)	
Total	230	36	28	27	1	92	

The higher rate of infection was found in 3rd trimester 57(42.5%) of pregnancy followed by 2nd trimester 28(39.4) and then 1st trimester 7(28.0) (p >0.05). However, the difference was not statistically significant (p >0.05). (Figure 2)

Figure 2: Distribution of vaginitis in different trimester of pregnancy



Vaginitis was common among symptomatic pregnant women (54.7%) while only 24.8% of infected patients were asymptomatic women (P<0.05). BV was more than twice common among smokers 28 (56.0%) while only 36(20.0%) of non-smokers had BV. The association between BV and smoking was statistically significant (P<0.05).

Table 2: Association between bacterial vaginosis with smoking

Smoking Habit	Bacterial Vaginosis		Total	Statistics
	Present (%)	Absent (%)		
Yes	28(56.0)	22(44.0)	50	Chi-square test (P<0.05)
No	36(20.0)	144(80.0)	180	
Total	64(27.8)	166(72.2)	230	

E. coli was the predominant bacteria isolated from both HVS and urine. Of the isolated bacteria from HVS, 60.0% of *S. aureus*, 52.9% of *E. coli,* 33.3% of *K. pneumoniae* was MDR. Also 66.7% of *S. aureus*, 57.1% of *E. coli,* 42.9% of *K. pneumoniae* isolated from urine was MDR. An isolate of *P. aeruginosa* and 2 isolates of CoNS were also MDR. (Table 3)

Table 3: Detection of MDR pathogens from HVS and urine isolates

Bacteria isolated from HVS	Total	MDR (%)	Bacteria isolated from urine	Total	MDR (%)
E. coli	34	18(52.9)	*E.coli*	14	8 (57.1)
K. pneumonia	12	4(33.3)	*K. pneumoniae*	7	3 (42.9)
P. mirabilis	5	2(40.0)	*P. mirabilis*	5	2 (40.0)
S. aureus	10	6(60.0)	*S. aureus*	3	2 (66.7)
CoNS	1	1(100.0)	CoNS	2	2 (100.0)
Streptococcus spp	2	1(50.0)	*P. aeruginosa*	1	1 (100.0)
Total	64		Total	32	

UTI was more than twice common among in pregnant women with BV than without it (P<0.05).

Table 4: Incidence of BV, UTI and their association

N=230	No.	%
Bacterial vaginosis Present	64	27.8
Bacterial vaginosis Absent	166	72.2
Urinary Tract Infection Present	32	13.9
Urinary Tract Infection Absent	198	86.1
Bacterial vaginosis associated with UTI in 64 BV patients	15	23.4
UTI without BV	17	10.2

4. Discussion

The prevalence of infectious vaginitis among pregnant women was found to be high (40.0%). BV (39.13%) was the most prevalent type of vaginitis followed by VVC (30.43%) and mixed infection (30.43%). Similar trend of infection was reported by different studies in India, Jamaica and Peru.[19,20,21] In similar study done by Sarita *et al.,*[22] in Nepal, BV was the common (52.6%) followed by VVC (29.5%), trichomoniasis (1.3%) and polymicrobial infection existed in 16.7% of cases. Vaginitis was most common in age group 20-29 (68.47%) while the least infected age group was 40 and above (1.09%). The higher rate of infection in 20-29 age groups might be due to age being the most reproductively active age and high sexual exposure. Higher infection rate during third trimester of pregnancy is due to increased level of estrogens and corticoids that disrupt vaginal acid level and reduce vaginal defense mechanisms against opportunistic infections such as *Candida* spp.[7,23]

Symptomatic pregnant women were infected more than asymptomatic women and this is in accordance with results of other studies.[24,25] However some studies have shown up to 50% of pregnant women with vaginitis being asymptomatic.[4,26] In this study prevalence of BV among smokers was 56.0% as compared to nonsmokers 20.0%. BV was twice common among smokers than nonsmokers.[27] Cigarette smoking exposes various chemicals like nicotine, cotine and benzo[a]pyrenediol epoxide (BPDE) which have been demonstrated in cervical epithelium mucus of smokers and may directly alter the vaginal microflora or may act by depleting Langerhans cells in cervical epithelium leading to local immunosupression.[28]

In accordance with our study, vaginal colonization by *E. coli*, *K. pnemoniae*, *Proteus* spp., *Staphylococci, Streptococci* and *P. aeruginosa* during pregnancy has also been reported by different authors.[29,30,31] Less acidic vagina with increased vascularity and estrogen content, bowel movement, cleansing habits, presence of hemorriods and use of sanitary pads influence the growth and colonization of different pathogens in vagina during pregnancy.[32] In our study higher proportion of uropathogens were found to be MDR. This is in accordance with a study done in Nepal where 38.2% of *E. coli* isolates, 100% by *S. aureus* and also 100% of *Pseudomonas aeruginosa* isolated from urine were found to be MDR.[33] In another similar study, 90.8% of *E. coli* isolates from urine were MDR.[34] The higher MDR rate among uropathogens may be due to irrational and repeated use of antibiotics which is especially true for developing countries where antibiotics are prescribed irrationally not only by the medical practitioners but the antibiotics are also purchased directly from the chemist (Medicine shop keepers) without prescription.

Among 64 BV positive women, 23.4% had UTI while 10.2% of women without BV had UTI. The association between BV and UTI was statistically significant. Previous studies by Sharami *et al.* and Hillerbrand *et al.* have also reported pregnant women with bacterial vaginosis have a significantly increased risk of UTI.[11,12] It seems that sexual intercourse has an important confounding role on the association of UTIs and bacterial vaginosis.[35,36] UTI in women develop when uropathogens almost always from the fecal flora colonize the vagina, ascend into the bladder and in some cases the kidney. Loss of the vaginal lactobacilli may predispose women to acquisition of genitourinary infections.[37, 38] The colonization of different pathogenic microorganism is favored by host behavioral factors such as spermicides use, sexual intercourse[38] and moreover due to increase in vaginal pH as a result of decrease or alteration of normal flora of vagina i.e. lactobacilli to the vagina as a result of BV which ultimately results in UTI.[39]

Nitrofurantoin, Amoxicillin, Amoxicillin-clavulanate, Cephalexin, Cefuroxime, Erythromycin, Sulfisoxazole are the first line of antibiotics used for the treatment of UTI during pregnancy. [40,41] Fosfomycin is used as second line therapy[40] and serve as an alternative for patients with restrictions for other antibiotics .[42] It has broad spectrum of antimicrobial activity against many gram-negative bacteria and also gram-positive organisms including methicillin-resistant *S. aureus* and vancomycin-resistant *Enterococcus*. [43,44] However, increasing prevalence of infections caused by antibiotic-resistant bacteria makes the empirical treatment of UTIs more difficult. And the choice of antibiotics should be based on urine culture and antimicrobial susceptibility testing. Topical azoles are recommended for treatment of VVC during pregnancy.[45]

Vaginitis is common among pregnant women of Nepal. The infection does not seem to depend on demographic distribution. Smoking was found to be the risk factor for BV. UTI was significantly associated with BV. Multidrug resistance among bacteria isolated from vagina and urinary tract was high. In conclusion, we recommend that antenatal health care facilities should incorporate screening of vaginitis among pregnant women. And those women with BV should be screened for UTI. Proper use of antibiotics should be encouraged. Since douching, smoking and multiple sexual partners are risk factors of BV, preventive measures should be undertaken.

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