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Fetomaternal outcomes in vaginal discharge during pregnancy: A prospective comparative study

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ABSTRACT

Background: Vaginal discharge (VD) is a common symptom in women during the reproductive period, especially during pregnancy. Pathological VD during pregnancy is an important public health concern because it has a sociopsychological impact on women and influences fetomaternal outcomes. **Aims and Objectives:** The study aims to estimate the prevalence of pathological discharge in pregnant women. The study also focuses on the demographic profile and various risk factors associated with pathological VDs and their consequences on fetal and maternal health. **Materials and Methods:** A prospective observational study was conducted in the Department of Obstetrics and Gynecology in a tertiary care center in Northern India. A total of 150 pregnant women with complaints of VD in the second and third trimesters with confirmation on speculum examination were recruited and evaluated for the etiology of discharge. Patients were followed until delivery and data regarding fetomaternal outcomes was collected. **Results:** The prevalence of pathological VD among enrolled women was 39.33% and various etiologies were candidiasis (15.33%), bacterial vaginosis (10.66%), aerobic vaginitis (8.67%), and trichomoniasis (4.67%). These infections were significantly related to pre-term delivery and pre-term pre-labor rupture of membranes. Furthermore, the incidence of prematurity, and low birth weight neonates requiring neonatal intensive care unit care was significantly high in babies born to mothers with pathological VD. **Conclusion:** Vaginal infections affect both maternal and neonatal health, thus, increasing the likelihood of poor perinatal outcomes. Hence, we propose that routine screening for pathological VD for all pregnant women should be introduced into standard antenatal care.

Key words: Vaginal discharge; Trichomoniasis; Candidiasis; Bacterial vaginosis; Pre-term rupture of membranes

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INTRODUCTION

Vaginal discharge (VD) is a frequent gynecological complaint during pregnancy. It may occur as normal (physiological) or abnormal (pathological) discharge.[1] A thin, clear, or milky white discharge with a slight odor is usually normal discharge while in the case of infection, color can vary from dirty white to yellowish to green, and some may have a foul odor. Pathological VD is often caused by infections such as bacterial vaginosis, aerobic vaginitis, trichomonas vaginalis, and candidiasis.[2] Vaginal infections can cause a plethora of obstetrical and gynecological complications, including cervicitis, pelvic inflammatory disease, post-operative infection, intrauterine infection, peripartum infection, and neonatal infection.[3] Untreated vaginal infections in the second and third trimester of pregnancy are associated with long-standing vaginal dysbiosis predisposing women to mixed vaginitis, subsequently increasing the incidence and risk of peripartum infection.[4] Vaginal infections can lead to premature birth, premature rupture of membranes (PROM), low birth weight (LBW), and increased perinatal death. Women with limited literacy, poor health history, or

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from low-income strata are more likely to develop vaginal and vulval diseases.[5] Thus, it is imperative to conduct a research in a low-resource setting like ours to study the implications of VD in pregnancy.

Aims and objectives

This study aims to evaluate the spectrum of various infections in pregnant women with vaginal discharge and assess their impact on maternal and fetal outcomes. The objectives are to categorize these infections and examine their effects on maternal health, including their correlation with preterm labor pains and premature rupture of membranes (PROM). Additionally, the study will evaluate fetal health outcomes, such as low birth weight and preterm birth.

MATERIALS AND METHODS

Study design and setting

A prospective comparative observational study was conducted after obtaining clearance from an Ethical Committee at a tertiary care institute in Haryana, India, catering to all private and government care centers of the state.

Study period

The study spans for 1 year, from January 2023 to December 2023.

Study population

A study was conducted on 150 antenatal women with VD after informed and written consent.

Inclusion criteria

Antenatal female in the second and third trimester of pregnancy with VD was included in the study.

Exclusion criteria

Patients with PROM, a history of bleeding per vagina, a history of sexually transmitted infections or on their treatment, and overt diabetes were excluded from the study.

Sample size

The sample size was obtained at a 5% level of precision at 95% confidence level yielding a sample size of 124 at a power of 99% to detect difference at a significant level of 0.05. Considering 20% loss to follow-up, the total size calculated was 150 participants for the study.

Recruited subjects were evaluated thoroughly by taking detailed history, clinical examinations, and investigations. The color, odor, and consistency of discharge on per speculum were noted. Three high vaginal swab sample was obtained under full aseptic condition. The first swab was used for wet mount preparation and potassium hydroxide (KOH) preparation for Whiff test. To prepare a wet mount, we put one drop of specimen from the tube on clean slide, cover it with cover slip and perform microscopic review of slide at 10×and 40×. For whiff test, drop of 10% KOH is added to the sample and a strong fishy odor indicated a positive test result. Gram stain smear was prepared using a second swab sample and the scoring system proposed by Nugent was used for evaluation (Healthy vaginal score=0–3, intermediate Nugent score=4–6, Bacterial Vaginosis Nugent Score=7–10).[6] During the documentation of Nugent scoring, the presence of *Candida* cells/hyphae was noted. The third swab was inoculated on blood and mac-Conkey agar plate for the culture of aerobic bacteria and *Candida* spp. Plates were incubated at 37°C for 24 h. Any growth detected on plates was identified using the standard protocol.[7]

The diagnosis of bacterial vaginosis was made if three out of four criteria are present:

- Thin dark grey or dull grey homogenous malodourous discharge adhering to vaginal wall
- Elevated vaginal pH (≥4.5)
- Whiff test (fishy odor on adding KOH)
- Presence of clue cells on wet mount.

Data were recorded on a predesigned pro forma. Enrolled subjects were kept on follow-up and their maternal outcomes (Pre-term PROM [PPROM], pre-term birth, and term birth) and fetal outcomes (birth weight, APGAR score, neonatal intensive care unit [NICU] admission) were recorded.

Statistical analysis

Data were evaluated with statistical software. Descriptive statistics represented demographic and clinical features. The Chi-square test was used for categorical variables and analysis of variance for continuous variables to compare outcomes. $P<0.05$ were regarded as statistically significant.

Ethical considerations

The study protocol was approved by the Institutional Biomedical Research Ethics Committee, Pt. BD Sharma PGIMS/UHS, Rohtak, Haryana, India vide number BREC/22/TH/OBG-016. The study was conducted in accordance with ethical guidelines and standards. Informed consent was obtained from all participants.

RESULTS

Enrolled patients were divided into two groups on the basis of VD:

1. Group 1 – No pathogens groups/normal/physiological discharge group: Patients with no pathology (n-91).
2. Group 2 – Pathological group: Patients with pathological organisms (n-59).

Table 1: Socio-demographic and clinical characteristics of studied population with vaginal discharge

S. no.	Characteristic	Physiological discharge (n=91)	Pathological discharge (n=59)	Total	P value
1.	Mean Age(years)				
	Mean ± SD	25.32 ± 3.91	25 ± 3.79	25.19 ± 3.85	0.622‡
2.	Socio-economic status				
	Lower	22 (24.18%)	18 (30.51%)	40(26.67%)	0.889*
	Upper lower	20 (21.98%)	13 (22.03%)	33 (22%)	
	Lower middle	36 (39.56%)	19 (32.20%)	55(36.67%)	
	Upper middle	10 (10.99%)	7 (11.86%)	17(11.33%)	
	Upper	3 (3.30%)	2 (3.39%)	5 (3.33%)	
3.	Educational status				
	Illiterate	14 (15.38%)	10 (16.95%)	24 (16%)	0.517†
	Primary	10 (10.99%)	3 (5.08%)	13 (8.67%)	
	Secondary	35 (38.46%)	21 (35.59%)	56(37.33%)	
	Senior secondary	19 (20.88%)	10 (16.95%)	29(19.33%)	
	Graduation	10 (10.99%)	12 (20.34%)	22(14.67%)	
	Postgraduation	3 (3.30%)	3 (5.08%)	6 (4%)	
4..	Gravidae Order				
	G1	34 (37.36%)	24 (40.68%)	58(38.67%)	0.936†
	G2	26 (28.57%)	17 (28.81%)	43(28.67%)	
	G3	17 (18.68%)	11 (18.64%)	28(18.67%)	
	≥G4	14 (15.38%)	7 (11.86%)	21 (14%)	
5.	Mean BMI				
	Mean ± SD	24.94 ± 4.16	26.23 ± 4.75	25.45 ±4.43	0.082‡
6.	Gestational age at time of presentation(weeks)				
	13 to 16+6 weeks	7 (7.69%)	2 (3.39%)	9 (6%)	0.209*
	17 to 20+6weeks	14 (15.38%)	4 (6.78%)	18 (12%)	
	21to 24+6weeks	12 (13.19%)	11 (18.64%)	23(15.33%)	
	25 to 28+6weeks	19 (20.88%)	14 (23.73%)	33 (22%)	
	29 to 32+6weeks	14 (15.38%)	16 (27.12%)	30 (20%)	
	33 to 36+6weeks	25 (27.47%)	12 (20.34%)	37(24.67%)	
6	Clinical presentation				
	Lower abdominal pain	24 (26.37%)	36 (61.02%)	60 (40%)	<.000†
	Pruritis	8 (8.79%)	18 (30.51%)	26(17.33%)	0.0006†
	Dysuria	5 (5.49%)	5 (8.47%)	10 (6.67%)	0.475†
	Vaginal irritation	5 (5.49%)	15 (25.42%)	20(13.33%)	0.0005†
	Fever	3 (3.30%)	0 (0%)	3 (2%)	0.279*
	Dyspareunia	2 (2.20%)	5 (8.47%)	7 (4.67%)	0.112*

*Fisher's exact test, † Chi square test

Sociodemographic and clinical characteristic of patients are described in Table 1. Majority of women were 21–30 years old (82.67%), primigravida (38.67%), and belonged to lower socioeconomic status (48.67%). They presented between 25 and 28^{+6} weeks of gestation (22%). Major chief complaint by pathological discharge group was lower abdominal pain followed by pruritis and vaginal irritation. These chief complaints had a significant association with pathological VD ($P<0.05$).

The prevalence of pathological discharge obtained in our study was 39.33% (Figure 1). The causative etiologies of various discharges are summarized in Figure 2.

Table 2 depicts fetomaternal outcomes in 147 women except three who had abortion. As compared to physiological VD, females with pathological discharge had statistically significant rate of PPROM (n=21, P=0.006) and pre-term deliveries (n=34, P=0.007). Furthermore, neonatal outcomes such as mean LBW and NICU admission are statistically significantly associated to women with pathological VD.

The fetomaternal outcomes in various etiologies of VD are shown in Table 3. Pre-term deliveries were significantly elevated in aerobic vaginitis (61.54%) and bacterial vaginosis (60.0%) compared to candidiasis (17.39%) and trichomoniasis (0%). Among the women with pathological discharge, 41.38% of neonates had LBW (<2.5 kg), with bacterial vaginosis being the major contributor followed by aerobic vaginitis. NICU admission was substantially higher among neonates born to mothers with bacterial vaginosis (53.33%) and aerobic vaginitis (30.77%) as compared to candidiasis (13.04) and trichomoniasis no admission to NICU (P=0.017).

Table 2: Fetomaternal outcomes in women with vaginal discharge

S. No	Outcomes	Physiological (n=89) (%)	Pathological (n=58) (%)	Total (%)	P-value
1.	Oligohydramnios				
	Mean AFI±SD	5.48±1.79	5.98±0.94	5.7±1.42	0.635‡
2.	PPROM (n)	7 (7.86)	14 (24.13)	21 (14.28)	0.006†
3.	Pre-term deliveries (POG)				
	28–31^{+6} weeks	2 (2.25)	5 (8.62)	7 (4.76)	0.007*
	32–36^{+6} weeks	11 (12.36)	16 (27.59)	27 (18.37)	
	≥37 weeks	76 (85.39)	37 (63.79)	113 (76.87)	
	Mean POG (weeks)±SD	37.9±1.86	36.68±2.65	37.42±2.28	0.003‡
4.	Mode of delivery				
	Vaginal delivery	71 (79.78)	53 (91.38)	124 (84.35)	0.058†
	LSCS	18 (20.22)	5 (8.62)	23 (15.65)	
5.	Birth weight (kg)				
	≤1.4 kg	2 (2.25)	5 (8.62)	7 (4.76)	0.08*
	1.5–2.499 kg	21 (23.60)	19 (32.76)	40 (27.21)	
	≥2.5 kg	66 (74.16)	34 (58.62)	100 (68.03)	
	Mean±SD	2.66±0.45	2.45±0.53	2.58±0.49	0.011‡
6	APGAR score at 5 min				
	0–3	1 (1.12)	1 (1.72)	2 (1.36)	0.361*
	4–6	4 (4.49)	6 (10.34)	10 (6.80)	
	≥7	84 (94.38)	51 (87.93)	135 (91.84)	
	Mean±SD	8.75±1.04	8.48±1.43	8.65±1.21	0.217‡
7.	NICU Admission	11 (12.36)	15 (25.86)	26 (17.69)	0.036†
8.	Neonatal mortality	2 (2.25)	1 (1.72)	3 (2.04)	0.954*

‡Independent t-test, *Fisher's exact test, †Chi-square test, AFI: Amniotic fluid index, SD: Standard deviation, POG: Period of gestation, PPROM: Pre-term premature rupture of membranes, LSCS: Lower segment cesarean section, NICU: Neonatal intensive care unit

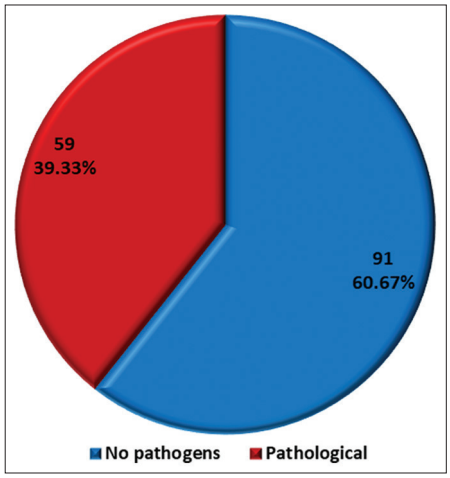

Figure 1: Pie diagram showing causes of vaginal discharge

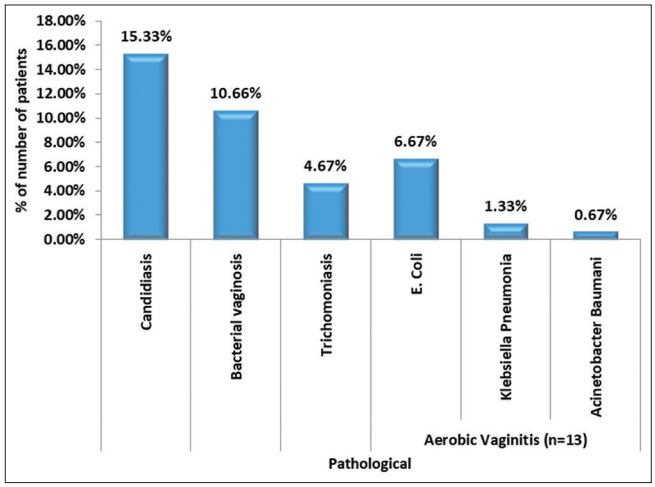

Figure 2: Etiological causes of pathological vaginal discharge

DISCUSSION

About one-third of all women and half of pregnant women experience VD, a common gynecological issue that commonly requires care. It is the second most prevalent issue, following menstrual disorders.[8]

In our study, out of 150 women 39.33% women had pathological VD. The prevalence reported in the study by Cesar et al.,[9] Fonseca et al.,[10] were 40% and 43%, respectively. The main cause of abnormal VD is pathogenic bacteria replacing the normal vaginal flora. Usually, one of the three illnesses-vulvovaginal candidiasis, trichomoniasis, or bacterial vaginosis, is associated with it. Candidiasis being the most common cause of VD, followed by bacterial vaginosis in our study. This is in agreement with the study by Nurat et al.,[11] who reported candidiasis prevalence of 20%. These results are parallel to the study conducted Ng et al., that reported the same prevalence of bacterial vaginosis (10.1%).[5]

There was no significant relation of pathological discharge with sociodemographic and gestational variables such as age, socioeconomic status, number of gravida, and gestation age of presentation in the present study. In a study conducted in Karnataka by Rathod and Vijayalakshmi

Table 3: Fetomaternal outcomes in patients with different etiologies of pathological discharge

S. No	Variables	Candidiasis	Bacterial vaginosis	Aerobic vaginitis	Trichomoniasis	P-value
1.	Mean POG at PPROM (weeks)±SD	35.93±0.51	31.43±3.13	33.77±3.06	35.14±0	0.272§
2.	Mean POG at delivery (weeks)±SD	37.73±1.62	34.99±3.55	35.82±2.29	38.43±0.78	0.001§
3.	Mean Birth weight (kg)±SD	2.6±0.45	2.2±0.62	2.28±0.52	2.8±0.17	0.01§
4.	Mean APGAR Score (at 5 min)±SD	8.83±0.83	7.8±2.11	8.38±1.5	9±0	0.123§
5.	NICU admission (n)	3 (13.04%)	8 (53.33%)	4 (30.77%)	0 (0%)	0.017*
6.	Mean duration of NICU stay (days)±SD	11.33±12.74	11.62±9.75	18±11.17	-	0.498**

*Fisher's exact test, **Kruskal–Wallis test, PPROM: Pre-term pre-labour rupture of membranes, NICU: Neonatal intensive care unit, POG: Period of gestation, SD: Standard deviation

majority of women were in the age group 26–30 years with no significant association (P=0.23).[12] However, another study found that pathological VD during pregnancy was related to factors such as maternal age, living with a partner, household asset index, parity, previous VD, diabetes, depression, threatened premature labor, urinary infection, and hospitalization during the current pregnancy.[6] This study was conducted in our government institution which caters to the majority of patients belonging to poor families, living in rural areas, and with low education.

Lower abdominal pain, pruritis, and vaginal irritation were found to be significantly associated with pathological VD as evident in Table 1. Microorganism interactions contribute significantly to vaginal inflammation causing pruritis and irritation. Pathological VD includes secretions accompanied by itching, rash or soreness, persistent, increased discharge, burning during urination, white, clumpy discharge, a discharge that is heavier and thicker than usual, and grey/white or yellow/green discharge. The most common symptom reported in the study by Almubarak et al., was itching 49.2% followed by redness 48.4%, dysuria 36%, and swilling 4.5%.[13]

In the current study, it was observed that PPROM was statistically significantly associated with pathological discharge (P=0.006). Studies done by Khaskheli et al.,[14] Rathod and Vijayalakshmi[12] reported a significant association of PPROM with pathological discharge and bacterial vaginosis. The choriodecidual invasion by the microbes from vaginal infections may cause the release of endotoxins and exotoxins, further activating cytokines production from decidua and fetal membranes. The released cytokines stimulate neutrophil infiltration and synthesis of metalloproteases. These metalloproteases attack and weaken these membranes leading to rupture of membranes prematurely. A statistically significant difference (P=0.007) was found in gestational age at delivery in pathological group and physiological group. Higher number of women in the pathological group (36.21%) had pre-term delivery (before 37 weeks) in comparison to the physiological discharge group (14.61%). On the similar line, study by Rathod and Vijayalakshmi demonstrated a significant association between the vaginal infections and pre-term delivery, where 28.90% candidiasis patients, 26.90% of bacterial vaginosis-positive females, and 20% of females with trichomoniasis delivered before 37 weeks (P<0.0001).[12] In a study by Ng et al., 50% of females with bacterial vaginosis had pre-term birth.[5] Donders et al., found bacterial vaginosis to be associated with 2.4-fold increase risk of pre-term delivery.[15] In a study by Li et al., 8.5% of females with aerobic vaginitis, 5.2% with bacterial vaginosis and 10.2% with candidiasis, and proportion 33.3% with trichomoniasis had pre-term delivery.[4] Although proportion of pre-term delivery varies from study to study, but majority of studies have verified that these vaginal infections are associated with pre-term delivery which is matter of concern and timely action is need of the hour. Mechanism proposed for vaginal infection causing pre-term labor is through causing ascending infection from vagina and replication of these organisms in placenta, decidua, and membranes. Thus, invasion of amniotic membranes stimulates production of IL-1β, IL-6, IL-8, and PG-E_2, and PG-$F_{2\alpha}$.[16] These prostaglandins are known to stimulate uterine contractions.

Mean birth weight in neonates of females with pathological VD was low (2.45 kg) with a significant association between LBW and pathological discharge. Khaskheli et al., reported LBW in 33.33% of women with VD and had a significant association between LBW and pathological discharge (P<0.0001).[14] Rathod and Vijayalakshmi reported 23.10% of bacterial vaginosis and 7.9% of candidiasis females had LBW with statistically significant association between the two (P<0.01).[12] Similarly, Das et al., reported incidence of LBW as high as 47.9% among bacterial vaginosis patient with a statistically significant association (P=0.023).[17] Mulinganya et al., also reported a significant association between LBW and bacterial vaginosis where 44.4% of females with bacterial vaginosis had LBW babies.[18]

Low APGAR score at 5 min was observed in a higher percentage of women with pathological VD (12.06%) in comparison to 5.61% of females with normal VD, though not associated significantly (P=0.361). Ng et al., also reported a high proportion of 12.5% neonates with low APGAR at 5 min among BV-positive females with no statistical significance (P=0.117).[5] Similarly Nguyen et al., reported an insignificant relation of APGAR score and aerobic vaginitis.[19] A significant relation was observed between pathological discharge and NICU admissions (P=0.036). Rathod and Vijayalakshmi[12] and Ng et al.,[5] also derived a significant association between NICU admission and vaginal infections. All antenatal women presenting with VD should be investigated thoroughly to find the pathological cause and should be treated promptly.

Limitations of the study

Limited sample sizes and lack of diversity in our study populations may affect the generalizability of our findings. Additionally, variability in diagnostic methods and criteria for identifying infections can lead to inconsistencies.

The limitation of the present study is being monocentric and observational in nature. Further randomized multicentric studies are warranted to study association of various pathogenic organisms causing vaginitis in pregnancy and fetosmaternal outcome.

CONCLUSION

The prevalence of pathological VD among our antenatal population is a matter of concern as these vaginal infections are not only concern of maternal health but also put neonates at risk of poor perinatal outcomes. Pathological discharge is found in almost 40% of antenatal females with VD. Adverse maternal outcomes like PPROM and pre-term delivery are significantly higher in women with pathological discharge. In turn, neonates born to these mothers are at high risk of being born prematurely with LBW and requiring NICU care. Hence, it is necessary to screen timely, diagnose early, and treat promptly in these antenatal women with vaginitis to prevent poor perinatal outcomes.

Routine screening for pathological VD for all pregnant females should be incorporated into routine antenatal care which is need of the hour.

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