

# Vaginal Discharge in Pregnancy: The Relationship of Uterine Contractions in the Case of Preterm Birth

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## ABSTRACT

**Background & Objective:** Vaginal discharge caused by infection and inflammation could lead to premature rupture of the membranes, which increases the risk of premature labor. If not handled properly, preterm delivery elevates the neonatal mortality risk and morbidity rate. This study aims to know the relationship between uterine contractions with preterm.

**Materials & Methods:** Observational research and cross-sectional design on pregnant women with vaginal discharge and without vaginal discharge based on criteria inclusion was gestational age 16–37 weeks, and exclusion criteria were pregnant women with a history of sexually transmitted diseases.

**Results:** The results showed that there were 130 pregnant women, of whom 77 (59.23%) have vaginal discharge complaints, and 53 (40.77%) do not have vaginal discharge complaints. Most pregnant women were in their first pregnancy (primigravida) and with 29–36 weeks gestational age. Uterine contractions (his) occurred in 68.8% ( $P=0.000$ ) of pregnant women with vaginal discharge complaints but did not occur in pregnant women without vaginal discharge complaints.

**Conclusion:** Vaginal discharge in pregnancy carries the risk of uterine contractions, which may increase the incidence of preterm birth. To conclude, vaginal discharge in pregnancy has a relationship with preterm birth.

**Keywords:** Vaginal Discharge, Preterm birth, Uterine Contractions



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## Introduction

Pregnancy is calculated from the last menstrual period, and gestational age is divided into three trimesters, namely, trimester I (TM I, 1-12 weeks of gestation), trimester II (TM II, 13–27 weeks of gestation), and trimester III (TM III, 28–40 weeks of gestation) (1). Pregnancy is also categorized into early gestation (up to 22 weeks of gestation), immature pregnancy (22–<28 weeks of gestation), premature pregnancy (28–<37 weeks of gestation), term gestational age (37–40 weeks of gestation), and post-term (>40 until 42 weeks of gestation). In general, it can be said that preterm labor is a delivery that occurs at more than 20 weeks of pregnancy and less than 37 weeks (2, 3).

The risk of unhealthy conditions can occur at each gestational age. Antenatal care (ANC) is expected to guard a pregnancy perfectly for healthy development until giving birth in a term pregnancy. Babies born at nine months of pregnancy/maturity/term will be ready to live independently because their organs function perfectly. Premature delivery has a high neonatal

mortality and morbidity rate. This is related to the ability of organ maturity in premature babies, such as the lungs, brain, and gastrointestinal tract maturity, which are still imperfect (4).

The rate of preterm labor ranges from 6% to 10%. The rate of preterm labor (under 32 weeks of gestation) was 1.5% and 0.5% at gestational age less than 28 weeks (immature) (4). The prevalence of preterm birth in Indonesia is about 10% (5). One of the difficulties in preterm labor is the maintenance of the organs of the premature baby who is not yet fully developed. In addition, caring for premature babies is costly because it requires a longer hospital stay than full-term babies.

Premature labor can result from one of the following complications: premature rupture of the membranes (PROM), infections, bacteriuria, and genital colonization with symptoms of leucorrhea. In leucorrhea, the infection forms cytokines and cause the release of bioactive fats which will form prostaglandins. Prostaglandins will then stimulate contractions in the uterus, giving rise to the symptoms

of premature labor (6). The longer uterine contractions at preterm labor can lead to preterm birth if not handled properly. Premature pregnancies range from 40% to 50%, thus ending with preterm labor (7). According to a study, premature pregnancy begins to feel its impurities even when it is weak, while only 30% will end with preterm labor (8). Early rupture of the membranes in preterm pregnancy is caused by the presence of vaginal infection, for example, complaints of vaginal discharge or leucorrhea (4).

The vaginal discharge or leucorrhea is simply a normal occurrence in pregnant women. The incidence of increased vaginal discharge in pregnant women is probably due to the increased moisture in the vaginal area. If the vaginal humidity is not maintained in dry conditions, it can cause an increase in vaginal discharge complaints in pregnant women. Although initial vaginal discharge is a normal occurrence, not being cared for will allow the growth of secondary infections caused by pathological infections. The prevalence of pathological vaginal infection increases the risk of uterine contractions in pregnant women.

Local or systemic infection and/or inflammation is one of the important factors contributing to the occurrence of premature labor. The incidence of preterm labor associated with the presence of local infection (genital tract infection) has been reported in several microbiological studies (3). According to Kiran *et al.* (2), the infection has been the most important risk factor in 65.51% of preterm deliveries. Infections associated with an increased incidence of preterm labor are urinary tract and genital infections and periodontal diseases (9). Chorioamnionitis is probably one of the causes of PROM and preterm labor. The process of infection-associated premature labor is thought to begin with the release of some products as a result of monocyte activation. The found bacteria were likely to cause membrane damage through the direct influence of proteases (4).

Vaginal discharge in women of reproductive age is mostly caused by *bacterial vaginosis* (BV). It is related to the increased susceptibility to *human immunodeficiency virus* (HIV), preterm birth, and sexually transmitted infections. In Gram stain criteria of BV, the increased symptoms of vaginal discharge and/or vaginal malodor are obtained by 65%, while homogeneous vaginal discharge with amine-like odor is obtained by 74%; although the least specific and sensitive signs of BV respectively were the increased vaginal pH and amine-like odor (10). Previously, BV was considered an innocuous condition. However, the last report has indicated the association of BV with several obstetric and gynecologic conditions and disorders, such as preterm labor, spontaneous abortion, placental infection, PROM, wound infection, and pelvic inflammatory disease (PID) (11). Furthermore, the number of BV-positive women with preterm birth has been significantly higher (73%) than that of BV-negative women (25.4%). Mean gestational age ( $\pm$  SD)

also differed significantly ( $37.49 + 2.53$  vs.  $35.24 + 2.33$  weeks) (12). Moreover, according to a previous study, BV was associated only with obstetric infections as a risk factor, which could also be a risk factor for PID (10).

Fifty percent of women with vaginal discharge or malodor caused by BV are asymptomatic (13). The timing of infection with BV has a significant effect and becomes an independent risk factor for preterm birth. Therefore, detection and timely intervention can prevent the unpleasant side effects of pregnancy-associated with BV. BV, *Chlamydia trachomatis*, candidiasis, and trichomoniasis infection are frequently complained of at reproductive age, and the incidence increases during pregnancy (1). Difficulty in early detection of uterine contractions may progress to premature labor, and when contractions do occur, preventive treatment is too late (14).

This study aimed to determine the effect of leucorrhea on the risk of preterm labor in pregnant women and the types of microorganisms detected in pregnant women with leucorrhea. If a relationship is found between vaginal discharge and the incidence of premature labor, it is hoped that this study will be of benefit in paying attention to the presence or absence of uterine contractions in pregnant women who complain of vaginal discharge. Thus, if the complaint is not handled properly, there is a risk of preterm labor.

## Methods

### Study Design and Subjects

This study was an analytical laboratory observational research with a cross-sectional design. The study subjects were pregnant women referred to the primary healthcare facilities in a private clinic in Klaten, Central Java, Indonesia, according to the inclusion criteria of gestational age  $>16$  weeks, complaints of leucorrhea, uterine contractions, and pain. Pregnant women with a history of sexually transmitted diseases (STDs) and gestational age  $<16$  weeks and  $\geq 37$  weeks (term) were excluded from the study. The number of research subjects was 130 pregnant women. This study was based on a research project that obtained an ethical clearance number of 141/EC-KEPK FKIK UMY/V/2019, on May 16, 2019.

### Experimental Procedures

Primary data collection was a microscopic examination of vaginal swabs obtained from pregnant women with leucorrhea by a clinical microbiologist. The occurrence of imminent premature labor was detected based on patient complaints, and the abdominal palpation examinations were carried out by an obstetrician. In addition, vaginal swab examinations were carried out at the Microbiology Laboratory of Asri Medical Center, Yogyakarta, for 3 months, from May 2019 to July 2009.

Examining the signs of imminent premature based on the presence of uterine contractions by palpation of the abdomen of a pregnant woman, the abdomen feels tight, and the patient complains of pain (called 'his', a uterine contraction). In his perceived risk of strengthening and threatening to develop into premature labor, the respondents were given tocolytics. In general, contractions last for 1–2 min with weak contraction intensity. Inspeculo examination is performed to determine the presence of external uterine ostium (opening), and vaginal swab samples were taken for microscopic examination. Microscopic examination of the vaginal swab was performed by vaginal smears, Gram staining, and lactophenol cotton blue (LPCB) staining to identify the types of bacteria and fungi that are present.

#### Data Analysis

Univariate data analysis was carried out to determine the characteristics of research subjects and

the results of microscopic examination of vaginal swabs. Multivariate analysis was conducted to determine the relationship between vaginal discharge and his as a risk factor for premature labor. The statistical test used was Pearson's Chi-square test with a P value  $\leq 0.05$ .

#### Results

Out of 130 pregnant women, 77 complained of having vaginal discharge, and 53 did not. The characteristics of the research subjects are summarized in [Table 1](#). The age range of the subjects showed a healthy reproductive age (between 21 and <35 years) with details at most as much as 85.4% (111/130), followed by age  $\geq 35$  as much as 11.5% (15/130), and age  $\leq 20$  as many as 3.1% (4/130). Here, 59.2% (77/130) of pregnant women experienced vaginal discharge.

**Table 1.** Characteristics of the Pregnant Women with Vaginal Discharge

CHARACTERISTICS	CATEGORY	VAGINAL DISCHARGE		P-value
		Positive	Negative	
Pregnant women age (years)	$\leq 20$	1	3	0.041
	21–<35	68	43	
	$\geq 35$	8	7	
Parity	Primigravida	32	24	0.050
	Secundigravida	23	15	
	Multigravida	22	14	
Gestational age (weeks)	16–20	6	12	0.128
	21–28	29	13	
	29–36	42	28	
Pregnant women who experience his	Positive	53	0	0.000
	Negative	24	53	
Got tocolytic drugs	Yes	53	0	0.000
	No	24	53	
	TOTAL	77	53	

The highest number of pregnant women with primigravida was 43.1% (56/130), followed by secundigravida with 29.2% (38/130). The prevalence of multigravida was at least 27.7% (36/130). Pregnant women with vaginal discharge who experienced primigravida were 41.5% (32/77).

In this study, the 29–36 weeks gestation age had the most respondents (53.8%, 70/130), and this gestation age had the most vaginal discharge, as much as 54.5% (42/77). The 68.8% of pregnant women (53/77) who had complaints of vaginal discharge had felt uterine contraction (his), while all pregnant women, 100%

(53/53) with no complaints of vaginal discharge, did not feel his.

Of pregnant women, 68.8% with complaints of vaginal discharge have used tocolytic drugs (53/77). Tocolytics are given to prevent uterine contractions from developing into preterm labor, with gestational age still <37 weeks (1). About 30% of uterine contractions become preterm labor even though it is weak (8). Of pregnant women, 31.2% (24/77) were with vaginal discharge but did not experience his and did not need tocolytics. Most pregnant women who do not complain of vaginal discharge do not experience his and do not need tocolytics.

As shown in [Table 2](#), the microscopic results of vaginal swabs showed that the microorganisms identified in vaginal discharge varied. Most bacteria were gram-positive stem bacteria (32.8%) and Gram-negative *Coccobacilli* bacteria (20.4%). In addition, the bacteria identified by yeast cells and pseudohyphae are probably *Candida* sp., as much as 15.4%.

The relationship between the incidence of vaginal discharge and his experience by pregnant women as a risk factor for the incidence of preterm labor was analyzed statistically using Pearson's chi-squared test ([Table 3](#)).

**Table 2.** Microscopic Examination results of Vaginal Swab of Pregnant Women with Vaginal Discharge

TYPES OF BACTERIA	AMOUNT	PERCENTAGE
Gram-positive coccus	2	3.3
Gram-negative rods	20	32.7
<i>Coccobacilli</i> Gram variable	10	16.4
Gram-positive rods	19	31.1
Yeast cell and pseudohyphae	7	11.4
Normal flora	3	4.9
Total	61	100

**Table 3.** Multivariate Analysis Results

VARIABLE	CATEGORY	VAGINAL DISCHARGE				P
		Positive		Negative		
		n	%	n	%	
Pregnant women with his experience	Positive	53	68.8	0	0	0,
	Negative	24	31.2	53	100	

Pearson's/Spearman's correlation statistical test showed a significant correlation between the incidence of vaginal discharge experienced by pregnant women with a value of P-value = 0.000. His occurrence in pregnant women illustrates the risk of developing imminent premature labor. The correlation between the incidence of vaginal discharge and his experience shows a strong relationship with a value of 0.688.

## Discussion

The characteristics of the research subjects showed that most pregnancies were at healthy reproductive ages, that is, 21–35 years (85.4%, 111/130). Healthy reproductive age follows a government program, where the reproductive organs are mature for pregnancy and childbirth and are mentally prepared. The age range  $\geq 35$  years consists of 11.5% (15/130), and age  $\leq 20$  years consists of 3.1% (4/130). This result is in line with the study of Tellapragada *et al.* (15), with the mean age of the study subjects of  $27.18 \pm 3.54$  years. Age  $< 20$  years old has the risk of preterm labor at 28.36%, while at-term delivery is only 3.9% ( $P < 0.05$ ). This is probably due to the immature physical growth of women and relative malnutrition (16). Hediger *et al.* (17) have stated that young women aged  $< 16$  years are at risk of experiencing premature labor, leading to preterm labor. The age factor of  $< 20$

years is a significant predictor of the incidence of preterm labor with intact membranes. Other factors include a history of miscarriage, multiple growths of organisms in the vagina, and Gram-negative growths of *Bacilli* (18).

The primigravida had the highest frequency (43.1%, 56/130), secundigravida was the second (29.2%, 38/130), and multigravida had the lowest frequency (27.7%, 36/130). In accordance with the results of Tellapragada *et al.* (15), primigravida showed the highest number of respondents, that is, 58.3% (461/790). Secundigravida consists of 33% (261/790), and multigravida consists of 8.6% (68/790) (14). Pregnant women with the most complaints of vaginal discharge also occurred in primigravida at 41.5% (32/77). The 29–36 weeks gestational age had the most number of respondents at 53.8% (70/130), and most complaints of vaginal discharge were from 54.5% of respondents (42/77). This result is different from Tellapragada *et al.* (15) research, which showed that most respondents were at  $14 \pm 4.2$  weeks of gestation. However, about 1% of the study subjects had preterm labor in a previous pregnancy. In this study, no history of preterm labor in previous pregnancies was investigated; however, the presence or absence of his as a sign of uterine contractions was assessed. In contrast to the study of Varela *et al.* (19), which

observed women during the puerperium (postpartum), it was found that 23.6% of respondents experienced vaginal discharge, in addition to 31.5% who experienced urinary tract infections, 24.4% who experienced anemia, and 6% who experienced vaginal bleeding. The most common complication in the study stated that 22.6% was preterm labor (19).

In this study, 40.8% (53/130) of pregnant women had no vaginal discharge complaint, and 59.2% (77/130) had a vaginal discharge. About 68.8% (53/77) of pregnant women who complained of vaginal discharge experienced his, while all pregnant women, 100% (53/53) with no complaints of vaginal discharge, did not experience his (uterine contraction) at the same time. Tellapragada *et al.* (15) also reported that 710/790 showed a relationship between the incidence of preterm labor and individual infection. As many as 66.2% (523/790) of respondents from the Tellapragada *et al.* (15) study showed vaginal discharge. In this study, the complaints of vaginal discharge occurred in as much as 59.2% (77/130). Microscopic results showed 66.2% (523/790) in the Tellapragada *et al.* (15) were white-thin homogenous discharge by 21.5% (170/523), white-curdly discharge as much as 16.8% (133/523), yellowish frothy discharge as much as 15% (119/523), and purulent discharge as much as 12.7% (101/523).

There is a relationship between the color of vaginal discharge and the bacteria that caused the vaginal discharge. In the results study with a PP-intrauterine device (IUD), 8.5% greenish discharge was caused by the suspected fungus *Candida sp.* 15.9% yellowish discharge was caused by gram-positive cocci and gram-negative rods. Milky white discharge is the highest, with 75.6% caused by gram-positive coccobacillus, gram-negative coccobacillus with *clue cell* suspected of causing *Bacterial vaginosis*. While, the results from the IUD interval, greenish discharge caused by fungus and yellowish discharge caused by gram-positive cocci and gram-negative rods or gram-negative diplococci, are 17%, respectively. Milky white discharge, caused by gram-positive coccobacillus, gram-negative coccobacillus, and *clue cell*, had the highest prevalence (66%) and is suspected of causing bacterial vaginosis.

Another study by Al Quaiz (20) showed that the color of vaginal discharge was related to infection significantly ( $P > 0.01$ ). There are three types of vaginal discharge. The first was white vaginal discharge representing 50.8% of the complaints. The infection rate of patients complaining of white vaginal discharge was 48.3% (OR=0.5, 0.26-0.96). White vaginal discharge was caused by *Candida albicans* and *Trichomonas vaginalis*. The second was yellow vaginal discharge representing 41% of the complaints and an infection rate of 62.5%, caused by *Gardnerella vaginalis* infections (76%). The third was gray vaginal discharge with 6.2%, and the infection rate was 81.8%, while 10% was caused by *G. vaginalis* and 12.5% by

*Streptococcus* (20). At the same time, the microscopic results of the vaginal swab that we obtained revealed 32.8% gram-positive stem bacteria and 20.4% gram-negative *Coccobacilli* bacteria. Yeast cells and pseudohyphae, probably *Candida sp.*, were found in 15.4% of respondents.

The presence of Gram-negative bacilli as the cause of premature labor was also found in the study of Hosny *et al.* (16). Moreover, the microorganisms *T. vaginalis*, *M. hominis*, and *Coryneform* bacteria were also found. This supports the claim that Gram-negative bacilli exert a pathogenic effect on the placenta on the incidence of subclinical chorioamnionitis and preterm labor (16). Different results were obtained in de Borborema-Alfaia *et al.* (21) study, where the prevalence of *Chlamydia trachomatis* in pregnancy is 11%. *Chlamydia trachomatis* infection in pregnant women in the United States is the third cause of STDs after BV and herpes simplex virus-2 (21). In the imminent prematurity of labor that occurred in the study of Chawanpaiboon and Pimol (8), 36.4% (16/44) had a positive BV significance with Amsel's clinical criteria compared to labor.

Gram stain criteria for BV were not related to the concentrations of endocervical or vaginal inflammatory cells, but it was significantly related to a clinical diagnosis of PID (10). 10%-41% of women were reported with positive signs of BV, and the report also showed an association with maternal and fetal morbidity (13). Therefore, the studies have indicated that BV infection during pregnancy causes an increase in spontaneous abortion, premature birth, preterm PROM, preterm labor, amniotic fluid infection, postpartum endometritis, and postcesarean wound infections.

Research by Aduloju *et al.* (22) involved 362 pregnant women with complaints of vaginal discharge and found 16.6% (60/362) in the form of BV. BV in pregnancy increases the risk of abortion, preterm labor, chorioamnionitis, and postpartum complications such as endometritis and infection of the labor wound (22). At-term pregnancy, the clinical incidence of chorioamnionitis is 1%–5%, which can reach 25% in preterm labor (7). Kiran *et al.* (2) stated that chorioamnionitis, BV, strenuous labor, previous history of preterm labor, medical disorders, and placental abnormalities are significant causes of preterm labor. Choi *et al.* (23) showed that preterm labor was associated with Group B *Streptococcus*, *Mycoplasma hominis*, and *Ureaplasma urealyticum*, with a prevalence of 3.8% and 8.7%.

Of the 200 pregnant women enrolled, BV was the highest detected with 49.8%. Other infections detected were *Chlamydia trachomatis* (31.3%), *C. albicans* (16.6%), *Neisseria gonorrhoeae* (1.8%), and *T. vaginalis* (0.5%). Compared with the third trimester of gestation (with a percentage of 71.6%), the infection rates were recorded as higher than in the second trimester of gestation (28.4%) (24). Although there was

no statistically significant difference between BV positivity and BV negativity in terms of socioeconomic condition, educational status, and gravida, BV-positive women delivered prematurely at a higher rate (73%) than BV-negative women (25.4%) ( $P < 0.001$ ). BV, which is significantly related to preterm delivery, is indicated by abnormal bacterial colonization (12).

Da Fonseca *et al.* (25) showed that 15% of study subjects experienced preterm labor, while 52% complained of vaginal discharge. This suggests an association with the incidence of preterm labor due to pathological complaints of vaginal discharge in pregnancy da Fonseca *et al.* (24). In Kano, Northern Nigeria, the prevalence of vaginal discharge was found with a ratio of 1 in 20 antenatal patients.

However, other factors are associated with the risk of preterm labor, including the fetus and placental condition and the mother's health. Specific conditions of fetus and placental can cause early pregnancy bleeding, antepartum bleeding, ruptured the membrane, intrauterine growth retardation (IUGR), congenital malformation, Gemelli, and polyhydramnios. Therefore, mother health factors included serious disease, diabetes mellitus, preeclampsia/hypertension, urogenital/intrauterine infection, infectious disease with febris, psychological stress, uterine/cervix malformation, history of preterm/habitual abortion, cervix incompetence, drugs, trauma, heavy smoker, immunologic/rhesus malformation (26).

The prevalence of vaginal discharge infection decreased with increasing age, parity, and Western education but increased among HIV-infected patients with diabetes mellitus in pregnancy (27). Recruiting pregnant women as research subjects for gynecological

examination with vaginal discharge was difficult in this study. We suggest that obstetric gynecologists and midwives prevent vaginal discharge complaints from pregnant women to reduce the risk of premature rupture and premature labor of the membranes by carrying out gynecological examinations and vaginal swabs.

## Conclusion

Complaints of vaginal discharge in pregnant women significantly affect the occurrence of uterine contractions (his) and the risk of preterm labor. The closeness of the relationship between the two is strong. Most microorganisms that cause vaginal discharge are Gram-positive rod bacteria and Gram-negative rod bacteria. However, further research is still needed to confirm that complaints of vaginal discharge are predictive of premature labor.

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## Author's Contributions

IBB: Conceived and designed the analysis; IBB and I: Collected the data; I: Contributed data or analysis tools; IBB and I: Performed the analysis; IBB and I: Wrote the paper.

## Conflict of Interest

The authors declared no conflict of interest.

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