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Precautions for the characteristics of vaginal discharge for the tendency of genital infections†

Original article

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Abstract: **Objective:** To determine the relationship between the color of vaginal discharge and the volume of vaginal discharge and the types of microorganisms in the genital organs.
Methods: Cross-sectional study by conducting vaginal swab examinations on 56 women with complaints of vaginal discharge in Bareng Lor Village, Klaten, and Sewugalur, Kulon Progo, Indonesia. A vaginal swab was carried out with a Gram examination. Data were coded and analyzed using the chi-c test.
Results: The color of vaginal discharge was divided into: non-vaginal discharge 16.1% (9/56), white/clear/mucoid 50% (28/56), greenish/white 14.3% (8/56), brownish white/brown 3.6% (2/56), powdery and white 3.6% (2/56), post coitus bleeding 7.1% (4/56), and other complaints (itching, odor, erosion) 5.4% (3/56). The volume of vaginal discharge was divided into: normal 16.1% (9/56), a little 48.2% (27/56), and a lot 35.7% (20/56). The types of microorganisms obtained were: no microorganisms growing 8.9% (5/56), Gram positive cocci/bacilli 7.1% (4/56), Gram negative cocci/bacilli 19.6% (11/56), Gram positive/negative coccobacilli 7.1% (4/56), growth of >2 bacteria 42.9% (24/56), and fungus/yeast cells/clue cells 14.3% (8/56). There is a significant relationship between volume and type of microorganisms ($P = 0.011$), while the relationship between color/type of vaginal discharge and microorganisms is not significantly related.
Conclusions: The volume of vaginal discharge reflects the presence of risky microorganisms.

Keywords: *color of vaginal discharge • microorganisms • vaginal swab • volume • genital infection*

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1. Introduction

A balance between healthy bacteria and fungi occurs in a normal vagina. The hormone estrogen helps lactobacillus grow and kill pathogenic organisms in the vagina. The vaginal microbial composition differs from that of other human surfaces and mucosal regions, with lower microbial diversity and a predominance of *Lactobacillus* species.[1] The cervicovaginal epithelium acts as the first line of defense against invading microbes by employing several mechanisms, such as the production of immune mediators.[2]

The substance of the vulva, sebaceous glands, sweat glands, Bartholin's glands, and Skene's glands, the presence of cervical mucus, and secretions from the endometrial cavity are physiological secretions in the vagina. This discharge is termed as physiological vaginal discharge. Physiological vaginal discharge collects in the posterior fornix and does not stick to the vaginal wall.[3] Lechorrhea is a complaint with grayish, yellowish, or white discharge from the vagina and is not associated with a burning sensation, pain, or anxiety.[4] This discharge is known as pathological vaginal discharge. Pathological vaginal discharge sticks to the vaginal walls and causes complaints of irritation, itching, odor, and even urinary tract disorders or infections.[3]

Vaginal swab examinations are easy to do and cost-effective, but not all women who complain of vaginal discharge understand this examination. A study even showed that the results of an examination using a vaginal swab were able to indicate the presence of sexually transmitted diseases.[5] This vaginal swab examination is also needed in cases of married couples who need to undergo a pregnancy program. This is because the reception of sperm during intercourse is first collected in the vagina. Thus, for wives with complaints of vaginal discharge that are at risk of containing microorganisms, it can interfere with the sperm that has just been released by her husband during intercourse. This shows that vaginal swab examination provides great benefits. This vaginal swab examination is a simple easy-to-do procedure, which is affordable.

This article will convey the importance of carrying out vaginal swab examinations on women who complain of vaginal discharge, which is found to contain risky germs after examination. There are different types of vaginal discharge colors. Understanding the color of vaginal discharge offers a practical benefit, namely the ability to identify the microorganisms responsible for this condition. This knowledge contributes to the implementation of appropriate empirical therapy for patients. Furthermore, the evaluation of the volume of vaginal discharge is important for the assessment of the severity of the condition and serves as an important indicator for monitoring treatment effectiveness. This study supports the use of empirical therapy tailored to the color and volume of the vaginal discharge. Implementing such therapy can help reduce the severity of vaginal discharge and prevent potential complications effectively.

2. Methods

Material was obtained from respondents who had signed informed consent, which had been explained to the respondents. Respondents were mothers who complained of vaginal discharge and had vaginal swab examinations taken at the Obstetrics and Gynecology Specialist Polyclinic in Bareng Lor, Klaten, and Pratama Sewugalur Clinic, Kulon Progo. A total of 56 respondents were included in this cross-sectional study. The inclusion criteria were married women aged 20–50 years who reported experiencing vaginal discharge, were willing to undergo a vaginal swab examination, were not currently undergoing cancer treatment, and were not menstruating. Exclusion criteria were women who were menstruating, pregnant women, and menopausal women.

2.1. Sampling method

A total of 56 female respondents of reproductive age who complained of vaginal discharge according to the inclusion and exclusion criteria were included in this study. After ensuring that the respondents were not experiencing menstruation, pregnancy, or menopause, they was asked to go up to the gynecology table. The respondents underwent a gynecological examination by inserting a Cocor Bebek speculum into their vagina to display the vagina and cervix. The presence of vaginal discharge is recorded, paying attention to the color and volume of the vaginal discharge found. Next, a vaginal swab is taken by taking a sample of vaginal discharge around the posterior fornix.

Vaginal swab samples were then subjected to microscopic examination with Gram staining, and the interpretation of the results of the Gram examination was grouped based on Gram-positive, Gram-negative bacteria, Gram-positive coccobacilli, and Gram-negative coccobacilli, with clue cells suspected of causing bacterial vaginosis (BV) and the presence of yeast cells and pseudohyphae suspected of being *Candida* sp.

2.2. Data analysis

The data collected in this study were subjected to statistical analysis to evaluate the relationship between the dependent and independent variables. The independent variables included discharge color, categorized as nominal data; discharge volume, classified as ordinal data;

and microorganism type, categorized as nominal data. To assess these relationships, a correlation analysis was performed using an unpaired categorical comparative hypothesis, employing the chi-square statistical test (α = 0.05).

3. Results

3.1. Vaginal swab examination results

The most prevalent color of vaginal discharge found was 50% white/clear/mucous, followed by 16% normal, 14% greenish/greenish white/yellow, 7% due to post-coitus bleeding, 5% due to complaints of itching, odor, and erosion, 4% colored brownish white/brownish, and 4% white. This shows a very diverse picture of the characteristics of vaginal discharge and its relation to the causes (Figure 1).

Figure 2 shows that the vaginal discharge obtained by the majority of respondents was 48%, which is high, followed by 34% (above normal), 16% normal, and 2% minimal. This illustrates that the vaginal discharge obtained from respondents who complained of vaginal discharge, even though they felt it did not interfere with their activities, turned out to be 34% with a large volume. This condition further supports the need to carry out vaginal swab examinations on mothers who complain of vaginal discharge, even though it is not felt to be disturbing because it is not necessarily followed by complaints of itching and/or odor.

Figure 3 shows that the most microorganisms found among respondents were 43, >2 bacteria were found, followed by 20% coccus/Gram-negative bacilli, 14% fungi/yeast/yeast cells/clue cells, 9% found no growing microorganisms, 7% coccus/Gram-positive bacilli, and 7% Gram positive/negative coccobacilli.

There are three main causes of vaginal discharge in reproductive-age women, namely BV, candidiasis, and Trichomonas vaginalis. Abnormal vaginal discharge is characterized by a change in color, consistency, volume, and/or odor. It may be associated with symptoms such as itching, soreness, dysuria, pelvic pain, or intermenstrual or postcoital bleeding. The characteristic sign that may indicate cause of Vaginal discharge infection. Microorganisms responsible for vaginal discharge can be predicted by their color. BV is characterized by a thin, white/gray, homogeneous coating of the vaginal walls and vulva that has a fishy odor. While vaginal candidiasis is characterized by an odorless, white, curdy discharge, trichomoniasis is characterized by a yellow-green, frothy discharge with a fishy odor. Cervicitis caused by chlamydia (or less commonly by gonorrhea) is characterized by an inflamed cervix with a mucopurulent discharge. Desquamated inflammatory vaginitis (DIV) is vaginal inflammation that may range from focal petechiae to generalized erythema with mild to profuse purulent discharge.6

Of the types of microorganisms found, what needs attention is the discovery of suspected pathogenic bacteria, namely Gram-negative rod bacteria, Gram-positive cocci, Gram-positive coccobacilli, Gram-negative coccobacilli with clue cells, and the discovery of fungal spores in the form of yeast cells suspected of being *Candida* sp. The largest number of respondents were respondents who found more than 2 bacteria. This

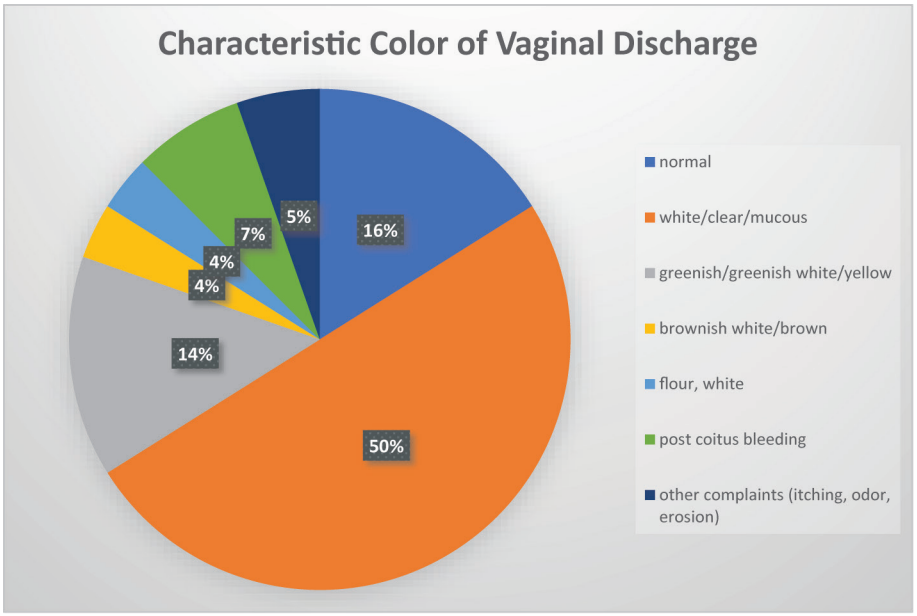


Figure 1. Characteristics of vaginal discharge complaints related to color and clinical symptoms.

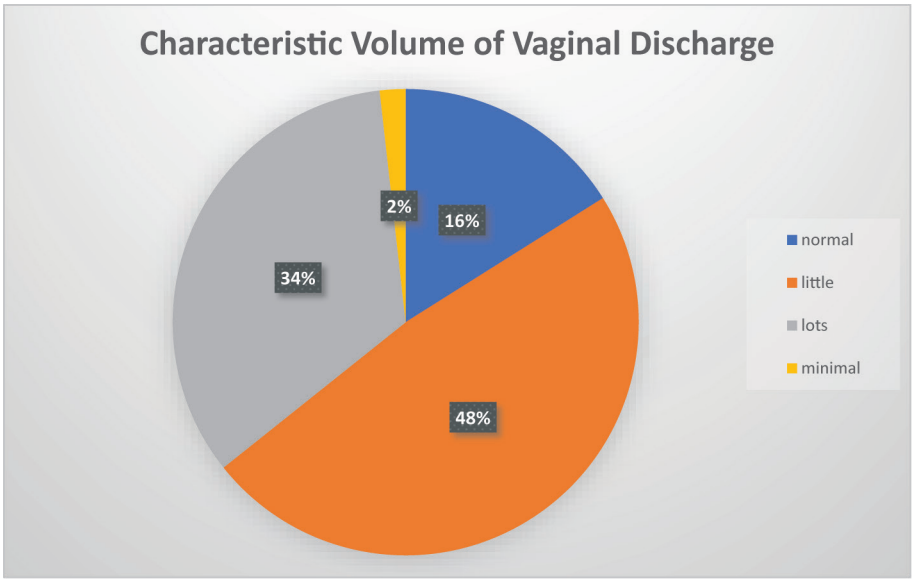


Figure 2. Characteristic of vaginal volume.

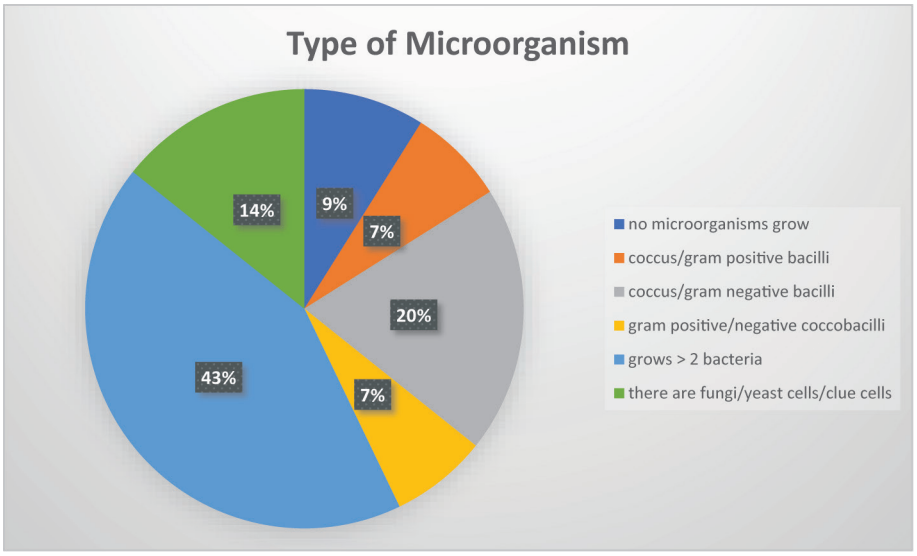


Figure 3. Microorganism findings based on vaginal swab microscopic results.

shows that the symptoms of vaginal discharge are often ignored, and people are less alert because, without complaints, more than one type of bacteria (polymicrobial etiology) is detected and requires appropriate treatment according to the cause.

Gram-negative rod bacteria are a group of Enterobacteriaceae known as pathogens that cause genital infections, for example, *Klebsiella pneumoniae* or *Escherichia coli*. Gram-positive cocci bacteria are also known to often be pathogens in genital infections, namely the genus *Staphylococcus* sp. and *Streptococcus* sp. Genital organ infections can be caused by one type of bacteria or several bacteria simultaneously (polymicrobial infection). Apart from that, other bacteria are often found, namely those that cause BV with the microscopic characteristics of Gram-positive coccobacilli and/or Gram-negative coccobacilli with clue cells. The presence of clue cells is a characteristic of the bacteria that cause BV, such as *Gardnerella vaginosis*. Apart from bacteria, fungi are also known to cause genital infections with complaints of typical vaginal discharge along with itching. The most common fungus that causes it is the genus *Candida* sp. Yeast infection is a germ that is often found in pathological vaginal discharge, apart

No.	Items	Chi-square tests	
		Amount (n)	*P* value
1.	The color of the discharge depends on the type of microorganism	56	0.189
2.	The volume of vaginal discharge depends on the type of microorganism	56	0.011

Table 1. Chi-square test.

from BV and trichomoniasis.[3] Only 9% of respondents did not find microorganisms in the vaginal discharge they complained about. This is only a small portion of all respondents. Thus, it is increasingly important to carry out a vaginal swab examination if the respondent complains of vaginal discharge, even though it is felt that it has not interfered with their activities, because there are no complaints of itching or odor.

This study uses color and volume as independent variables and the type of microorganisms as the dependent variable. Table 1 shows the results of the chi-square test data between the volume of vaginal discharge and the types of microorganisms found in the vaginal discharge. The results of the variable correlation showed statistical significance ($P < 0.05$). However, the relationship between discharge color and microorganism type was insignificant ($P = 0.189$). A significant relationship was shown between discharge volume and microorganism type ($P = 0.011$).

4. Discussion

Female genitalia are declared healthy due to the dominance of lactic acid and hydrogen peroxide, which maintain the vaginal pH in an acidic state.[7] Pathological vaginal discharge usually contains yeast infection (*Candida albicans*), BV, and trichomoniasis.[3] The same thing was also obtained from 50 respondents, with results of 84% pathological vaginal discharge, and the most common causes were fungal infections by *Candida* sp (90%), *Staphylococcus aureus* (64.8%), and *Klebsiella* (20.3%).[8] It is said that vaginal swab examination is needed to investigate women who are asymptomatic as a diagnostic tool according to the American Cancer Society guidelines.[9]

These results are in line with the results of research we conducted, where only 9% of respondents did not find microorganisms in the vaginal discharge they complained about. Most (91%) respondents indicated the presence of microorganisms in their genitals when they complained of vaginal discharge. The presence of yeast cells/fungi suspected of *Candida* sp. was found in 14% of respondents. The discovery of 14% yeast cells/fungi suspected of *Candida* sp. shows that a vaginal swab examination is important to be done as a first step for women who complain of vaginal discharge. Common symptoms of *Candida* infection of the skin are thickening, hyperkeratosis, and erythema.[10]

BV is defined by a well-organized polymicrobial biofilm that firmly attaches to the vaginal epithelium, mainly composed of the bacterium *Gardnerella vaginalis*.[11] BV infection is sometimes asymptomatic but can also cause serious problems, including preterm pregnancy, pelvic inflammatory disease, or sexually transmitted infections (STIs).[12] Changes in the composition of bacteria in the vagina cause BV, which is associated with inflammation in the vagina. The increased risk of BV in non-pregnant women is related to the incidence of STIs, such as HIV. In pregnant women, it can cause chorioamnionitis, preterm premature rupture of the membranes, and preterm birth.[7] A review study showed that microorganisms present in a pregnant woman's vagina are associated with the incidence of premature birth.[13] Pregnant women who complain of vaginal discharge have a 68.8% risk of uterine contractions ($P = 0.000$), which is at risk of causing preterm labor.[14] Alterations in the vaginal microbiome seem to be associated with pregnancy-related complications.[15]

An abnormal vaginal discharge is a frequent manifestation of reproductive tract infections, including STIs and vulvovaginal candidiasis. It is also a manifestation of BV, which has a prevalence of up to 50% among women of reproductive age. Reproductive tract infections are associated with a range of reproductive health challenges and increase the risk of HIV acquisition.[16] In the U.S., common viral STIs also include infections caused by human papillomavirus (HPV) and genital herpes simplex virus (HSV).[17] The human microbiome determines whether a core microbial species is associated with all human bodies. It is postulated that changes to this "core microbiome" may correlate with changes in human health or disease risk. The results from this study suggest that for the human vagina, there is no single core microbiome. Instead, it seems there are multiple core microbiomes.[18]

In the case of yeast cells/fungi suspected *Candida* sp., it can be found in our research that respondents who complain of vaginal discharge need to be examined to trace the type of microorganism that causes it so that it is hoped that an accurate therapy can be given and prevent unnecessary resistance to antibiotics. In providing therapy for complaints of vaginal discharge, one must consider the advantages and disadvantages associated with it because the vagina also contains normal flora. Inappropriate or excessive use of antibiotics can result in increased drug resistance, which can hamper

the ability to fight microorganisms.[4] Even the way of using the drug orally or intravaginally also needs to be considered. A study on experimental animals showed that the use of ayurvedic antimicrobial formulation in vaginitis therapy showed non-toxic results whether used orally or intravaginally.[19]

The results of the vaginal swab examination are also useful for couples who are undergoing a pregnancy program.[20] Microorganisms found in vaginal swabs can help clinicians to provide the right therapy. Thus, it is hoped that the collection of sperm in the vagina during intercourse can provide optimal results by being able to fertilize eggs in the fallopian tubes, without the risk of infection in the vagina.

The limitation of our research is that we do not know the type of pathogenic microorganism in question. Despite this limitation, the study methodology is simple, easy to implement, and cost-effective. Furthermore, it can be conducted effectively by the available human resources in primary healthcare facilities (fasyankes), ensuring optimal patient therapeutic outcomes. Therefore, future research should focus on identifying microorganisms at the species level, including bacteria, fungi, and parasites. Additionally, stricter inclusion criteria should be implemented.

5. Conclusions

The results of the vaginal swab examination revealed that 55 out of 56 (98.21%) samples contained microorganisms that required further treatment. There is a significant relationship between volume and type of microorganisms (P = 0.011), and the relationship between color/type of vaginal discharge and microorganisms is not significantly related with a value of P = 0.189.

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Ethical approval

This study was approved by the ethics committee of Universitas 'Aisyiyah Yogyakarta (EC: No. 3628/KEP-UNISA/V/2024).

Conflicts of interest

All contributing authors declare no conflicts of interest.

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