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The Effect of Turmeric-based Vaginal Liquid Soap with Different Concentrations on the Incidence of Vaginal Discharge and PH : Experimental Test on Santriwati of Darussholah II Islamic Boarding School North Pontianak

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ABSTRACT

Background: As many as 90% of Indonesian women have the potential to experience vaginal discharge because of Indonesia's tropical climate. Hot and humid weather causes mold to easily develop and cause vaginal discharge in women. For this reason, there needs to be an innovation that can be used as one of the efforts to overcome vaginal discharge in general. The purpose of this study is to prove the potential of turmeric-based vaginal soap that is able to overcome vaginal discharge.

Subjects and Method: This was a quasi experiment study. The study was conducted at the Darussholah II Islamic Boarding School, North Pontianak, Indonesia from November to December 2023. The sample was divided into 3 groups: (1) , namely groups 1, 2 and 3 with 5%, 10%, and 15% turmeric liquid soap interventions. The dependent variables studied were vaginal discharge and vaginal ph, and the independent variable was Vaginal Turmeric Soap. The analysis technique uses Wilcoxon bivariate analysis.

Results: The average value of 5% soap whiteness reduction was 0.96+0.20, 10% was 0.88+0.33 and 15% was 0.92+0.27 with *a p value* of 0.585. The average value of the pH reduction of 5% soap was 0.60 ± 0.57, 10% soap was 0.52 ± 0.65, and 15% soap was 0.48 ± 0.65 with a p value of 0.904. At a dose of 5%, the reduction in vaginal discharge and pH was the highest compared to other groups. And the results of the analysis showed that the administration of 5%, 10%, and 15% doses did not have a significant difference in changes in vaginal discharge and pH.

Conclusion: A 5% dose of turmeric-based vaginal soap was more effective at treating vaginal discharge and lowering vaginal pH, compared to other groups in this study. It is hoped that young women will be more selective in choosing soap in maintaining pH and vaginal discharge, especially if used for a long period of time.

Keywords: Vaginal liquid soap, turmeric, vaginal discharge, vaginal pH.

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BACKGROUND

According to WHO, about 75% of women in the world must experience vaginal discharge at least once in their lifetime (Nainar *et al.*, 2022), as many as 90% of Indonesian women have the potential to experience vaginal discharge because of Indonesia's tropical climate. Hot and humid weather causes mold to easily develop and cause vaginal discharge in women (Eduwan, 2022). Vaginal discharge is the excessive production of vaginal fluid which is the most common gynecological symptom, caused by infection or non-infection. Non-infectious vaginal discharge is considered physiological vaginal discharge where this condition does not cause disturbances because it is non-irritating, colorless, and odorless. Infectious vaginal discharge is a pathological vaginal discharge that has the characteristics of foul-smelling, offensive, and irritating (Dorjey et al., 2022).

The prevalence rate of pathological vaginal discharge is 6.8% worldwide with 51% to 64% of occurrences caused by polymicrobes. The incidence of vaginal discharge in Indonesia continues to increase every year until it reaches 70% (Eduwan, 2022). Adolescents are a vulnerable group to experience vaginal discharge due to a lack of knowledge which has an impact on attitudes that lack proper and correct hygiene of the genital area (Muftadiyah and Zubairi, 2022). The Regional Long-Term Development Plan (RPJMD) of West Kalimantan Province makes adolescents a priority to produce several targets, including reproductive health issues with a focus on children and adolescents as stated in Regional Regulation No. 3 of 2013, article 4 paragraph 1 concerning Adolescent Reproductive Health (Sali, 2016).

Research shows that 53.6% of students at the Darussholah Dua Islamic boarding school experience pathological vaginal discharge and the remaining 46.4% experience physiological vaginal discharge. More than 70% of students who experience pathological vaginal discharge are caused by poor knowledge, attitude, and behavior regarding the reproductive system and how to treat it (Ashari, 2018). Students in Islamic boarding schools are a vulnerable group that experiences reproductive health problems, especially related to personal hygiene. The reason is the lack of bathrooms available in Islamic boarding schools, the water source used for bathing and vulva hygiene is brownish well water, where the West Kalimantan area is not recommended to use directly dug wells because they contain iron and other mud materials that reduce water quality (Ashari, 2018).

The impact that occurs due to poor personal hygiene, especially related to reproductive health, is the appearance of pathological vaginal discharge in adolescent students caused by *Candidiosis vulvovaginitis, bacterial vaginitis, Trichomonas vaginalis*, and other bacteria (Ashari, 2018). The impact of untreated vaginal discharge is itching and an unpleasant odor in the vagina (Ardayani, 2022), in addition to that various reproductive problems such as vaginitis and vaginal infections can occur (Sumarah and Widyasih, 2017). The long-term impact if vaginal discharge is not treated for a long time is to cause pelvic infections, pregnancy outside the womb, infertility, and become the first symptoms of cervical cancer

There is pharmacological therapy to overcome vaginal discharge using *metronidazole, clindamycin*, and other antibiotic drugs (Maulidiyah, 2018), but the use of a single antibiotic has low effectiveness so that to treat vaginal discharge it is necessary to give a combination of two to three

types of antibiotics (Fennell et al., 2021). The use of antibiotics also has a risk of treatment failure caused by patients not taking antibiotics regularly so that it can actually lead to resistance (Verwijs et al., 2020).

Drug resistance is a major threat due to STIs challenges around the world (World Health Organization, 2023). The World Health Organization (WHO) has advised countries to take advantage of the use of traditional medicine in the health sector (Maulidiyah, 2018). Turmeric is a natural plant that has antioxidant and antimicrobial properties from its natural phenolic compounds. Turmeric is able to inhibit the growth of fungi by changing the morphology of hyphae (fungal body structure). Turmeric is also anti-inflammatory, anti-cancer, hepatoprotec-tive, anti-allergic, wound healing, anti-spasmodic, and has anti-HIV properties (Murugesh et al., 2019). The selection of turmeric as an alternative treatment for pathological vaginal discharge is because turmeric is a local plant that is abundant and easy to find, in addition, research shows that turmeric has passed toxicity tests in experimental animals with the results of safe use even in large doses of 5,000mg/kg body weight and for a long time for 90 days (Aggarwal *et al.*, 2016).

Turmeric made in the form of a feminine wash preparation has the potential to provide ease and safety of use in adolescents compared to using an applicator inserted into the vagina (Abouali et al., 2019). The feminine wash preparation also has a longer storage period compared to using turmeric in the form of a decoction (Tarigan, 2021). Turmeric has been shown to be safe to use on the vagina, does not cause side effects and does not kill the normal flora of the vagina (Zhang et al., 2019).

The use of turmeric-based vaginal soap is an alternative to safe vaginal discharge. The effectiveness of turmeric in overcoming high vaginal discharge with minimal side effects because it is used in the local area of the vagina is expected to be able to overcome discomfort in patients with pathological vaginal discharge in the form of itching, vaginal heat, and other symptoms. The antimicrobial and anti-oxidant properties in turmeric are expected to be able to prevent the long-term impact of pathological vaginal discharge in the form of reproductive diseases to cause reproductive system disorders.

SUBJECTS AND METHOD

1. Study Design

This was a quasi experiment study. The study was conducted at the Darussholah II Islamic Boarding School, North Pontianak, from November - December 2023.

2. Population and Sample

The target population is female students with babies aged 12-19 years at the Darussholah II Islamic Boarding School in North Pontianak. A total of 75 samples were selected by random sampling

3. Study Variables

The dependent variables studied were vaginal discharge and vaginal pH, and the independent variable was turmeric-based vaginal liquid soap.

4. Variable Operational Definition

Turmeric-based vaginal liquid soap is a vaginal liquid soap with the addition of turmeric extract as an effort to overcome vaginal discharge with concentrations of 5%, 10% and 15%. The administration of turmeric-based vaginal soap with different concentrations was given for 7 days and observed to analyze the results of changes in vaginal vaginal levels and pH.

5. Study Instruments

Vaginal discharge data was taken by giving a questionnaire and vaginal pH with vaginal swab pH.

6. Data analysis

The data analysis used was excel and with the help of the SPSS program. the mean difference between the paired groups was tested with the Wilcoxon test and for all three unpaired groups with the crucial walis.

7. Research Ethics

Research ethics issues including informed consent, anonymity, and confidentiality, are handled with care during the research process. The approval letter for the research ethics permit was obtained from the Research Ethics Committee of the Poltekkes of the Ministry of Health Semarang, Indonesia, No. 1223/EA/-KEPK/2023, on November 17, 2023.

RESULTS

The results of the sample characteristics are shown in table 1. Bivariate analysis of the effect of turmeric-based vaginal liquid soap on vaginal discharge, can be found in table 2. After being given turmeric-based vaginal liquid soap, the difference in the mean of vaginal discharge in the group was 5% faster than the decrease in vaginal discharge (mean= 0.04; SD= 0.20) compared to the 10% group with a difference (mean= 0.12; SD= 0.33) and a group of 15% with a mean difference (mean= 0.08; SD= 0.27), and not statistically significant (p<0.585).

Table 1. Sample Characteristics

Characteristics	Group		
	5%	10%	15%
Age (N)	25	25	25
Mean	16.08	16.04	16.12
SD	1.22	1.36	1.23
Min	14	14	14
Max	19	19	19
Stress level (N)	25	25	25
Mean	9.92	9.68	9.48
SD	2.70	2.07	2.95
Min	6	6	6
Max	16	14	16
Personal hygine (N)	25	25	25
Mean	7.52	7.96	8.28
SD	1.38	1.56	1.76
Min	5	5	5
Max	10	12	12
Physical activity (N)	25	25	25
Mean	108.48	103.96	103.36
SD	17.5	18.3	20.01
Min	78	74	69
Max	140	140	140

The effect of turmeric-based vaginal soap on vaginal pH is shown in table 3. After being given turmeric-based vaginal soap for 7 consecutive days, the difference in the mean vaginal pH in the group was 5% higher (mean = 0.60; SD= 0.57) compared to the difference of 10% group (mean= 0.52; SD= 0.65), and the 15% group (mean= 0.48; SD= 0.65) and is not statistically significant (p=0.904).

Table 2. Bivariate analysis of turmeric-based liqud soap with difference concentration on vaginal discharge after intervention

Concentration Group	Mean	SD	p
5%	0.04	0.20	0.585
10%	0.12	0.33	
15%	0.08	0.27	

Table 3. Bivariate analysis of turmeric-based liqud soap with difference concentration on vaginal pH before and after intervention

Vaginal pH	Mean	SD	P	Difference	
				Mean	SD
Group 5%					
Before	4.64	0.56	<0.001	0.60	0.57
After	4.04	0.20			
Group 10%					
Before	4.64	0.56	0.002	0.52	0.65
After	4.12	0.33			
Group 15%					
Before	4.56	0.50	0.003	0.48	0.65
After	4.08	0.27			

DISCUSSION

1. Vaginal discharge and vaginal pH Before and After Using Vaginal Liquid Soap Turmeric Extract 5%

Based on the results of pre and post statistical tests on research respondents who received turmeric-based vaginal soap at a dose of 5%, it showed a significant p= 0.000 which means it was effective in overcoming vaginal discharge and vaginal pH in students at the Darussholah II Islamic Boarding School.

Curcumin in turmeric soap has significant anti-inflammatory properties. Vaginal discharge caused by inflammation or irritation can be relieved by using vaginal liquid soap containing 5% turmeric extract. Reduction of inflammation can help improve the balance of vaginal microflora and reduce excessive fluid production. Turmeric can help in maintaining or restoring the pH of the vagina to its normal acidic state, which is an ideal condition for healthy vaginal microflora and for inhibiting the growth of pathogens. Vaginal discharge often occurs due to changes in pH that allow pathogens to multiply.

This study used 2.5 grams of turmeric extract at a dose of 5%, vaginal discharge is a common condition in women, including women of low age, and adolescent girls who have experienced menstruation, and can be caused by various factors, including age, where the age of adolescent girls between 14-19 years old is the fertile age and has experienced menstruation, so hormonally it will produce vaginal fluid to maintain a normal vaginal pH level.

Turmeric or curcumin is a polyphenol compound that has antioxidant and anti-cancer properties. The high benefits of curcumin in overcoming vaginal discharge by maintaining a normal pH also have a disadvantage in the form of difficulty in dissolving in water, so it is necessary to add a protein solution to allow the solution to be able to hold hydrophobic molecules such as curcumin in its structure and carry it

easily in an aqueous environment which will increase the dispersibility of the water (Abd El-Hack *et al.*, 2021).

The addition of lactoserum in the formulation of turmeric-based vaginal liquid soap increases its effectiveness in overcoming vaginal discharge and maintaining vaginal pH so that the varying doses of turmeric in each soap can describe how effective the turmeric soap is in absorbing the vagina even though the surrounding conditions are watery.

This study is in line with a study conducted by Abouali which showed that as many as 60% of respondents recovered from vaginal discharge after using turmeric-based vaginal cream, with a dose of 10% effectiveness of turmeric use equivalent to clotrimazole vaginal cream in overcoming vaginal discharge (Abouali *et al.*, 2019). Turmeric has anti-inflammatory and antioxidant effects that are able to inhibit oxidative stress in the body and has a strong ability to overcome inflammation and infections (Abd El-Hack *et al.*, 2021).

Based on the above description, researchers assume that the concentration of 5% turmeric extract in vaginal liquid soap is enough to activate the antimicrobial properties of turmeric against pathogens that commonly cause vaginal discharge, such as bacteria and fungi. This indicates that this concentration level is effective in reducing or eliminating microorganisms that cause infections or imbalances in the vaginal flora.

2. Vaginal Discharge and pH of Santriwati Before and After Using Turmeric Extract 10% Vaginal Liquid Soap

Based on the results of pre and post statistical tests on research respondents who received turmeric-based vaginal soap with a dose of 10%, showed significant results of P=0.000 for vaginal discharge and p=0.002 for vaginal pH, which means that a 10% dose of soap is effective in overcoming vaginal discharge and vaginal pH in students at the Darussholah II Islamic Boarding School.

This study used 5 grams of turmeric extract at a dose of 10%. The safety level of turmeric soap at a dose of 10% has been known through clinical trials and is safe to use up to a dose of 12 g/day for three months (Andrade *et al.*, 2019). At a concentration of 10%, turmeric extract has a higher potential to inhibit or kill microorganisms that cause infections or imbalances in the vaginal flora. Turmeric, especially the curcumin in it, is effective against various types of bacteria, fungi, and even some viruses, which can cause abnormal vaginal discharge. By reducing the number of pathogenic microorganisms, vaginal discharge due to infection can be reduced.

Vaginal discharge that is common in adolescent girls can be caused by physical activity factors, heavy activity can cause frequent vaginal discharge. Physical activity is an effective antidote to stress. Excessive stress can affect the body's hormonal and immune balance, which in turn can affect vaginal discharge and vaginal pH.

Vaginal discharge is vaginal discharge that comes out in addition to blood, it is called normal vaginal discharge if it does not have an odor, the liquid is clear or white, does not show abnormalities when examined by a laboratory, this vaginal discharge is affected by female reproductive hormones. Vaginal discharge is said to be pathological if it smells, accompanied by itching in the area around the vagina (Wijayanti, 2021).

The curcumin compound in turmeric has ten times the antioxidant activity of vitamin E, which is a common antioxidant. Curcumin has antibacterial, antioxidant, and anti-inflammatory effects that can

potentially overcome inflammation and kill bacteria, fungi and pathogens that occur during vaginal discharge (Murugesh *et al.*, 2019; Abd El-Hack *et al.*, 2021).

This research is in line with the research conducted by Mengmeng (Zhang *et al.*, 2019) which shows that the use of *Curcumin Hydrogel extract* is able to overcome inflammation and bacterial infections in the vagina more effectively compared to drug preparations on the market.

Based on the description above, researchers assume that with a turmeric extract content of 10%, this liquid soap has strong antimicrobial properties, which can effectively kill or inhibit the growth of microorganisms that cause vaginal discharge, including bacteria and fungi. This can reduce excessive vaginal discharge or caused by an infection, and can help maintain or restore the vaginal pH to a healthy acidic state. The antibacterial properties of turmeric may help balance the vaginal flora, reducing the growth of unwanted bacteria that can raise pH and cause imbalances.

3. Vaginal Discharge and pH of Santriwati Before and After Using Turmeric Extract Vaginal Liquid Soap 15%

Based on the results of pre and post statistical tests on research respondents who received turmeric-based vaginal soap at a dose of 15%, showed significant values of $p<0.001$ for vaginal discharge, and $p= 0.003$ for vaginal pH.

This study used 7.5 grams of turmeric extract at a 15% concentration. Vaginal discharge is a common condition among women of childbearing age, with personal hygiene playing an important role in maintaining vaginal health, including its effects on vaginal discharge and vaginal pH. Good hygiene can reduce the risk of vaginal infections, such as bacterial vaginosis or fungal infections (candidiasis), both of which can cause abnormal vaginal discharge. Cleaning the vaginal area regularly (but not excessively) with clean water and avoiding the use of perfumed soaps or harsh hygiene products can help maintain the natural balance of the vaginal flora.

Curcumin is a polyphenol compound that has various pharmacological activities in the form of anti-inflammatory, antioxidant, antitumor, anticoagulant and immune enhancer. In addition, curcumin can eliminate free radicals, reduce the inflammatory response, shorten wound healing time, improve collagen deposition and increase fibroblasts and blood vessel density (Zhang *et al.*, 2019).

This study is in line with Vitali *et al.* (2021) which shows that the use of curcumin nanoparticles in the vagina can reduce inflammation of local vaginal tissues and HSV-2 infection and reduce the risk of HIV transmission.

Based on the description above, the researcher assumes that with a turmeric extract content of 15%, it provides a higher level of antimicrobial activity. This means a stronger ability to kill or inhibit the growth of microorganisms that cause pathological vaginal discharge, including bacteria and fungi, thereby reducing the incidence of abnormal vaginal discharge, as well as abun with higher concentrations of turmeric extract may be more effective at maintaining or restoring vaginal pH to its normal acidic levels. This is important because acidic pH helps maintain the balance of vaginal flora, suppresses the growth of pathogens and minimizes the risk of imbalances that cause vaginal discharge.

4. Difference in the Effectiveness of Turmeric-Based Liquid Vaginal Soap at 5%, 10% and 15% Doses on Vaginal Vaginal Discharge and pH

The results of the statistical test showed that there was no significant difference in

the three doses of vaginal soap in overcoming vaginal discharge (p= 0.585), but the average value of post-vaginal discharge of 5% dose of soap was lower than that of the other two doses, which means that turmeric soap with a dose of 5% was more effective in overcoming vaginal discharge compared to the other two doses due to the smaller rate of vaginal discharge. The smaller the value of vaginal discharge, the better.

The results of the statistical test showed that there was no significant difference in the three doses of vaginal soap in overcoming vaginal pH (p= 0.904), but the average pH value of the 5% dose of vaginal soap was the highest compared to the other two doses, which was 0.60 which means that 5% turmeric soap was more effective in lowering vaginal pH compared to the other two doses.

Research shows that curcumin in turmeric at a dose of 2-5% of curcuminoids has benefits as anti-inflammatory, antioxidant, anticancer, and chemotherapy (Murugesh *et al.*, 2019), while turmeric with a concentration of 1% has properties and the ability to deal with fungi. Turmeric extract with a dose of 10% has the property of overcoming symptoms of vaginal discharge in general in the form of vaginal discharge, burning sensation, itching, erythema, and effective culture results (Abouali *et al.*, 2019).

Studies have shown that vaginal pH is strongly correlated with diseases that infect the vagina, where vaginal pH < 4.2 is a moderately acidic condition that can protect the vaginal mucosa from pathogenic organisms and indicate vaginal health conditions (Lin *et al.*, 2021).

The interrelationship between vaginal discharge and vaginal pH proves that the 5% turmeric dose is the most effective in overcoming vaginal discharge and maintaining vaginal pH as shown by the test results of 5% turmeric soap being able to overcome vaginal discharge and maintain vaginal pH in a balanced manner. At 10% and 15% soap, vaginal discharge can be resolved, but the decrease in vaginal pH is lower than the 5% dose, so this condition is also related to the decrease in vaginal discharge in the other two doses which have a lower effectiveness compared to the 5% dose.

Vaginal liquid soaps with 5%, 10%, and 15% turmeric extract show similar effects because turmeric contains curcumin, which has powerful anti-inflammatory and antimicrobial properties. A dose of turmeric extract in that range is sufficient to activate its therapeutic properties without significant differences in effectiveness. This may be due to the presence of a saturation limit where an increase in the concentration of the extract above a certain point no longer significantly increases its biological activity. In addition, the structure of the vaginal mucosa may only be able to absorb and react to certain amounts of the active ingredient, so increasing the concentration of turmeric extract above a certain threshold does not provide any additional benefits. Therefore, although the concentration of turmeric extract is different, its effect on vaginal health remains the same, suggesting that the minimum dose has been sufficient to produce the desired effect.

This research is in line with research (Oktaviana *et al.*, 2020) which shows that there is an effect of turmeric decoction extract on the incidence of vaginal discharge in women of childbearing age.

Based on the description above, the researcher assumes that the effectiveness of turmeric extract in overcoming vaginal discharge does not depend linearly on the concentration of the extract. This means that even at low concentrations, such as 5%,

turmeric extract is already reaching its maximum effectiveness in combating vaginal discharge-causing bacteria or fungi, the physiological properties of teenage vaginas, which may be more sensitive or responsive to natural active ingredients such as curcumin, make increasing turmeric extract concentrations above 5% not provide significant additional benefits in reducing vaginal discharge, as well as there could be other factors in vaginal liquid soap formulations which limits the absorption or activity of curcumin at higher levels, such as product pH or interactions with other ingredients, so that the addition of turmeric extract concentrations does not show a difference in effect.

AUTHOR CONTRIBUTION

In the preparation of this journal, Delvia Lutfiawaliah, Diyah Fatmasari and Arwani collaborated to develop a manuscript. Delvia Lutfiawaliah prepared all research administration documents and data collection. Delvia Lutfiawaliah, Diyah Fatmasari and Arwani analyse data, interpret and publish.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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