



# Effectiveness of Curcuma Longa and Piper betel leaf Extracts on Vaginal Discharge: A Pre-Experimental Study

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## Abstract

Vaginal discharge is basically a reproductive complaint that is always experienced by women. Herbal treatments such as Curcuma longa and betel leaves have antimicrobial and anti-inflammatory properties. This study aims to determine the effectiveness of Curcuma longa and piper piper betel leaf extracts in preventing and treating vaginal discharge in women of reproductive age. This study used a pre-experimental design with a pretest-posttest group conducted on 35 women of childbearing age (WUS) aged 20-45 years who were determined using purposive sampling. Respondents were given 200 mL of extract orally consumed three times a week for one month. Classification of vaginal discharge severity was categorized as: mild, moderate, or severe. Data analysis in this study used the Shapiro-Wilk test and the Wilcoxon Signed Rank Test. This study obtained results the median severity score decreased from 2 (moderate) before the intervention to 1 (mild) after the intervention. Wilcoxon Signed Rank Test showed a significant reduction in vaginal discharge after intervention ( $Z = -5.477$ ;  $p < 0.001$ ) with a large effect size ( $r = 0.92$ ). From this study, it was found that Curcuma longa extract and piper piper betel leaf can significantly reduce the severity of vaginal discharge and can be considered as a complementary intervention.

**Keywords:** curcuma-longa, piper-betel-leaf, leucorrhoea, vaginal-discharge, women-of-childbearing-age, herbal-therapy

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## INTRODUCTION

Vaginal discharge is one of the most common reproductive health complaints experienced by women of reproductive age worldwide. Although some vaginal discharge is physiological and normal, pathological discharge is generally associated with infections such as bacterial vaginosis, vulvovaginal candidiasis, trichomoniasis, and disturbances in the vaginal microbiota balance. This condition remains a global health problem because it may cause itching, unpleasant odor, irritation, dyspareunia, psychological distress, decreased quality of life, and increased healthcare visits. The World Health Organization reported that bacterial vaginosis is one of the leading causes of abnormal vaginal discharge among reproductive-aged women, with a global prevalence ranging from 23% to 29%. In addition, approximately 75% of women experience vulvovaginal candidiasis at least once in their lifetime (Abbe & Mitchell, 2023; Paavonen et al., 2022; Rosati et al., 2020; WHO, 2025).

In Indonesia, vaginal discharge is a consistently reported reproductive health problem among adolescents and adult women. The tropical climate, characterized by warm temperatures and high humidity, creates a favorable environment for the growth of microorganisms that cause vaginal infections. Several international studies have shown that an imbalance in the vaginal ecosystem is closely linked to an increased incidence of vaginitis and bacterial vaginosis among women of reproductive age[6]. In addition to environmental factors, poor genital hygiene, prolonged use of tight clothing, inadequate sanitation, and inadequate knowledge about reproductive health also contribute to the high prevalence of vaginal discharge. A study in Nigeria reported that genital hygiene practices and sexual behavior were significantly associated with abnormal vaginal discharge in women of reproductive age[7].

Many women still consider vaginal discharge to be a normal condition rather than a health problem requiring medical treatment, leading them to self-medicate or delay consultation with healthcare professionals. This situation may result in delayed diagnosis and increase the risk of recurrent infection. A study in Uganda found that vaginitis infections remain highly prevalent among women seeking reproductive health services, highlighting the importance of early detection and prompt management [8].

Current treatment for pathological vaginal discharge is tailored to the cause, including antifungal, antibiotic, or antiparasitic treatment. However, high recurrence rates, antimicrobial resistance, drug side effects, treatment costs, and limited access to healthcare often hinder successful therapy. Consequently, herbal-based complementary therapies are gaining popularity. Several international studies indicate that the use of herbal medicines in women's reproductive health is increasing due to their perceived naturalness, accessibility, and

potential benefits as supportive therapies. An article published in *Frontiers in Pharmacology* reports that herbal medicines have a potential role in various female reproductive disorders, including inflammatory and gynecological conditions [9], [10]. In addition, a survey study among women of reproductive age in the United States showed that the use of herbal supplements was relatively common among patients seeking reproductive healthcare, indicating increasing public trust in complementary therapies [11]. Thus, herbal therapy may represent a relevant supportive approach in women's reproductive health, including as an adjunctive alternative in the management of pathological vaginal discharge.

One widely used herbal plant is the piper betel leaf. Betel leaves have been shown to have antimicrobial activity against *Candida albicans*, *Escherichia coli*, and *Staphylococcus aureus*, microorganisms commonly responsible for abnormal vaginal discharge. The phenols, flavonoids, and essential oils contained in betel leaves play a role in inhibiting the growth of pathogenic microbes. Meanwhile, *Curcuma longa*, or turmeric, contains curcumin, which has anti-inflammatory, antioxidant, immunomodulatory, and antimicrobial effects. Recent research shows that curcumin can reduce inflammation and inhibit microbial proliferation. Therefore, the combination of these two plants may provide greater benefits in treating vaginal discharge (Hanni, 2024; Maria et al., 2024).

Previous studies in Indonesia and other countries have generally investigated piper betel leaf and turmeric separately. Several studies reported that boiled piper betel leaf preparations or cleansing products containing piper betel leaf may help reduce vaginal discharge symptoms. Other studies found that turmeric has antimicrobial and anti-inflammatory activities beneficial to women's reproductive health [15]. However, most studies have focused on single-herb use, in vitro laboratory testing, topical application, or descriptive designs. Scientific evidence regarding the combination of piper betel leaf and turmeric in oral form, particularly using a clinical pretest-posttest design among women of reproductive age, remains very limited. Several studies have also shown that boiled betel leaves or preparations based on betel leaves can help reduce vaginal discharge symptoms due to their antimicrobial activity against *Candida albicans*, *Escherichia coli*, and other pathogenic microorganisms. However, most of these studies focused on single herbal therapies and did not evaluate the combined benefits of both plants. [16].

Furthermore, most available studies were laboratory-based (in vitro), assessing the antimicrobial or anti-inflammatory activity of plant extracts, but only a few directly measured clinical effectiveness among women experiencing vaginal discharge (Hussain et al., 2022; Yassin et al., 2020). Previous studies also more frequently used topical applications, such as boiled piper betel leaf water for cleansing or feminine hygiene solutions, while oral administration remains very limited [20], [21]. In contrast, turmeric containing

curcumin is known to have systemic effects as an anti-inflammatory, antioxidant, and immunomodulatory agent that may support reproductive mucosal health. [22] explained that curcumin has potential as a natural therapeutic agent through anti-inflammatory mechanisms and tissue repair.

In addition, most previous studies used observational or descriptive designs, and therefore were limited in objectively demonstrating changes in vaginal discharge levels through pre- and post-intervention measurements. Studies using a pretest-posttest design among women of reproductive age in community settings remain scarce, particularly those relevant to midwifery community services. Based on the above explanation, there is still a research gap regarding the effectiveness of a combination of turmeric (*Curcuma longa*) extract and piper piper betel leaf (*Piper piper betel leaf*) in oral form, administered regularly and evaluated using a pre-experimental pretest-posttest design among women of reproductive age experiencing vaginal discharge. Therefore, this study was conducted to fill this scientific evidence gap while providing an alternative complementary therapy that is affordable, easy to implement, culturally acceptable, and potentially supportive of midwifery practice.

The novelty of this study lies in the evaluation of a combination of turmeric (*Curcuma longa*) extract and piper piper betel leaf (*Piper piper betel leaf*) in oral form, administered regularly for one month among women of reproductive age experiencing vaginal discharge. Unlike previous studies, this research uses a pre-experimental pretest-posttest approach to directly assess changes in vaginal discharge levels in the community. The results of this study are expected to provide a scientific basis for an alternative complementary therapy that is affordable, easy to implement, culturally acceptable, and supportive of midwifery services. This study aimed to determine the effectiveness of Curcuma longa and Piper betel extracts in reducing vaginal discharge among women of reproductive age.

## METHODS

This study used a pre-experimental design with a single-group pretest-posttest approach to determine the effectiveness of Curcuma longa extract and Piper betel leaf extract in preventing and treating vaginal discharge in women of childbearing age. The study was conducted in Pamekasan from October 2024 to January 2025. Ethics approval was obtained from the institutional ethics committee under Ethics Permit Number 0723431/EC/KEPK/I/04/2026.

The target population consisted of women of childbearing age aged 20 to 45 years who experienced physiological or pathological vaginal discharge. The sampling technique used in this study was total sampling, meaning that the entire population meeting the inclusion criteria was selected as a sample of 35

respondents. Inclusion criteria were women aged 20–45 years, experiencing physiological or pathological vaginal discharge, and willing to participate by signing an informed consent. Exclusion criteria included respondents with severe gynecological disorders, pregnancy complications, or current use of antifungal or antibiotic therapy who did not complete the study.

Respondent characteristics at baseline were recorded, including age, marital status, education level, occupation, personal hygiene practices, contraceptive use, and history of recurrent vaginal discharge. The intervention consisted of a combination of Curcuma longa extract and Piper betel leaf extract, administered according to the study protocol. Each respondent received 200 mL of the herbal extract three times a week for one month or four consecutive weeks. The extract was hygienically prepared using standard procedures to ensure consistent concentration and quality. Outcome assessments were conducted before and after the intervention using a structured observation sheet and a validated questionnaire. The instrument assessed vaginal discharge characteristics such as type, color, odor, consistency, itching or irritation, and frequency of occurrence or measured the severity of the discharge. This was then scored (Mild = 1, Moderate = 2, Severe = 3) and evaluated with a score of Reduced = decrease by 1 level No change = 0.

The questionnaire underwent validity and reliability testing using SPSS before data collection. Data analysis was performed using SPSS software. Descriptive statistics were used to determine respondent characteristics. Normality of data distribution was tested using the Shapiro–Wilk test. Because the data were not normally distributed, differences in pretest and posttest scores were analyzed using the Wilcoxon Signed Rank Test with a significance level of  $p < 0.05$ . The effect size ( $r$ ) was also calculated to determine the magnitude of the intervention effect.

## RESULT

This study involved 35 women of reproductive age who experienced vaginal discharge. The study examined the effect of turmeric (*Curcuma longa*) and betel leaf (*Piper betle*) extracts on reducing vaginal discharge using a one-group pretest–posttest design.

## Respondent Characteristics

**Table 4.1 Distribution of Respondents by Age**

Characteristics	Frequency (f)	Percentage (%)
<b>Age</b>		
19–25 years	16	45.7
26–35 years	12	34.3
36–40 years	7	20.0
<b>Marital Status</b>		
Married	30	85.7
Unmarried	4	11.4
Widow	1	2.9
<b>Contraceptive History</b>		
Injectable contraception	21	60.0
Oral contraceptive pills	5	14.3
Implant	1	2.9
IUD	3	8.6
<b>Natural Family Planning (NFP)</b>		
No contraception	3	8.5
<b>Personal Hygiene</b>		
Poor	8	22.9
Adequate	27	77.1

Table 4.1 Table characteristics show that almost half of the respondents were aged 19–25 years, namely 16 people (45.7%). Respondents aged 26–35 years amounted to 12 people (34.3%), while those aged 36–40 years were 7 people (20.0%). This distribution indicates that most respondents were still in the productive reproductive age group. From the aspect of marital status, the majority of respondents were married, totaling 30 people (85.7%). Meanwhile, 4 respondents (11.4%) were unmarried and 1 respondent (2.9%) was widowed. The data illustrate that most participants had entered married life.

Based on contraceptive history, injectable contraception was the method most widely used by respondents, with a total of 21 people (60.0%). The use of oral contraceptive pills was reported by 5 respondents (14.3%), while 3 respondents (8.6%) used an IUD. In addition, 2 respondents (5.7%) used Natural Family Planning (NFP), 1 respondent (2.9%) used an implant, and 3 respondents (8.5%) stated that they did not use any contraceptive method. Regarding personal hygiene, most respondents were categorized as having adequate personal hygiene, namely 27 people (77.1%). Meanwhile, 8 respondents (22.9%) were categorized as having poor personal hygiene. These findings indicate that good hygiene practices were more

commonly found among the respondents in this study

**Table 4.2 Distribution of Vaginal Discharge Severity Before Intervention**

Vaginal Discharge Severity	Frequency (f)	Percentage (%)
Mild	15	42.9
Moderate	17	48.6
Severe	3	8.5
<b>Total</b>	<b>35</b>	<b>100</b>

Table 4.2 shows that before the intervention most respondents experienced moderate vaginal discharge, totaling 17 respondents (48.6%). Severe vaginal discharge was found in 3 respondents (8.5%).

### Vaginal Discharge Scores Before and After Intervention

**Table 4.3 Distribution of Vaginal Discharge Scores Before and After Intervention**

Variables	Mean $\pm$ SD	Median	Mean Difference	95% CI	Z	p-value
<b>Pretest</b>	1.66 $\pm$ 0.63	2	0.52	0.30–0.74		
<b>Posttest</b>	1.14 $\pm$ 0.36	1			-5.477	0.000

Table 4.3 shows that the median vaginal discharge score before intervention was 2, while after intervention the median score decreased to 1. The mean score before intervention was 1.66  $\pm$  0.63. After intervention, the mean score decreased to 1.14  $\pm$  0.36. The maximum score before intervention was 3 and decreased to 2 after treatment. These findings indicate a decrease in vaginal discharge scores after administration of turmeric and betel leaf extracts

### Intervention Outcomes

**Table 4.4 Distribution of Intervention Outcomes**

Intervention Outcomes	Frequency (f)	Percentage (%)
Reduced	30	85.7
No change	5	14.3
Worsened	0	0
<b>Total</b>	<b>35</b>	<b>100</b>

Table 4.4 shows that 30 respondents (85.7%) experienced reduced vaginal discharge after intervention. Five respondents (14.3%) showed no change, and no respondents experienced worsening symptoms.

## Wilcoxon Signed Rank Test Results

The Wilcoxon Signed Rank Test was used to determine the effect of turmeric and betel leaf extracts on vaginal discharge levels.

**Table 4.5 Wilcoxon Signed Rank Test Results**

Variables	Negative Ranks	Positive Ranks	Ties	Z	Asymp. Sig. (2-tailed)
Pretest– Posttest	30	0	5	-5.477	0.000

Table 1.5 The Wilcoxon Signed Rank Test showed 30 negative ranks, indicating that vaginal discharge scores decreased after intervention. No positive ranks were identified, while 5 respondents showed no change. The statistical analysis produced a Z value of -5.477 with a significance value of 0.000 ( $p < 0.05$ ). This result indicates that turmeric and betel leaf extracts affected the reduction of vaginal discharge among women of reproductive age.

## DISCUSSION

This study demonstrated that the administration of Curcuma longa and Piper betle extracts reduced vaginal discharge symptoms among women of reproductive age. The findings showed a decrease in the median vaginal discharge score from 2 (moderate) before intervention to 1 (mild) after intervention. In addition, 85.7% of respondents experienced improvement after receiving the herbal intervention, and no respondents reported worsening symptoms. Statistical analysis using the Wilcoxon Signed Rank Test also confirmed a significant reduction in vaginal discharge severity after treatment ( $p < 0.05$ ). These findings indicate that the combination of turmeric and betel leaf extracts may provide beneficial effects as a complementary therapy for vaginal discharge management. Age may be associated with the occurrence of vaginal discharge because women of reproductive age experience active hormonal and reproductive changes. Women in younger reproductive age groups generally have higher estrogen activity, which can affect vaginal secretions and vaginal moisture. Hormonal fluctuations during the reproductive period may influence the balance of vaginal microbiota and vaginal pH. These conditions can increase susceptibility to bacterial or fungal growth associated with pathological vaginal discharge. Women of reproductive age also tend to have higher reproductive and sexual activity, which may contribute to changes in vaginal conditions[23].

Shows that most respondents were married, totaling 30 respondents (85.7%). Unmarried respondents accounted for 4 respondents (11.4%), while only 1 respondent (2.9%) was widowed. Marital status may be associated with

the occurrence of vaginal discharge because married women generally have higher reproductive and sexual activity, which can influence vaginal conditions and reproductive tract health. Sexual activity, hormonal changes, contraceptive use, and genital hygiene may affect the balance of vaginal microbiota and increase susceptibility to vaginal discharge. A study explains that reproductive and gynecological factors are associated with changes in the vaginal microbiota among women of reproductive age. Disturbance of vaginal microbiota balance may increase the risk of reproductive tract infections and abnormal vaginal discharge[24].

The results of this study showed that most respondents used hormonal contraception, particularly injectable contraception, totaling 21 respondents (60%). Hormonal contraceptive use may be one of the factors associated with vaginal discharge among women of reproductive age. Hormonal contraceptives may influence the balance of estrogen and progesterone, leading to changes in the vaginal environment, including vaginal pH and microbiota composition. These changes may increase the growth of bacteria and fungi associated with pathological vaginal discharge. A recent study on the effect of contraceptive use on cervicovaginal microbiota reported that hormonal contraception may alter the balance of normal vaginal flora and affect vaginal microbiota composition[25].

Indicates that most respondents had adequate personal hygiene, totaling 27 respondents (77.1%). Respondents with poor personal hygiene accounted for 8 respondents (22.9%). Personal hygiene is one of the factors associated with the occurrence of vaginal discharge among women of reproductive age. Inadequate genital hygiene may increase moisture in the genital area and facilitate the growth of bacteria and fungi associated with pathological vaginal discharge. Poor hygiene practices such as infrequent changing of underwear, improper cleansing of the genital area, wearing tight clothing, and excessive use of feminine cleansing products may disturb the balance of normal vaginal flora. This imbalance can increase the risk of itching, unpleasant odor, excessive discharge, and reproductive tract infections[26].

Vaginal Discharge Before Intervention Before treatment, most respondents experienced moderate vaginal discharge. Several factors may contribute to this condition, including genital hygiene, hormonal contraceptive use, and vaginal moisture. Some respondents still had poor personal hygiene habits. Inadequate genital hygiene may increase bacterial and fungal growth, which can trigger vaginal discharge. Hormonal contraceptive use was also found among respondents. Long-term hormonal contraceptive use may influence hormonal balance and vaginal pH. Several respondents reported symptoms such as itching, excessive discharge, and unpleasant odor before intervention.

Effect of Turmeric and Betel Leaf Extracts on Vaginal Discharge The findings showed a reduction in

vaginal discharge after administration of turmeric and betel leaf extracts. The median score decreased from 2 before intervention to 1 after intervention. The mean score also decreased from  $1.66 \pm 0.63$  to  $1.14 \pm 0.36$ . Most respondents experienced improvement after intervention, while no respondents showed worsening symptoms. The Wilcoxon Signed Rank Test showed a significance value of 0.000 ( $p < 0.05$ ), indicating that the intervention affected vaginal discharge reduction. Betel leaf contains phenols, flavonoids, tannins, and essential oils that may inhibit bacterial and fungal growth. Turmeric contains curcumin, which has anti-inflammatory and antimicrobial properties. After intervention, several respondents reported reduced itching, less discharge, and decreased unpleasant odor.

**Interpretation of Statistical Results** The number of negative ranks was higher than the number of ties, while no positive ranks were found. This result indicates that most respondents experienced improvement after intervention. The standard deviation after intervention was lower than before intervention. This finding suggests that respondents' conditions became more similar after treatment. The effect size value of 0.92 indicates that turmeric and betel leaf extracts had a strong effect on reducing vaginal discharge in women of reproductive age.

Compared with previous studies, the present study provides additional evidence regarding the combined oral administration of turmeric and betel leaf extracts among women of reproductive age. Earlier studies mostly focused on single-herb interventions, laboratory-based experiments, or topical applications such as vaginal cleansing solutions and boiled leaf water. In contrast, this study evaluated the combined oral administration of both herbal extracts using a pretest–posttest clinical approach. Therefore, this study contributes new evidence regarding the potential synergistic effects of *Curcuma longa* and *Piper betle* as complementary therapy for vaginal discharge management.

The findings of this study have important implications for midwifery practice and women's reproductive healthcare. Herbal therapies based on turmeric and betel leaf may serve as affordable, culturally acceptable, and easily accessible complementary interventions, particularly in communities with limited access to healthcare services. Midwives and healthcare providers may consider providing education regarding safe herbal use and reproductive hygiene practices to support women experiencing vaginal discharge. In addition, these findings may encourage further development of evidence-based complementary reproductive healthcare interventions using medicinal plants commonly available in Indonesia.

Despite the positive findings, this study had several limitations. First, the study used a pre-experimental design without a control group, making it difficult to exclude the influence of external factors on the

observed outcomes. Second, the sample size was relatively small and limited to one study area, which may reduce the generalizability of the findings. Third, several confounding variables such as dietary habits, stress levels, sexual behavior, and hormonal conditions were not fully controlled during the intervention period. Furthermore, microbiological examinations were not performed to identify specific causative organisms associated with vaginal discharge. Therefore, future studies using randomized controlled trial designs, larger sample sizes, longer follow-up periods, and microbiological confirmation are recommended to strengthen the scientific evidence regarding the effectiveness of Curcuma longa and Piper betle extracts in reproductive health management.

## CONCLUSIONS

The combination of Curcuma longa and piper betel leaf has been shown to be effective in reducing vaginal discharge symptoms in women of childbearing age. Clinical improvements included reductions in itching, odor, excessive vaginal discharge volume, abnormal color, and thick consistency. This suggests that the combination of Curcuma longa and piper betel leaf may serve as an effective complementary herbal therapy for the prevention and treatment of vaginal discharge through antimicrobial and anti-inflammatory mechanisms. This study used a single-group pretest-posttest design without a control group and involved a relatively small sample size; the findings should be interpreted with caution. Further randomized controlled trials with larger populations, longer follow-up periods, and microbiological confirmation are recommended to validate these results and establish a standardized dosing protocol.

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## AUTHOR CONTRIBUTIONS

Emi Yunita contributed to the conceptualization of the study, methodology design, data collection, data analysis, interpretation of results, manuscript writing, and final manuscript preparation. Ni Wayan Manik Parwati contributed to supervision, methodology review, critical revision of the manuscript, validation of research findings, and final approval of the manuscript for publication. All authors have read and approved the final version of the manuscript.

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