



Original Research

Efficacy of Mulberry Leaf (*Morus alba L.*) Mask in Reducing Acne Vulgaris among Vocational School Students

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ABSTRACT

Introduction: Teenager girls often experience acne due to hormonal changes. This condition not only affects their appearance but also lowers self-confidence and impacts their mental health. This study aims to determine the effect of the natural mulberry leaf mask formula (*Morus alba L.*) on acne vulgaris in female students of Vocational School in Jombang, Indonesia.

Method: The research design used was a One-Group Pre-Experimental, Pre-Test-Post-Test. This study involved 65 students, with a sample of 20 respondents selected through Quota Sampling. Data were collected using observation sheets and analyzed with SPSS 25 using the Wilcoxon Test.

Results: Before therapy, 15 respondents (75%) experienced moderate acne vulgaris. After therapy, 15 respondents (75%) experienced mild acne vulgaris. Statistical analysis showed a significance value of $0.000 < \alpha$ (0.05).

Conclusion: Regular use of a natural mulberry leaf mask is beneficial for acne healing. Mulberry leaves contain vitamins A, C, and E, alkaloids, and flavonoids, which act as antibacterials, reduce inflammation, and reduce oxidative stress. This formula can be used as an alternative treatment for acne vulgaris.

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1. INTRODUCTION

Everyone desires clean, smooth, healthy, and problem-free facial skin, especially teenage girls. However, in reality, the majority of teenage girls experience facial skin problems (Gurram et al., 2021). Biological changes in adolescents with hormonal instability easily cause acne vulgaris, resulting in inflammation that will reduce the aesthetic value of the face (Borzyszkowska et al., 2022). Although acne vulgaris does not cause severe symptoms, this condition can reduce quality of life and self-esteem, feelings of

inferiority, and embarrassment about appearance (Australilia & Ninin, 2022). In addition to disrupting appearance, acne can also cause mental health problems ranging from mild to serious, which are often inseparable from the phenomenon of "acne shaming" often experienced by individuals with acne-prone skin (Ahla et al., 2023).

In the results of the Global Burden of Disease (GBD) study, the prevalence of acne in 2019 occurred in the 15-49 age group was as much as 95% (Ollyvia et al., 2021). Data on the prevalence of acne in Indonesia in 2020 in

adolescents was 80% to 85% with the highest incidence in the 15 to 18 age group. In women over 25 years old, it was 12% and aged 35-44 years around 35% (Zeichner et al., 2017). Data on the prevalence of acne vulgaris in East Java in the male population was 41.46% and in women as much as 58.54% with the highest prevalence at the age of 16-19 years (Influence et al., 2025). Based on the results of a preliminary study at a vocational high school. Considering, preliminary study, as many as 28 cases, with details of 1 normal skin, 13 oily skin, 7 sensitive skin, 3 dry skin, and 5 combination skin were reported among the students.

Acne vulgaris is caused by several factors, such as genetics, hormones, excessive sebaceous gland production, or *Propionibacterium acnes* infection (Vasam et al., 2023). *Propionibacterium acnes* contributes the appearance of acne vulgaris by producing lipase, which converts free fatty acids into fats in the skin and causes inflammation. During inflammation, *Propionibacterium acnes* bacteria multiply and increase the severity of inflammation by stimulating the production of pro-inflammatory cytokines (Zai et al., 2019).

Acne can be treated with synthetic drug therapy, such as antibiotics. Antibiotic therapy consists of two types: topical and oral. Commonly used topical antibiotics include erythromycin and clindamycin, while commonly used oral antibiotics include tetracycline, trimethoprim, and sulfamethoxazole (Madelina & Sulistyaningsih, 2018). Additionally, other synthetic medications that can treat acne include peroxide, benzoyl peroxide, retinoids, and isotretinoids (Li et al., 2024). However, the use of synthetic medications is often associated with undesirable side effects, such as skin irritation, dryness, and hypersensitivity reactions. Moreover, the prolonged or inappropriate use of antibiotics in acne management carries the risk of inducing microbial resistance, thereby reducing treatment effectiveness and complicating long-term therapy.

Therefore, herbal-based acne therapy is an alternative to reduce the risk of side effects from synthetic medications (Almeria, 2022). This has encouraged researchers to look for various alternative efforts that use traditional medicines derived from plants that contain many active substances for use in treatment, one of which is mulberry leaves, which can function as an antibacterial (Suriyaprom et al., 2021). Acne can be treated with antibacterial medications. One plant proven to have antibacterial properties is

the mulberry leaf. The compounds in mulberry leaves generally consist of alkaloids, polyphenols, and flavonoids, which function as antibacterials by forming complexes against extracellular proteins that disrupt bacterial cell membrane integration (Suriyaprom et al., 2021). A natural mask formulation made from mulberry leaves with the addition of oatmeal and corn starch has the potential to be an innovation in the safe and effective treatment of acne vulgaris. Mulberry leaves as the main ingredient of the mask contain vitamins A, C, E, as well as alkaloid and flavonoid compounds as antibacterials. In addition, oatmeal also contains vitamins E, vitamin B5, B2 and B3, which function to maintain and protect healthy skin to keep it moist and healthy (Paudel et al., 2021). And corn flour is rich in vitamins A, vitamin B, vitamin B1, vitamin C, vitamin E, vitamin K, carbohydrates, proteins, and minerals that are good for skin health.

Mulberry leaves are widely utilized in traditional medicine and cosmetic formulations due to their natural bioactive compounds with antioxidant, anti-inflammatory, and antibacterial properties. In a study Aris et al. (2023) mulberry leaf extract can inhibit *Streptococcus mutans* bacteria very strongly in dental caries. Meanwhile, research Aliah et al. (2019) shows that mulberry leaves are used as an anti-acne gel preparation that is very effective in inhibiting the growth of *Propionibacterium acnes* bacteria. The results of antibacterial inhibition showed that gel preparations with concentrations of 2%, 4%, and 6% showed activity that inhibited bacteria with an inhibition diameter of 15.7 mm; 20.3 mm; and 21.7 mm, respectively. And in research D et al. (2020) showed that the mulberry leaf extract formula with a concentration of 10 grams of mulberry leaf material, 0.5 grams of oatmeal, 1 gram of corn starch, and 50 ml of distilled water provided a high inhibition zone against *Propionibacterium acnes* bacteria with an inhibition diameter of 14.8 mm, in the strong category. These findings indicate that increasing the concentration of mulberry leaf extract corresponds to a larger inhibition zone, suggesting a stronger antibacterial effect.

Due to the benefits of Mulberry leaves, this study aims to provide an overview of the effect of a natural mulberry leaf (*Morus alba L.*) mask formula on the incidence of acne vulgaris in female students at Vocational School, in Jombang city, Indonesia. This study also aims to evaluate the effectiveness of a mulberry leaf mask

formula as an alternative therapy for acne vulgaris, considering that empirical research on this topic remains limited.

2. METHODS

2.1 Research Design

This study employed a pre-experimental design using a one-group pre-test–post-test approach. The research aimed to examine the effect of an organic soursop leaf face mask on the incidence of acne vulgaris. The pretest was conducted to assess the condition of acne vulgaris before the intervention, while the posttest was performed after the administration of the mask six times to evaluate changes in acne severity following treatment.

2.2 Population, Sample and Sampling

The population in this study were all 65 female students of Vocational High School, Jombang Indonesia. The sample was determined using a quota sampling (non-probability) technique based on inclusion and exclusion criteria. The inclusion criteria were set for female students aged 15–18 years who experienced papular, pustular, or nodular acne vulgaris and were willing to be respondents. The exclusion criteria were set for female students who had allergies or sensitive skin, were undergoing cosmetic doctor treatment, and those who experienced cystic acne vulgaris. Respondents were obtained from grades X, XI, and XII according to these criteria, resulting in 20 female students who met the requirements as research samples.

2.3 Variable

The dependent variable in this study was the incidence of acne vulgaris among female students at Vocational School in Jombang. The independent variable in this study was a natural mulberry leaf (*Morus alba* L.) mask formula.

2.4 Instruments

The instrument used was an acne vulgaris observation sheet to see the condition of acne vulgaris before and after applying the natural mulberry leaf mask formula using kala. massage with 4 parameter assessments such as looking at the color, condition, number, and volume of acne. The research instrument underwent a content validity assessment by expert integumentary nursing lecturers, who evaluated the appropriateness of each item. Furthermore, the instrument was pilot-tested on 20 respondents to examine the consistency of measurement

outcomes. The results showed that the validity coefficient (r-count) exceeded the r-table value (0.444), indicating that all items were valid. Reliability testing using Cronbach's Alpha yielded a value of $\alpha = 0.81$, demonstrating a good level of internal consistency; thus, the instrument was considered reliable for use in this study.

2.5 Procedure

Data collection was conducted through observations before and after the treatment was administered. Prior to the treatment, potential respondents were first asked to complete an application form. If they agreed, they were given an informed consent form and signed it. Next, the researcher conducted initial observations of the respondents' facial features. Respondents were then given masks in two sachets, each for six uses. Researchers explained the mask usage instructions and then asked them to first cleanse their faces using the same brand of facial cleanser and packaging to maintain treatment homogeneity and avoid bias due to differences in product composition. After cleansing, respondents wore the masks for approximately 10–15 minutes. Once the masks dried, they were asked to rinse their faces with clean water and dry them with a tissue. For subsequent home use, respondents were asked to send photographic evidence of mask use to the researchers. After the first week (three uses), the researchers returned to the vocational school to conduct observations. In the second week, after six uses, the researchers conducted further observations at Vocational School, Jombang, and compared the respondents' facial conditions through before and after photos of the natural mulberry leaf mask.

2.6 Data Analysis

Data analysis in this study was conducted using computer software, employing the Wilcoxon signed-rank test (version 25.0). This non-parametric statistical test was applied to determine the difference in mean scores between the pretest and posttest measurements. A p-value ≤ 0.05 was considered statistically significant, indicating the presence of an effect from the intervention. Conversely, a p-value ≥ 0.05 was interpreted as no significant effect.

2.7 Ethical Clearance

This study was approved by the Health Research Ethics Committee of Husada Health Sciences College, Jombang, Indonesia (No. 01004-KEPK

SHJ-2025). All procedures complied with ethical principles, including informed consent, anonymity, confidentiality, and fairness.

3. RESULTS

Based on the data in Table 1, nearly half of the respondents were 16 years old (6 respondents; 30%), while a smaller proportion were 17 years old (4 respondents; 20%). Half of the respondents have oily skin, namely 10 respondents (50%). Meanwhile, a small number of respondents have sensitive skin, namely 5 respondents (25%). The majority of respondents exhibited severe acne vulgaris, while only a small proportion presented with mild acne, before the administration of the natural mulberry leaf powder mask for two weeks (six applications, 5 g dissolved in 10–15 mL of water). Furthermore, after the mulberry leaf mask formula treatment, the majority of respondents experienced a mild level of acne vulgaris (13 respondents, 75%), while only a small proportion reported a moderate level (1 respondent, 5%).

A notable difference can be observed in the severity of acne vulgaris before and after the application of the natural mulberry leaf mask formula. (Figure 1) In the pretest stage, the majority of respondents presented with moderate severity of acne vulgaris (15 respondents; 75%). Following two weeks of treatment, during which respondents applied the mulberry leaf mask three times per week (six applications in total, with 5 grams of powder dissolved in 10–15 mL of water each time), significant improvements were recorded. In the post-test, most respondents were found to have only mild severity of acne vulgaris (15 respondents; 75%). These findings demonstrate a clear change between pretest and post-test results, indicating that the condition of most respondents improved substantially, with acne severity decreasing to a lighter level after treatment.

A statistically significant difference between the incidence of acne vulgaris before (pretest) and after (post-test) treatment was shown on Table 2. The intervention was conducted over 14 days, with six applications of the mask (each consisting of 5 grams of mulberry leaf powder dissolved in 10–15 mL of water), ensuring that the findings were measured objectively. This demonstrates that the use of a natural mulberry leaf mask had a meaningful impact on reducing the severity of acne vulgaris among respondents. In other words, a clear improvement was observed after the intervention, as acne severity

levels tended to decrease following the mask application. Therefore, it can be concluded that the natural mulberry leaf mask formula is effective in lowering the severity of acne vulgaris in students.

4. DISCUSSION

This study aims to evaluate the effectiveness of a natural mulberry leaf (*Morus alba* L.) mask formula in reducing the severity of acne vulgaris among students. The results demonstrated a significant improvement after treatment, with most respondents showing decreased acne severity following the intervention. These findings as written below, reinforce the potential of natural, plant-based therapies as alternatives to conventional acne treatments.

4.1 The Emergence of Acne Vulgaris Before Applying the Natural Mulberry Leaf Mask Formula

Acne vulgaris is a disease of the integumentary system that occurs in adolescents aged 16-19 and can persist into adulthood (age 30). One of the etiologies of acne is increased oil production, which can clog pores, causing the growth of occurrence grow bacteria (Li et al., 2024). The presence of *Propionibacterium acnes* activity is one of the triggers of inflammation in acne vulgaris (Vasam et al., 2023). Accordingly, this study found that the incidence of acne vulgaris can also be influenced by age. According to Borzyszkowska et al. (2022) stated that adolescents experiencing puberty between the ages of 10 and 19 will experience increased hormone secretion, one of which is androgen. Androgen hormones can enlarge the size of the oil glands, thereby stimulating their production and increasing the risk of acne vulgaris.

Accordingly, the incidence of pimple vulgaris can also be affected by the type of skin. As the majority of respondents had oily skin. This is in accordance with the theory of Borzyszkowska et al. (2022), who stated that oily skin has high sebum levels and is an ideal place for the growth of *Propionibacterium acnes* colonies, which was more on those with oily skin rather than dry skin type.

Based on research results and theory, researchers assume that respondents who experience acne vulgaris is caused by factors such as age and facial skin type. That one another related. Thus, teenage androgen hormones in the body increase, which can stimulate excess

Table 1. Distribution Frequency of Respondents

Age	Amount	Total %
Age 15 year	5	25
Age 16 year	6	30
Age 17 year	4	20
Age 18 year	5	25
Total	20	100
Type Skin Face	Amount	Total %
Normal	1	5
Dry	1	5
Greasy	10	50
Sensitive	5	25
Combination	3	15
Total	20	100
Incident Pimple Vulgaris Before Natural Mulberry Leaf Formula Treatment	Amount	Total %
Heavy	3	15
At the moment	15	75
Light	2	10
NO There is	0	0
Total	20	100
Incident Pimple Vulgaris After Natural Mulberry Leaf Formula Treatment	Amount	Total %
Heavy	0	0
At the moment	1	5
Light	15	75
NO There is	4	20
Total	20	100

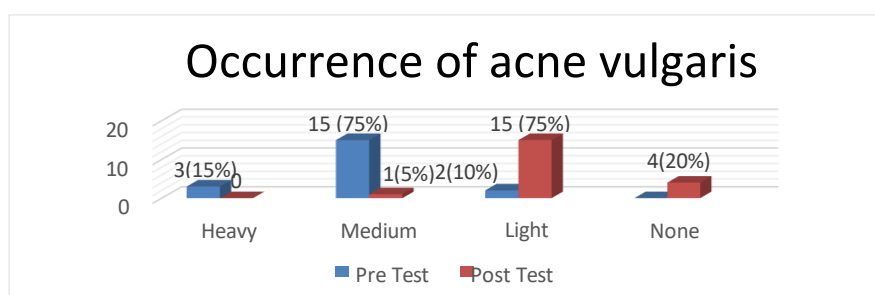


Figure 1. Incident Pimple Vulgaris

Table 2. Analysis of Research Results on the Effect of Natural Mulberry Leaf Mask Formula (Grief alba L) on Incident Pimple Vulgaris

Incident Pimple Vulgaris	Results Test Wilcoxon	
	Z	Asymp.Sig. (2 tails)
Pre-test – Post-test	- 3.938	0.000

sebum production that causes clogged skin pores and then causes acne vulgaris. Additionally, acne vulgaris might occur due to increased sebum production, resulting in clogged facial pores resulting in the appearance of blackheads, and exacerbated by the presence of *Propionibacterium acne* bacterial infection, which causes acne vulgaris.

4.2 Acne Vulgaris Occurs After Applying Natural Mulberry Leaf Mask Formula

Mulberry leaves are a plant rich in alkaloids, flavonoids, phenols, and terpenoids, which have been proven to be antibacterial (Suriyaprom et al., 2021). According to D et al. (2020), mulberry leaves made into gel preparation anti that acne

effectively in inhibiting the growth of *Propionibacterium acne* bacteria. The results of measuring the average diameter of the inhibition zone around the disc paper gel. The chemical compounds contained biological activities, such as terpenoids, tannins, saponins, alkaloids, and flavonoids. Previous research Suriyaprom et al. (2021) showed that mulberry leaf extract contains total phenols with antibacterial properties.

The bioactive compounds in mulberry leaves, such as flavonoids, phenols, and alkaloids, are known to possess antioxidant, antibacterial, and anti-inflammatory properties, which may help inhibit bacterial growth and reduce skin inflammation. However, not all respondents experienced improvement after using the mask. Some reported skin irritation and prolonged itching, leading researchers to recommend discontinuing use. In addition, several respondents did not apply the mask consistently, thereby reducing its therapeutic effectiveness.

It is also important to recognise that external factors significantly influence the development of acne vulgaris. Lifestyle-related variables such as irregular sleep patterns, poor dietary habits, and inadequate personal hygiene can exacerbate acne severity. For instance, lack of sleep increases cortisol production, which stimulates excess sebum secretion and worsens acne. Diets high in oily foods, sugar, or dairy products may trigger inflammatory processes, while poor hygiene, such as infrequent face washing or frequent touching of the face with unclean hands might increase bacterial contamination and aggravate acne. These factors highlight the multifactorial nature of acne and the need for comprehensive management strategies that combine topical treatments with lifestyle modifications.

4.3 The Effect of Mulberry Leaf Face Mask Formula on the Incidence of Acne Vulgaris among Students

This study found that the mulberry leaf extract formula with a concentration of 10g mulberry leaf material, 0.5g oatmeal, 1g corn starch and 50ml distilled water provided a high inhibition zone against *Propionibacterium acnes* bacteria. This shows that the more extract added, the larger the inhibition zone (Putri et al., 2023). Mulberry leaves are one of the plants that contain rich amounts of alkaloids, flavonoids, phenol, and terpenoids have been shown to have

antibacterial properties (Suriyaprom et al., 2021). Indeed, in the study by Vasam et al. (2023) and D et al. (2020) reported that an inhibitory diameter of 14.8 mm was found as a strong category. This highlights that antibacterial is the property of a substance that inhibits bacterial growth. The effect of the natural mulberry leaf mask formula (*Morus alba L.*) on the occurrence of acne vulgaris is due to the content of active compounds such as alkaloids, flavonoids, phenols, and terpenoids, which inhibit the growth of acne-causing bacteria and act as antioxidants and anti-inflammatories to prevent inflammation of the skin. If mulberry leaves are processed into a mask and applied regularly to the face three times a week with a dose of 5 grams of powder dissolved in 10-15 mL of water per application, then acne-prone skin will experience significant improvements. Nevertheless, the effectiveness of the treatment depends on consistent application, good personal hygiene, and healthy lifestyle practices, as some respondents who were irregular in mask use or who maintained poor sleep and dietary habits did not experience optimal improvement.

All of the significant impacts, this study is limited by its relatively small sample size and short intervention period. Future research with larger populations, longer treatment durations, and laboratory analysis of the active constituents of mulberry leaves is needed to confirm and expand these findings. For consumers, mulberry leaf masks can be considered a natural and effective skincare option, while for the herbal and cosmetic industries, they hold potential for further development and commercialization with standardized formulations.

5. CONCLUSION

This study demonstrates that mulberry leaf (*Morus alba L.*) masks have a positive impact on reducing the severity of acne vulgaris among students. Before the intervention, most respondents experienced moderate acne, but after consistent use of the mulberry leaf mask over two weeks, many showed noticeable improvement with milder symptoms. These findings indicate that mulberry leaves, which contain bioactive compounds such as flavonoids, tannins, and phenolics, may play an important role in reducing inflammation, controlling sebum production, and supporting the healing process of acne-prone skin. The outcomes suggest that mulberry leaf masks can serve as a safe, affordable, and natural alternative in skin

care for adolescents, particularly for those seeking herbal remedies with fewer side effects compared to chemical treatments. Future research should expand on the findings of this study by involving larger and more diverse sample populations to increase generalizability. A longer intervention period is also needed to observe the sustained effects of mulberry leaf mask application on acne severity. Experimental studies with randomized control groups are recommended to strengthen causal inferences.

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7. FUNDING SOURCE

None.

8. AVAILABILITY OF DATA AND MATERIALS

All data underlying the findings are fully available.

9. AUTHORS' CONTRIBUTION

The author carried put all phases pertaining to this research study.

10. CONFLICT OF INTEREST

None.

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