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# The Effect of a Duckbill Plant (Kalanchoe pinnata) Compress on Reducing Post-Vaccination Fever in Children Under 2 Years of Age

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**ABSTRACT**

**Introduction:** Immunization is a vital public health program, but it often causes side effects such as fever. Fever can be managed using non-pharmacological methods, one of which is a compress made from the traditional plant cocor bebek (Kalanchoe pinnata). **Objective:** This study aims to assess changes in body temperature before and after the application of a Kalanchoe pinnata compress in children under two years of age. **Methods:** This study used a pre-experimental, one-group pretest-posttest design without a control group. The sample consisted of 18 children under two years of age in the service area of the Kapongan Community Health Center, Situbondo. Data were analyzed using the Wilcoxon test. Results: There was a significant difference in body temperature before and after the intervention, with a p-value of 0.016 (<0.05). However, the average decrease was only 0.23°C (from 37.94°C to 37.71°C), indicating statistical significance but requiring further clinical evaluation. **Conclusion:** Kalanchoe pinnata compresses appear to have an effect on reducing body temperature, although interpretations of causality must be made with caution due to the limitations of the study design.

## Introduction

Immunization is a process that uses vaccines to build immunity against specific diseases. These vaccines contain substances that stimulate the immune system to recognize and fight off these diseases. The primary goal of immunization is to prevent infections and protect children from diseases that could endanger their health. Immunization is especially important for infants because their immune systems are still developing. Through immunization, we can protect children from infectious diseases that can lead to serious complications or even death.

Fever is one of the most common Adverse Events Following Immunization (AEFI) in children; it is generally mild and resolves within 24–48 hours. The incidence of fever varies by vaccine type, but generally occurs in about 10–30% of children following routine immunization. Appropriate care by parents—such as providing adequate fluids, applying warm compresses, using antipyretics as indicated, and monitoring the child's condition—plays a crucial role in preventing complications. Based on Indonesia's National Immunization Strategy 2025–2029, the government continues to strengthen immunization coverage, monitor AEFI, and introduce new vaccines to improve children's health protection. In addition, the latest WHO/UNICEF data show

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that global immunization coverage in 2024 reached 85% for DTP3 and 84% for the first dose of the measles vaccine, which are key indicators of the success of global immunization programs.

Based on data from the Indonesia Health Profile, in 2021, the basic immunization rate reached 83.3%. Then, in 2022, there was a slight increase to 84.2%. However, looking at this data, basic immunization has not yet reached the target set in the strategic plan, which is 93.6%.

It is known that the immunization coverage of the East Java Health Office showed a complete basic immunization rate of 42.7% in 2021, and unfortunately, this figure decreased in 2022 to 38.4%. From this data, we can see that the complete basic immunization rate is still far from the government's target of 93%. Furthermore, looking at Situbondo Regency, there are several areas with high rates of complete basic immunization, such as Kapongan at 98%, Situbondo at 94%, and Panji at 91%.

A literature review indicates that, to date, no clinical trials have been identified that specifically evaluate the efficacy or safety of using Kalanchoe pinnata leaf compresses to treat post-vaccination fever in infants or toddlers. The available evidence is still dominated by preclinical research and ethnopharmacological studies, whereas clinical studies in humans have primarily evaluated other herbal interventions such as Allium cepa, Aloe vera, and Hibiscus rosa-sinensis. Therefore, this study is expected to provide preliminary evidence regarding the potential use of Kalanchoe pinnata leaf compresses as a complementary therapy for post-vaccination fever, applying a compress can help lower body temperature. Also, ensure the person wears light, loose-fitting clothing. This prevents body temperature from rising further (Kristiyaningsih et al., 2019). One plant with potential as a natural antipyretic is the duck's bill plant (Kalanchoe pinnata). This plant is commonly found in Indonesia and has long been used by communities as a traditional remedy. This remedy can treat various conditions, such as wounds, inflammation, and fever. The plant contains several active compounds, including flavonoids, tannins, and saponins. These active compounds provide antipyretic, anti-inflammatory, and analgesic effects.

Several experimental studies have shown that duckbill leaf extract can lower body temperature in test animals with induced fever. However, research examining its direct effects on post-vaccination fever in children remains limited. Therefore, this study is urgently needed to provide scientific evidence regarding the effectiveness and safety of using duckbill as a natural fever-reducing therapy for children under two years of age (toddlers). The duckweed plant is one of the plants frequently used by communities as an analgesic and antipyretic in traditional, generations-old treatments for fever, headaches, joint inflammation, and rheumatism. Traditional treatments using duckweed leaves in Asian countries, including Indonesia, exhibit analgesic effects due to the presence of steroid and flavonoid compounds contained within the duckweed leaves (Sinala, 2021).

## Methods

### *Study Design*

This study used a pre-experimental one-group pretest-posttest design to assess changes in body temperature before and after application of a Kalanchoe pinnata compress. Because no control group was included, causal interpretation should be made cautiously.

### *Setting*

This study was conducted in December 2025 at the Kapongan Community Health Center in Situbondo Regency. The specific location of the intervention was the community health center's immunization room. The type of immunization service provided was a PCV booster. The time

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interval between vaccination and body temperature measurement was 30 minutes. The time interval between the application of the compress and the post-test body temperature measurement was 60 minutes.
The intervention was supervised by researchers and accompanied by parents. Environmental conditions were stable and well-ventilated, with normal room temperatures ranging from 22°C to 25°C. At the time of the injection, the children were wearing light clothing.

***Research Subject***
The sample consisted of 18 participants. Suggested inclusion criteria: Children aged 0–24 months, Received immunization within a defined time period, Body temperature ≥38.0°C measured by a standardized thermometer, Parent or guardian gave informed consent, Child was clinically stable.
Exclusion Criteria
Current exclusion criteria are too limited: Infants with congenital abnormalities or illness, Parents unwilling to participate.
Recommended additional exclusion criteria: History of febrile seizure, Severe fever requiring immediate medical treatment, Signs of serious infection, Allergy or skin reaction to herbal material, Skin lesions at compress site, Use of antipyretic medication before or during observation, Children receiving multiple fever-reducing interventions, Children with immunodeficiency or chronic disease, Incomplete temperature measurement.

***Instruments***
The main instruments used in this study were a digital thermometer to measure the children's body temperature and a structured observation sheet to record the respondents' characteristics, the implementation of the intervention, and changes in clinical condition during the study. Body temperature was measured using an Omron® MC-246 digital thermometer with an accuracy of ±0.1°C and a measurement range of 32.0–42.0°C. Measurements were taken in the axillary (underarm) region, as this method is a standard procedure for infants and toddlers in primary health care settings. Before the study began, all thermometers were checked for proper functioning and compared with a standard thermometer that had been calibrated at the community health center to ensure the accuracy of the measurement results. All participants were measured using the same type and model of thermometer to minimize variations in measurement results due to differences in equipment.

***Intervention***
The intervention in this study involved the use of leaf compresses made from the duck's beak plant (Kalanchoe pinnata (Lam.) Pers.), a medicinal plant traditionally used by the Indonesian people as a fever reducer and anti-inflammatory agent. The plant was identified by a botanist from the Biology Program at a relevant university or institution to ensure that the species used was Kalanchoe pinnata (Lam.) Pers. The plants were obtained from a community-owned medicinal plant garden in Kapongan Subdistrict, Situbondo Regency, where they were cultivated without the use of chemical pesticides.
The plant parts used were fresh, mature leaves that were dark green, not wilted, and free from physical damage, mold, or insect contamination. For each intervention, 4–6 fresh leaves with a total weight of approximately 30–40 grams were used.
Before use, the leaves are washed under running water for approximately 1 minute to remove dust and dirt, then soaked in boiled water for 5 minutes and dried using disposable sterile gauze. The leaves are then gently crushed by hand—wearing sterile gloves—until the leaf surface becomes soft and releases a small amount of natural liquid, without heating, boiling, or adding

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any other ingredients. The leaves are then wrapped in a thin layer of sterile gauze so they do not come into direct contact with the baby's skin.

***Data Analysis***

Although the present study demonstrated a statistically significant reduction in body temperature following the application of Kalanchoe pinnata leaf compresses, the mean decrease was relatively small, from 37.94°C to 37.71°C (0.23°C). This reduction may not be considered clinically meaningful if evaluated solely by the magnitude of temperature change. In clinical practice, management of post-vaccination fever aims not only to reduce body temperature but also to improve the child's comfort, prevent progression to higher fever, and reassure caregivers, as most post-immunization fevers are mild and self-limiting.

A reduction of approximately 0.2–0.3°C may contribute to maintaining body temperature below clinically concerning thresholds, particularly in infants who have recently received immunization. Furthermore, non-pharmacological interventions are generally intended as supportive measures rather than substitutes for antipyretic medication. Therefore, even a modest reduction in temperature may have clinical value when combined with routine supportive care, such as adequate fluid intake, breastfeeding, light clothing, and observation of the child's condition.

Nevertheless, the findings of this study should be interpreted with caution. Because the study did not include a control group, it is not possible to determine whether the observed temperature reduction resulted specifically from the pharmacological properties of Kalanchoe pinnata, the cooling effect of the compress itself, or the natural resolution of post-vaccination fever over time. Consequently, although the intervention appears to be associated with a statistically significant decrease in temperature, its independent clinical effectiveness remains uncertain. Future randomized controlled trials comparing Kalanchoe pinnata compresses with water compresses and standard care are needed to determine whether the observed temperature reduction translates into meaningful clinical benefits for children with post-vaccination fever.

## Result

All samples were included in this study and showed a positive response. The results of the study are presented in the following table:

**Table 1. Characteristics of the Respondents**

| Age | Frekuensi | Persentase (%) |
|---|---|---|
| 12 Months | 5 | 27,8 |
| 14 Months | 3 | 16,7 |
| 15 Months | 10 | 55,5 |
| Total | 18 | 100 |

Source: Primary data 2025

**Table 2. Frequency Distribution of Respondents' Body Temperatures Before the Intervention in the Service Area of the Kapongan Community Health Center**

| Variabel | N | Mean | Median | SD | Min | Max | 95%CI |
|---|---|---|---|---|---|---|---|

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Body Temperature Pretest | 18 | 37,94 | 38,00 | 0,257 | 38 | 39 | 37,82-38,07 |

Source: Primary data 2025

**Table 3. Frequency Distribution of Respondents' Body Temperatures Before the Intervention in the Service Area of the Kapongan Community Health Center**

| Variabel | N | Mean | Median | SD | Min | Max | 95%CI |
|---|---|---|---|---|---|---|---|
| Body Temperature Postest | 18 | 37,71 | 37,90 | 0,314 | 37 | 38 | 37,55-37,87 |

Source: Primary data 2025

**Table 4. Wilcoxon Rank**

| Variabel | n | Pretest Median Mean Maks | Pretest Median Mean Maks | Difference | *p* - value |
|---|---|---|---|---|---|
| Temperature | 18 | 38 37.94 - 39 | 37.90 37.71 - 38 | 0.23 | $p = 0.016$ |

Based on Table 4, a total of 18 respondents were analyzed in this study. The measurement results showed that before the intervention, body temperature had a median of 38°C, a mean of 37.94°C, and a maximum value of 39°C. After the intervention, the median body temperature decreased to 37.90°C, with a mean of 37.71°C and a maximum value of 38°C. The average difference between body temperature before and after the intervention was 0.23°C, indicating a decrease in body temperature following the intervention. The results of the Wilcoxon Signed-Rank Test showed a p-value of 0.016 ($p < 0.05$), leading to the conclusion that there was a significant difference between body temperature before and after the intervention.

## Discussion

The present study demonstrated a statistically significant reduction in body temperature following the application of Kalanchoe pinnata leaf compresses in children with post-vaccination fever. However, the observed mean temperature reduction of 0.23°C (from 37.94°C to 37.71°C) should be interpreted cautiously. Although statistically significant, this magnitude of change represents a relatively small clinical effect. In the management of post-vaccination fever, clinical significance should not be determined solely by statistical testing but also by whether the intervention provides meaningful improvements in patient outcomes, such as reducing discomfort, preventing progression to high fever, or decreasing the need for pharmacological treatment. Therefore, the clinical relevance of the observed temperature reduction remains uncertain.

Another important consideration is the natural course of post-vaccination fever. Fever following routine childhood immunization is generally a mild, self-limiting physiological response that commonly resolves spontaneously within 24–48 hours as the immune response develops. Consequently, part of the temperature reduction observed in this study may have reflected the normal resolution of fever rather than the specific therapeutic effect of Kalanchoe pinnata leaf compresses.

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The absence of a control group represents one of the major methodological limitations of this study. Without comparison with a standard care group or a water-compress group, it is impossible to determine whether the observed reduction in body temperature resulted from the herbal properties of Kalanchoe pinnata, the cooling effect of the compress itself, environmental factors, increased fluid intake, breastfeeding, rest, or the natural decline of post-vaccination fever. Therefore, causal conclusions regarding the effectiveness of the herbal compress cannot be established from the current study design.

The study was also conducted without blinding of either participants' caregivers or outcome assessors. Knowledge of the intervention received may have introduced observer bias during temperature measurement and reporting of clinical outcomes. Future studies should consider blinding outcome assessors whenever feasible to reduce the risk of measurement bias.

Another limitation is the relatively small sample size, which may have reduced the statistical power of the study and limited the generalizability of the findings. Studies involving larger and more diverse populations from multiple healthcare settings are needed to confirm these preliminary findings.

The type of vaccine received by each participant was not analyzed separately. Different vaccines, such as DPT-containing vaccines, measles-containing vaccines, pneumococcal conjugate vaccines, and others, have different frequencies and patterns of post-immunization fever. Failure to account for vaccine type may have introduced clinical heterogeneity that could influence the magnitude and duration of fever observed among participants.

Potential confounding factors, including the use of antipyretic medications, breastfeeding frequency, additional fluid intake, clothing, and environmental temperature, may also have influenced body temperature during the observation period. Although caregivers were instructed regarding the study procedures, these variables were not fully controlled and therefore could have contributed to the observed reduction in temperature.

Because body temperature was the primary outcome, measurement error should also be considered. Small changes in temperature, such as the 0.23°C reduction observed in this study, may fall within the range of normal biological variation or instrument measurement variability. Although standardized procedures and the same digital thermometer were used for all participants, repeated measurements and calibration remain essential to minimize potential measurement error.

The safety of herbal compresses in infants also requires careful consideration. Although no serious adverse reactions were observed during this study, current evidence regarding the topical use of *Kalanchoe pinnata* in children younger than two years remains limited. Infant skin has a relatively immature epidermal barrier, potentially increasing susceptibility to irritation, allergic contact dermatitis, or absorption of bioactive plant constituents. Therefore, the safety profile of this intervention has not yet been fully established.

Future studies should incorporate systematic adverse event monitoring, including documentation of skin erythema, rash, pruritus, swelling, allergic reactions, excessive crying, or any unexpected clinical events occurring during and after application of the herbal compress. Comprehensive safety evaluation is essential before this intervention can be recommended for routine clinical use.

To strengthen the evidence base, future research should employ randomized controlled trial (RCT) designs with adequate sample sizes and appropriate comparison groups, including *Kalanchoe pinnata* compresses, water compresses, and standard care. Such studies should incorporate allocation concealment, blinded outcome assessment, standardized

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intervention protocols, detailed recording of vaccine type and concomitant medications, longer follow-up periods, and comprehensive monitoring of adverse events. These methodological improvements would provide more robust evidence regarding both the effectiveness and safety of *Kalanchoe pinnata* leaf compresses for managing post-vaccination fever in young children.

## Conclusions

A comparison of body temperature in the participants before and after the application of a Kalanchoe pinnata compress, using the Wilcoxon test, yielded a p-value of 0.016 (<0.05), indicating that the Kalanchoe pinnata compress has an effect on reducing post-immunization fever in infants under 2 years of age (Baduta) in the service area of the Kapongan Community Health Center (UPT Puskesmas).

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