Original Article

Effectiveness of Allium cepa L. Compress in Reducing Body Temperature Among Under-Five Children with Acute Respiratory Infections: A Quasi-Experimental Study

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ARTICLE INFO

Article History
Submit : November 30, 2025
Accepted : March 24, 2026
Published : March 30, 2026

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Citation:
Zen, D. N., & Wibowo, D. A. . (2026). Effectiveness of Allium cepa L. Compress in Reducing Body Temperature Among Under-Five Children with Acute Respiratory Infections: A Quasi-Experimental Study. Journal of Applied Nursing and Health, 8(1), 767–776. https://doi.org/10.55018/janh.v8i1.626

ABSTRACT

Background: Acute Respiratory Infections (ARI) are among the most common illnesses affecting children under five and are often accompanied by fever. Inadequately managed fever may lead to discomfort and potential complications. One complementary therapy widely used in communities is the application of shallot (Allium cepa L.) compresses. This study aimed to analyze the effectiveness of Allium cepa L. compresses in reducing body temperature among toddlers with ARI.

Methods: A quasi-experimental design with a pretest–posttest control group approach was employed. The study involved 48 toddlers, divided into 24 intervention and 24 control groups, selected using purposive sampling. Body temperature was measured using a digital thermometer. Data were analyzed using Wilcoxon and Mann–Whitney tests.

Results: The mean body temperature in the intervention group decreased from 38.2°C before intervention to 36.6°C after intervention, with an average reduction of 1.63°C. Statistical analysis showed a significant effect ($p < 0.05$). The control group experienced a smaller decrease (0.28°C). There was a significant difference between the intervention and control groups, with a large effect size ($r = 0.87$).

Conclusion: Allium cepa L. compresses are effective in reducing body temperature among toddlers with ARI and can be considered a non-pharmacological intervention in pediatric nursing practice, particularly in primary healthcare settings.

Keywords: Allium cepa L.; Fever; Acute Respiratory Infection; Toddlers; Complementary Therapy.

Implications for Practice:

- In clinical practice, Allium cepa L. compress may be considered as a safe and feasible non-pharmacological adjunct to support fever management in under-five children with acute respiratory infections, particularly in primary care and community settings.
- From a health policy perspective, the integration of evidence-based complementary therapies such as Allium cepa L. into pediatric care guidelines may enhance culturally sensitive, cost-effective, and accessible approaches to fever management.
- In midwifery education, incorporating training on the use of locally available complementary interventions such as Allium cepa L. is relevant for preparing practitioners to deliver context-appropriate care in Low- and Middle-Income Countries and other resource-limited settings.

Introduction

Acute respiratory infections (ARIs) remain a leading cause of morbidity and mortality among children under five years of age worldwide, particularly in low- and middle-income countries. According to the World Health Organization, ARIs account for a substantial proportion of pediatric healthcare visits and hospitalizations, reflecting a persistent global health burden. In Indonesia, ARIs are consistently reported among the most prevalent childhood illnesses and represent a major contributor to primary healthcare utilization, especially in community health centers.

Fever is one of the most common clinical manifestations associated with ARIs in young children. It represents a physiological response to infection mediated by endogenous pyrogens, including pro-inflammatory cytokines such as interleukin-1, interleukin-6, and tumor necrosis factor (Evans et al., 2021). Although fever plays a role in host defense, inadequate management may lead to discomfort, dehydration, febrile seizures, and increased parental anxiety. Therefore, effective and safe fever management remains an essential component of pediatric care.

Pharmacological interventions, such as paracetamol and ibuprofen, are widely recommended as first-line treatments for fever in children. However, growing concerns regarding inappropriate use, dosing errors, and potential side effects have prompted increased interest in non-pharmacological and complementary approaches to fever management. Clinical guidelines from the National Institute for Health and Care Excellence emphasize that non-pharmacological strategies can be used to improve comfort in febrile children, provided they are safe and evidence-based.

In many tropical and resource-constrained settings, traditional remedies based on local knowledge continue to play an important role in child healthcare. One such practice is the use of Allium cepa L. (shallot) compress, which has been widely utilized in Indonesian communities as a home-based intervention to reduce fever in children. This practice is valued for its affordability, accessibility, and cultural acceptability. Several community-based studies have reported that the application of shallot compress is associated with a significant reduction in body temperature among febrile children (Ainy & Riyanti, 2023).

From a pharmacological perspective, Allium cepa L. contains various bioactive compounds, including flavonoids (notably quercetin), phenolic compounds, and organosulfur constituents, which exhibit antioxidant and anti-inflammatory properties (Marefati et al., 2021; Ullah et al., 2022). Quercetin, in particular, has been shown to modulate inflammatory pathways and suppress the production of pro-inflammatory cytokines, thereby potentially contributing to the regulation of febrile responses. In addition to these biochemical mechanisms, topical application of shallot is also hypothesized to promote peripheral vasodilation, facilitating heat dissipation through the skin via conduction and evaporation.

Despite its widespread use and promising biological plausibility, the scientific evidence supporting the effectiveness of Allium cepa L. as a complementary therapy for fever management remains limited, particularly in controlled clinical settings. Most existing studies are observational or community-based, with limited methodological rigor. Consequently, there is a need for more robust empirical evidence to validate its clinical effectiveness and support its integration into evidence-based nursing practice.

Given the high burden of ARIs among children under five and the widespread use

of traditional remedies in primary care settings, this study aims to evaluate the effectiveness of Allium cepa L. compress in reducing body temperature among under-five children with ARIs using a quasi-experimental design. The findings are expected to contribute to the growing body of evidence on complementary therapies and support the development of culturally appropriate, accessible, and evidence-based interventions in pediatric nursing practice.

Methods

Study Design

This study employed a quasi-experimental design using a pretest–posttest with control group approach. This design was selected to evaluate changes in body temperature before and after the administration of Allium cepa L. compress in the intervention group and to compare the outcomes with a control group receiving standard care. The inclusion of a control group allowed for better control of potential external influences and strengthened the internal validity of the study compared to pre-experimental designs. The study was conducted in the working area of Sukadana Community Health Center, Ciamis Regency, Indonesia.

Participants

The target population consisted of all children under five years of age (0–5 years) diagnosed with acute respiratory infections (ARIs) and registered at the Sukadana Community Health Center. Based on health service records, there were 127 ARI cases among under-five children in the three months preceding the study.

The sample size was calculated using a proportion estimation formula with a 95% confidence level (Z = 1.96), an assumed population proportion of 0.5, and a margin of error of 0.2. The calculation resulted in a minimum sample size of 24 participants per group. Accordingly, a total of 48 children were included, consisting of 24 participants in the intervention group and 24 in the control group.

A non-probability sampling technique with purposive sampling was applied to select participants who met the predetermined inclusion and exclusion criteria. Inclusion criteria were as follows: children aged 0–5 years diagnosed with ARIs, body temperature ≥ 37.5°C at baseline, parental or guardian consent provided, no history of allergy to Allium cepa L., no skin irritation or wounds at the application site, and no use of antipyretic or other temperature-affecting medications within the previous four hours. Exclusion criteria included children receiving treatment in hospitals or other healthcare facilities, those with sensitive skin or known allergies to shallots, and children with body temperature exceeding 39°C requiring immediate medical intervention.

Instruments

Data collection was conducted using a calibrated digital thermometer to measure axillary body temperature. An observation sheet was used to record body temperature before the intervention (pretest) and 30 minutes after the intervention (posttest). In addition, a respondent characteristics form was used to collect demographic data, including age and sex.

All measurements were conducted following standardized operating procedures (SOPs) to ensure consistency across both intervention and control groups. The intervention group received Allium cepa L. compress prepared by slicing 3 grams of shallot and mixing it with five drops of coconut oil, which was then gently applied to the child's fontanel area for 30 minutes. Meanwhile, the control group received standard management without the shallot compress intervention. Data collection procedures were carried out by trained researchers and assistants to

maintain uniformity and reliability of the measurements.

Intervention

Participants in the intervention group received a topical Allium cepa L. (shallot) compress administered according to a standardized operating procedure. The intervention was initiated after baseline (pretest) body temperature measurement. Prior to the procedure, the researcher introduced themselves, verified the child's condition, assessed for any history of allergy to Allium cepa L., and explained the purpose and steps of the intervention to the parents or guardians. Informed consent had been obtained before participation.

The materials used in the intervention included 3 grams of Allium cepa L., a knife, a digital scale, coconut oil, a small plate, disposable gloves, and a calibrated digital thermometer. Hand hygiene was performed following standard protocols before and after the procedure. The shallot was sliced and placed on a clean plate, then mixed with approximately five drops of coconut oil. The mixture was gently applied to the child's fontanel area using a careful and non-invasive technique.

The compress was left in place for 30 minutes. During this period, the child's condition was monitored to ensure comfort and to detect any potential adverse reactions, such as skin irritation. After 30 minutes, body temperature was re-measured using the same digital thermometer at the axillary site, and the results were recorded in the observation sheet. All procedures were documented in the nursing records.

Participants in the control group received standard care consisting of observation without the application of Allium cepa L. compress, in accordance with routine practice at the community health center.

Data Collection

Data collection was conducted through a structured and sequential process. Initially, eligible under-five children with acute respiratory infections (ARIs) were identified based on the predefined inclusion and exclusion criteria. Parents or guardians were then provided with a detailed explanation of the study objectives, procedures, potential benefits, and risks, followed by the signing of informed consent.

Baseline body temperature (pretest) was measured using a calibrated digital thermometer at the axillary site. Subsequently, participants received the assigned intervention according to their respective groups. The intervention group received the Allium cepa L. compress, while the control group received standard care without the compress. After 30 minutes, body temperature was measured again (posttest) using the same instrument and procedure to ensure consistency. All measurements and participant information were recorded in standardized observation sheets. Data collection was carried out by trained researchers and assistants to ensure uniformity and reliability of the procedures.

Data Analysis

Data analysis was performed using statistical software. Univariate analysis was used to describe participant characteristics, including age, sex, and baseline body temperature, which were presented as means, standard deviations, frequencies, and percentages.

Bivariate analysis was conducted to examine differences in body temperature before and after the intervention within each group, as well as to compare the magnitude of temperature reduction between the intervention and control groups. Normality of the data distribution was assessed using the Shapiro–Wilk test. As the data were not normally distributed

($p < 0.05$), non-parametric tests were applied.

The Wilcoxon signed-rank test was used to evaluate within-group differences between pretest and posttest measurements, while the Mann–Whitney U test was used to compare differences between the intervention and control groups. Statistical significance was set at $p < 0.05$ with a 95% confidence interval. In addition, effect size was calculated to determine the magnitude of the intervention effect.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee Ethical principles applied in this study included respect for persons, beneficence, non-maleficence, and confidentiality.

Respect for persons was ensured by providing complete information to parents or guardians regarding the study and obtaining informed consent prior to participation. Beneficence was maintained by ensuring that the intervention was non-invasive and posed minimal risk to participants. Non-maleficence was upheld by monitoring participants throughout the procedure and discontinuing the intervention if any adverse effects or worsening conditions were observed, with referral for appropriate medical care when necessary. Confidentiality was strictly maintained by anonymizing participant data and using it solely for research purposes.

Results

Table 1. Participant Characteristics

Variable	Intervention (n=24)	Control (n=24)	Total (n=48)
Sex, n (%)			
Male	13 (54.2)	12 (50.0)	25 (52.1)
Female	11 (45.8)	12 (50.0)	23 (47.9)
Age Group, n (%)			
Infant (0–12 months)	5 (20.8)	6 (25.0)	11 (22.9)
Toddler (1–3 years)	10 (41.7)	9 (37.5)	19 (39.6)
Preschool (3–5 years)	9 (37.5)	9 (37.5)	18 (37.5)

Table 1 illustrates the distribution of participant characteristics across the intervention and control groups. The results show that the proportion of male participants (52.1%) was slightly higher than that of females (47.9%). In terms of age, most participants were classified as toddlers (1–3 years), representing 39.6% of the total sample. The distribution of sex and age was relatively balanced between the two groups, indicating that the baseline demographic characteristics were comparable.

Table 2. Body Temperature Before and After Intervention

Group	Measurement	Mean (°C)	SD	Min	Max
Intervention	Pretest	38.2	0.49	37.8	39
	Posttest	36.6	0.18	36.3	37
Control	Pretest	38.1	0.37	37.7	38.9
	Posttest	37.8	0.31	37.3	38.5

Table 2 illustrates the mean body temperature of participants before and after the intervention. At baseline, the mean temperature was similar between the intervention group (38.2°C) and the control group (38.1°C). After the intervention, a substantial reduction was observed in the intervention group, with the mean temperature decreasing to 36.6°C. In contrast, the control group showed a smaller decrease to 37.8°C. The magnitude of temperature reduction was considerably greater in the intervention group compared to the control group, suggesting a potential therapeutic effect of Allium cepa L. compress.

Table 3. Within-Group Comparison of Temperature Changes (Wilcoxon Test)

Group	Mean Reduction (°C)	Z-value	p-value
Intervention	1.63	-4.297	<0.001
Control	0.28	-2.112	0.035

Table 3 illustrates the within-group comparison of body temperature changes based on the Wilcoxon signed-rank test. The results indicate a statistically significant reduction in body temperature in both groups. The intervention group showed a greater mean reduction of 1.63°C ($Z = -4.297$, $p < 0.001$), while the control group demonstrated a smaller reduction of 0.28°C ($Z = -2.112$, $p = 0.035$). These findings suggest that although a natural decline in temperature may occur, the reduction was substantially more pronounced in the intervention group.

Table 4. Between-Group Comparison of Temperature Reduction (Mann–Whitney U Test)

Variable	Intervention Mean Rank	Control Mean Rank	p-value
Temperature Reduction	36.75	12.25	<0.001

Table 4 illustrates the comparison of temperature reduction between the intervention and control groups using the Mann–Whitney U test. The analysis revealed a statistically significant difference between the two groups ($p < 0.001$). The intervention group demonstrated a markedly higher mean rank (36.75) compared to the control group (12.25), indicating that the reduction in body temperature was significantly greater among participants receiving the Allium cepa L. compress.

Discussion

This study provides evidence that the application of Allium cepa L. compress contributes to the reduction of body temperature among under-five children with acute respiratory infections (ARIs). These findings reinforce the potential role of complementary therapies in pediatric fever management, particularly within primary healthcare and community-based settings.

Fever is a common physiological response to infection, mediated by endogenous pyrogens and inflammatory cytokines such as interleukin-1, interleukin-6, and tumor necrosis factor, which act on the hypothalamic thermoregulatory center (Evans et al., 2021). While fever plays a protective role in enhancing immune response, its persistence may lead to discomfort and complications in young children. Conventional management typically involves pharmacological agents; however, concerns related to inappropriate use and potential side effects have encouraged the exploration of safer, non-pharmacological alternatives (National Institute for Health and Care Excellence, 2021).

The findings of this study are consistent with previous community-based research indicating that Allium cepa L. compress is associated with a reduction in body temperature among febrile children (Ainy & Riyanti, 2023; Handayani & Maulina, 2025). However, unlike earlier studies that were largely descriptive or observational in nature, the present study employed a quasi-experimental design with a control group, thereby providing stronger evidence regarding the effectiveness of this intervention. This methodological approach represents an important contribution to the existing literature, where controlled studies on traditional therapies remain limited.

From a biological perspective, the therapeutic effect of Allium cepa L. may be

explained by its rich composition of bioactive compounds, including flavonoids, phenolic substances, and organosulfur compounds. Among these, quercetin has been extensively studied for its anti-inflammatory and antioxidant properties, including its ability to modulate inflammatory pathways and suppress the production of pro-inflammatory cytokines (Marefati et al., 2021; Ullah et al., 2022). These mechanisms are particularly relevant in the context of fever, where inflammatory mediators play a central role in elevating body temperature.

In addition to its biochemical effects, the topical application of shallot compress may facilitate peripheral vasodilation, thereby enhancing heat dissipation through the skin via conduction and evaporation. This dual mechanism—combining pharmacological and physiological effects—may explain the observed clinical benefits of the intervention. Such findings support the integration of traditional knowledge with biomedical understanding, which is increasingly recognized as a valuable approach in evidence-based practice (Bennett et al., 2022).

Despite its promising findings, the use of Allium cepa L. as a complementary therapy in clinical settings remains underexplored in the global literature. Most existing studies are conducted in localized contexts, with limited generalizability and methodological rigor. This highlights a critical research gap in the evaluation of culturally rooted, low-cost interventions using robust study designs. The present study addresses this gap by providing empirical evidence from a controlled quasi-experimental framework, thereby strengthening the scientific basis for the use of Allium cepa L. in pediatric care.

The findings of this study are supported by a growing body of evidence demonstrating the anti-inflammatory and immunomodulatory properties of Allium cepa, particularly through its major bioactive compound, quercetin. Previous studies have shown that Allium cepa exerts its therapeutic effects by inhibiting pro-inflammatory mediators such as cytokines, prostaglandins, and signaling pathways including NF-κB and JAK–STAT, which are central to the inflammatory response associated with fever (Marefati et al., 2021; Lee et al., 2023; Pagliaro et al., 2022) . In addition, quercetin has been reported to reduce oxidative stress and modulate immune responses, thereby contributing to the regulation of body temperature and inflammatory processes (Kianian et al., 2021; Cho et al., 2024) . These biological mechanisms provide a plausible explanation for the observed reduction in body temperature following the application of Allium cepa compress in children, supporting its role as a complementary non-pharmacological intervention in fever management.

Furthermore, empirical and clinical evidence indicates that Allium cepa is not only biologically active but also clinically relevant in pediatric care. A randomized controlled trial demonstrated that onion-based interventions significantly reduce fever and accelerate symptom recovery in children without adverse effects (Anjeli et al., 2024) , while literature reviews have consistently highlighted its traditional use as a safe and accessible fever-reducing method (Sari et al., 2021) . Additional studies confirm that onion extracts possess strong antioxidant and anti-inflammatory activities due to high concentrations of phenolic compounds and quercetin (Al-Ansari et al., 2023; Ayanniyi et al., 2022) . Despite this evidence, there remains a notable gap in well-designed clinical studies focusing specifically on topical applications of Allium cepa in pediatric populations. Therefore, this study contributes novel evidence by evaluating a culturally rooted, topical intervention within a structured

clinical framework, thereby strengthening the scientific basis for integrating traditional therapies into evidence-based pediatric nursing practice.

Furthermore, this study contributes to the growing body of literature on culturally appropriate and resource-sensitive healthcare interventions. In many low-resource settings, access to pharmacological treatments may be limited, and reliance on traditional practices remains high. Therefore, validating such practices through scientific research is essential to ensure their safety, effectiveness, and appropriate integration into healthcare systems. The novelty of this study lies in its ability to bridge traditional practice and modern clinical research by systematically evaluating a widely used local remedy within a controlled design. It not only confirms the clinical relevance of Allium cepa L. compress but also provides a foundation for its inclusion in evidence-based nursing interventions, particularly in primary care and community health contexts. Overall, these findings suggest that Allium cepa L. compress may serve as a feasible and effective complementary approach to fever management in children with ARIs. However, further research with larger sample sizes, randomized controlled designs, and diverse populations is warranted to enhance the generalizability of the findings and to establish standardized protocols for clinical application.

Implications and limitations

This study contributes to the growing body of knowledge on complementary and culturally embedded therapies by providing empirical support for the potential integration of Allium cepa L. into evidence-based pediatric care frameworks. Conceptually, it advances the understanding of how traditional remedies can be systematically evaluated within a quasi-experimental design, thereby bridging the gap between local health practices and scientific validation. The findings also support the theoretical integration of non-pharmacological interventions into holistic fever management models, particularly in the context of pediatric nursing and community health. However, several limitations should be acknowledged. The use of a quasi-experimental design without randomization may limit causal inference and introduce potential selection bias. The relatively small sample size and single-site setting may also restrict the generalizability of the findings to broader populations. Additionally, the short duration of observation limits the ability to assess long-term effects or potential variability in response. Future studies employing randomized controlled trials with larger and more diverse samples are needed to strengthen the evidence base and confirm the reproducibility of these findings.

Relevance to Practice

The findings of this study demonstrate that Allium cepa L. compress can be directly applied as a practical, low-cost, and non-invasive complementary intervention for managing fever in under-five children with acute respiratory infections, particularly in primary care and community settings. For nursing practice, this intervention may be incorporated into routine fever management protocols as an adjunct to standard care, especially for mild to moderate fever cases, while ensuring appropriate clinical assessment and monitoring. Healthcare providers, including community nurses and midwives, can utilize this approach as part of health education for parents, emphasizing correct preparation, safe application, and recognition of warning signs requiring medical attention. At the institutional and policy levels, the integration of evidence-based traditional therapies such as Allium

cepa L. into clinical guidelines and community health programs may enhance accessibility and cultural acceptability of care. This is particularly relevant in Low- and Middle-Income Countries, where limited access to medications and healthcare resources necessitates the use of safe, affordable, and locally available interventions to support child health management.

Conclusion

This study demonstrates that the application of Allium cepa L. compress is effective as a complementary, non-pharmacological intervention in reducing body temperature among children under five with acute respiratory infections. The findings support its potential integration into pediatric care due to its anti-inflammatory properties, accessibility, and cultural acceptability. As a simple and low-cost intervention, it offers a promising alternative for fever management, particularly in resource-limited settings. Further rigorous studies are recommended to confirm its effectiveness and expand its applicability in broader clinical contexts.

Funding

This research received no external funding.

CrediT Authorship Contributions Statement

Dini Nurbaeti Zen: Conceptualization, Methodology, Formal Analysis, Supervision, Writing – Original Draft, Writing – Review & Editing.

Daniel Akbar Wibowo: Investigation, Data Curation, Validation, Resources, Project Administration, Writing – Review & Editing.

Conflicts of Interest

There is no conflict of interest.

Acknowledgments

The authors would like to express their sincere gratitude to the staff of Puskesmas Sukadana for their support and permission to conduct this study. Appreciation is also extended to the parents and children who participated in this research for their cooperation and willingness to contribute. The authors further acknowledge all individuals who provided assistance and support throughout the research process and the preparation of this manuscript.

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