

Original Article

Preliminary effects of a red ginger-honey drink on symptoms of acute respiratory infection in toddlers: A quasi-experimental study

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Abstract

Background: Acute respiratory infection (ARI) is a common cause of illness in children younger than five years. Red ginger and honey have anti-inflammatory, antimicrobial, antioxidant, and demulcent properties that may relieve respiratory symptoms, although pediatric evidence remains limited.

Objective: To evaluate changes in body temperature, respiratory rate, cough frequency, and peripheral oxygen saturation among toddlers receiving usual care with or without an adjunctive red ginger-honey drink.

Methods: A quasi-experimental nonequivalent pretest-posttest control-group study was conducted at the Labuhan Ratu Community Health Center, Bandar Lampung, in 2026. Thirty toddlers with physician-diagnosed ARI were selected purposively and allocated to an intervention group (n = 15) or a control group (n = 15). Both groups continued physician-prescribed care; the intervention group additionally received a drink prepared from 5–10 g of fresh red ginger in 150–200 mL of water plus 10 g of honey twice daily for five days. Paired-samples t tests and Wilcoxon signed-rank tests evaluated within-group changes.

Results: Body temperature did not change significantly in either group (intervention p = .913; control p = .275). Respiratory rate decreased in both groups (both p = .001), cough frequency decreased in both groups (both p < .001), and oxygen saturation increased in both groups (intervention p = .002; control p = .013). The reduction in cough frequency was descriptively greater in the intervention group (mean change 8.267) than in the control group (mean change 7.200).

Conclusion: Clinical improvement occurred in both groups. The red ginger-honey drink may have adjunctive potential, particularly for cough relief, but superiority over usual care cannot be established from within-group tests alone. Larger studies using randomized allocation, baseline comparability assessment, and direct between-group analyses are required.

Background

Acute respiratory infections (ARIs) encompass infections of the upper and lower respiratory tracts and remain a major source of pediatric morbidity. Viral and bacterial pathogens may produce cough, rhinorrhea, fever, tachypnea, respiratory distress, pneumonia, or hypoxemia, and severe viral ARI may prolong hospitalization or increase the risk of complications (Ilboudo et al., 2024). Etiologic assessment can be complex because viral, bacterial, and potential fungal pathogens may present with overlapping symptoms, while inappropriate antimicrobial use can further complicate management (Bitew & Bati, 2021; Iskandar et al., 2021; Maryoto & Dewi, 2024). The World Health Organization (WHO) therefore emphasizes integrated assessment and management of childhood illness (WHO, 2021).

Clinical assessment of a child with ARI requires attention to age-specific respiratory rate, work of breathing, danger signs, hydration, feeding, and oxygenation. Fast breathing and reduced oxygen

saturation may indicate lower respiratory involvement and require prompt evaluation, while persistent cough can disrupt sleep, food intake, and family functioning (Kementerian Kesehatan RI, 2023; WHO, 2021). Recurrent or inadequately managed illness may affect nutritional status, growth, and early development, and broader evidence supports the importance of health-provider and parenting interventions for child outcomes (Desmawati et al., 2025; Hirve et al., 2023; Jeong et al., 2021; Pakpahan & Tarigan, 2024). Pediatric nursing sources also emphasize airway-clearance management, systematic symptom monitoring, and caregiver education (Elmadi Putra et al., 2025; Lestari et al., 2022).

ARI remains an important primary-care problem in Indonesia. Household crowding, tobacco-smoke exposure, inadequate ventilation, poor nutrition, caregiver knowledge, and delayed care-seeking may increase the risk or severity of illness (Amra Viona, 2023; Masrel et al., 2024; Sarumaha, 2023). Local observations in Bandar Lampung have also

documented unfavorable housing conditions among families of toddlers with ARI (Zahrana, 2023). Public-health responses require community education, accessible primary care, and locally responsive surveillance, including the appropriate use of data-based approaches to identify disease patterns (Hidayati & Km, 2024; Liu et al., 2025).

Red ginger (*Zingiber officinale* var. *rubrum*) contains gingerols, shogaols, volatile oils, and other bioactive constituents with reported anti-inflammatory, antioxidant, antimicrobial, and immunomodulatory activity. Reviews, chemical analyses, and *in silico* studies have described these potential actions across different biological models (Afifa, 2022; Azzahra et al., 2025; Nabilah, 2022; Siregar et al., 2022; Yulianita et al., 2024; Zhang et al., 2022). These properties provide a plausible basis for using red ginger as a warm herbal drink intended to soothe the throat, support secretion clearance, and reduce respiratory discomfort. Mechanistic plausibility alone, however, does not establish clinical effectiveness in young children.

Honey has demulcent, antioxidant, and antimicrobial properties and may reduce irritation of cough receptors by coating the pharyngeal mucosa. Its phytochemical composition, antioxidant activity, and antibacterial components have been described in reviews and laboratory studies of different honey products (Heliyon, 2022; Kwakman & Zaat, 2023; Poltekkes Kupang, 2024; Rozman et al., 2022; Sulistyianingsih et al., 2022; Wardani et al., 2024). A systematic review found low- to very-low-certainty evidence that honey may improve acute cough symptoms and sleep compared with placebo, no treatment, or some cough medicines (Kuitunen, 2023). Evidence from cardiometabolic outcomes and wound care further indicates broad biological activity, but those findings should not be directly extrapolated to pediatric ARI (Ahmed et al., 2022; Tang et al., 2024). The present study limited enrollment to children aged at least 12 months as a safety precaution.

The use of traditional medicine in Indonesia is influenced by knowledge, attitudes, cultural familiarity, and interaction between traditional and biomedical systems (Febriyanti et al., 2024). Community programs and case-based nursing reports have explored ginger, honey, aromatherapy, and other complementary approaches for symptom relief and caregiver participation in children with ARI (Anjani & Wandini, 2021; Daulay, 2022; Juniati et al., 2023;

Novikasari et al., 2021). These approaches should remain complementary to clinical assessment and prescribed care rather than replace them.

Previous clinical and community studies have reported reductions in cough scores, cough frequency, or broader ARI symptoms after red ginger, honey, or combined ginger-honey interventions (Arba'atin et al., 2023; Jaybhaye et al., 2022; Khusuma et al., 2021; Kusumadewi, 2024; Lisdawati et al., 2024; Lisiptari et al., 2025; Nimatillah et al., 2024; Purwitasari & Rosyaria, 2023; Susilowati et al., 2022). However, many studies used small samples, nonrandomized designs, or limited between-group analyses. This study therefore evaluated pretest-posttest changes in body temperature, respiratory rate, cough frequency, and oxygen saturation among toddlers receiving usual care with or without an adjunctive red ginger-honey drink at the Labuhan Ratu Community Health Center in Bandar Lampung.

Methods

Study Design

This study used a quasi-experimental nonequivalent pretest-posttest control-group design. Data were collected in 2026 at the Labuhan Ratu Community Health Center, Bandar Lampung, Indonesia. The design compared clinical measurements obtained before and after a five-day observation period in an intervention group and a control group.

Participants and Sampling

The target population comprised children with ARI who lived within the health center's service area. Thirty participants were recruited through purposive sampling and assigned to the intervention group ($n = 15$) or control group ($n = 15$). Eligibility criteria were age 12–59 months, physician-diagnosed ARI, residence in the service area, ongoing physician-prescribed treatment when indicated, and written informed consent from a parent or legal guardian. Children were excluded if they had chronic respiratory disease such as asthma or a known allergy to ginger, honey, or bee products. The lower age limit was set at 12 months as a safety precaution against infant botulism.

Intervention and Control Conditions

Both groups continued usual care prescribed by the treating clinician. The intervention group

additionally received a red ginger-honey drink twice daily for five consecutive days. Each serving was prepared by boiling 5–10 g of freshly grated red ginger in 150–200 mL of water and adding 10 g (approximately two teaspoons) of honey after the liquid had cooled to a safe drinking temperature. Parents or caregivers received standardized instructions on preparation, administration, and monitoring for adverse reactions. The control group did not receive the study drink.

Outcome Measures

The outcomes were body temperature, respiratory rate, cough frequency, and peripheral oxygen saturation (SpO₂). Body temperature was measured with a thermometer; respiratory rate was counted for one full minute, and SpO₂ was measured with a pulse oximeter. Cough frequency was recorded using a structured observation sheet. WHO child-health guidance informed the clinical interpretation of respiratory rate and oxygenation (WHO, 2021). Measurements were obtained before the intervention and after the five-day observation period.

Data Collection

After administrative and ethical permissions were obtained, potentially eligible children were screened against the inclusion and exclusion criteria. Parents or guardians received information about the study and provided written informed consent. Baseline measurements were recorded for both groups. Caregivers in the intervention group were then instructed to administer the drink according to the protocol, while the control group continued usual care. The same clinical outcomes were reassessed at the end of day five. Data were checked, coded, and entered into statistical software for analysis.

Data Analysis

Continuous variables were summarized descriptively. Paired-samples *t* tests were used for normally distributed paired outcomes, while Wilcoxon signed-rank tests were used for outcomes that did not meet parametric assumptions. Statistical significance was set at $p < .05$, and exact *p* values were reported whenever available. Because the available analysis assessed pretest–posttest change separately within each group, findings were interpreted as within-group

improvement rather than definitive evidence of between-group superiority.

Ethical Considerations

The study received ethical review and approval from the Research Ethics Committee of Universitas Malahayati. Participation was voluntary, parents or legal guardians provided written informed consent, and participant confidentiality was protected. The approval number should be inserted in the final submitted manuscript.

Results

The findings are presented in three parts: participant overview, within-group changes in body temperature and cough frequency, and within-group changes in respiratory rate and oxygen saturation. Tables 1 and 2 summarize the pretest–posttest analyses for the intervention and control groups.

Participant Overview

Thirty toddlers completed the study, with 15 participants in each group. The source dataset did not include a baseline demographic table; therefore, comparability of age, sex, ARI severity, medication use, and other potential confounders could not be evaluated in this manuscript.

Body Temperature and Cough Frequency

Body temperature did not change significantly in either group. The mean pretest–posttest change was 0.267°C in the control group ($p = .275$) and –0.020°C in the intervention group ($p = .913$). Cough frequency decreased significantly in both groups. The mean reduction was 7.200 episodes in the control group and 8.267 episodes in the intervention group (both $p < .001$). The intervention group therefore showed a descriptively larger reduction of 1.067 cough episodes, but no direct between-group test was available (Table 1).

Respiratory rate decreased significantly in both groups. Fourteen participants in the intervention group and 13 participants in the control group had lower posttest respiratory rates; the corresponding Wilcoxon tests were significant (both $p = .001$). Oxygen saturation increased in 13 intervention participants and 10 control participants. The increase was significant in the intervention group ($p = .002$) and the control group ($p = .013$). These findings demonstrate

improvement over time in both groups but do not establish that the intervention produced greater improvement than usual care (Table 2).

Table 1. Within-group changes in body temperature and cough frequency

Outcome	Group	n	Mean change	SD	SE	95% CI	t	p
Body temperature (°C)	Control	15	0.267	0.908	0.235	-0.236 to 0.770	1.137	.275
Body temperature (°C)	Intervention	15	-0.020	0.697	0.180	-0.406 to 0.366	-0.111	.913
Cough frequency	Control	15	7.200	1.373	0.355	6.440 to 7.960	20.307	<.001
Cough frequency	Intervention	15	8.267	2.840	0.733	6.694 to 9.840	11.273	<.001

Table 2. Wilcoxon signed-rank results for respiratory rate and oxygen saturation

Outcome	Group	Negative ranks, n	Positive ranks, n	Ties, n	Z	p
Respiratory rate	Intervention	14	1	0	-3.369	.001
Respiratory rate	Control	13	0	2	-3.204	.001
Oxygen saturation	Intervention	1	13	1	-3.114	.002
Oxygen saturation	Control	3	10	2	-2.481	.013

* For respiratory rate, negative ranks indicate lower posttest values. For oxygen saturation, positive ranks indicate higher posttest values.

Discussion

This study examined changes in four clinical indicators among toddlers with ARI who received usual care with or without an adjunctive red ginger-honey drink. Respiratory rate and cough frequency decreased, while oxygen saturation increased, in both groups. Body temperature did not change significantly. The intervention group showed a descriptively larger reduction in cough frequency and a greater number of participants with improved oxygen saturation, but the available analyses did not directly compare changes between groups. The findings should therefore be interpreted as preliminary evidence of adjunctive potential rather than confirmation of treatment superiority.

The absence of a significant temperature change is clinically plausible. Many children with uncomplicated ARI may be afebrile or have temperatures that normalize during usual treatment and natural recovery. When baseline values are already within or near the normal range, a floor effect limits the magnitude of measurable change. Continued use of physician-prescribed antipyretics could also reduce the ability to isolate any contribution from ginger or honey. The result therefore does not demonstrate

an antipyretic effect and should not be used to recommend the drink as a replacement for structured clinical assessment or indicated medical treatment (Kementerian Kesehatan RI, 2023; WHO, 2021).

Respiratory rate decreased significantly in both groups, suggesting general clinical improvement over the five-day period. This pattern may reflect usual treatment, caregiver support, hydration, spontaneous resolution of infection, or regression toward the mean. Red ginger has biologically plausible anti-inflammatory, antimicrobial, immunomodulatory, and secretion-modulating properties (Afifa, 2022; Azzahra et al., 2025; Nabilah, 2022; Siregar et al., 2022; Yulianita et al., 2024; Zhang et al., 2022). Evidence linking these mechanisms to clinically meaningful respiratory-rate improvement in toddlers remains insufficient, so future trials should compare change scores directly or use analysis of covariance adjusted for baseline respiratory rate and disease severity.

Cough frequency declined markedly in both groups, with a descriptively larger mean reduction in the intervention group. Honey may soothe irritated pharyngeal mucosa, while ginger may provide warmth and contribute anti-inflammatory or expectorant effects. The finding is consistent

with pediatric studies, community interventions, and nursing reports describing reduced cough or ARI symptoms after ginger, honey, or combined preparations (Anjani & Wandini, 2021; Arba'atin et al., 2023; Daulay, 2022; Jaybhaye et al., 2022; Khusuma et al., 2021; Kusumadewi, 2024; Lisdawati et al., 2024; Lisiptari et al., 2025; Nimatillah et al., 2024; Novikasari et al., 2021; Purwitasari & Rosyaria, 2023; Susilowati et al., 2022). The low to very low certainty reported in the systematic review of honey for acute pediatric cough nevertheless supports cautious interpretation (Kuitunen, 2023).

Oxygen saturation improved in both groups and increased in more intervention participants than control participants. Small increases may be clinically relevant when baseline saturation is mildly reduced, but pulse-oximetry results can be affected by child movement, probe placement, peripheral perfusion, device quality, and timing of measurement. The source dataset did not provide baseline medians, posttest medians, or between-group effect estimates, so the magnitude and clinical importance of the difference cannot be determined. WHO guidance supports pulse oximetry as part of integrated respiratory assessment, but changes in SpO₂ should be interpreted together with work of breathing, danger signs, feeding, hydration, and the overall clinical condition (WHO, 2021).

The biological properties of honey also require careful interpretation. Reviews and laboratory studies support phytochemical, antioxidant, and antibacterial activity in several honey types (Heliyon, 2022; Kwakman & Zaat, 2023; Poltekkes Kupang, 2024; Rozman et al., 2022; Sulistyianingsih et al., 2022; Wardani et al., 2024). Findings from cardiometabolic research and chronic-wound management demonstrate that honey can have effects in other clinical contexts, but they do not constitute direct evidence of efficacy for ARI symptoms in toddlers (Ahmed et al., 2022; Tang et al., 2024). The observed improvements should therefore be attributed to the study period as a whole unless a direct between-group analysis demonstrates an additional intervention effect.

Several limitations reduce causal inference. The study used purposive sampling, a small sample, nonrandom group allocation, and no reported blinding. Baseline demographic and clinical

characteristics were unavailable, medication use was not standardized, adherence to the drink was not quantified, and cough frequency may have been vulnerable to observer or caregiver reporting bias. Most importantly, separate within-group significance tests do not establish that one group improved more than the other. A nonsignificant change in one group and a significant change in another would also not, by itself, prove an intervention effect; direct between-group analysis is required.

The intervention may still have practical value as a culturally familiar complementary measure when used responsibly alongside usual care. Nurses can educate caregivers about preparation, age restrictions, allergy screening, warning signs, and the need to seek medical care when breathing difficulty, persistent fever, poor intake, lethargy, or low oxygen saturation occurs (Elmadi Putra et al., 2025; Lestari et al., 2022). Community implementation should consider caregiver knowledge, attitudes toward traditional medicine, family participation, and the accessibility of primary-care support (Febriyanti et al., 2024; Hidayati & Km, 2024; Juniati et al., 2023). Broader child-health evidence also supports integrating caregiver-focused interventions with attention to nutrition, growth, and early development (Desmawati et al., 2025; Hirve et al., 2023; Jeong et al., 2021; Pakpahan & Tarigan, 2024). Future research should use randomized allocation, an adequately powered sample, standardized usual care, validated cough measurement, adverse-event monitoring, and direct between-group estimates with confidence intervals.

Conclusion and Recommendation

Toddlers in both the intervention and control groups experienced reductions in respiratory rate and cough frequency and increases in oxygen saturation over five days, while body temperature remained unchanged. The red ginger-honey group showed descriptively favorable changes, particularly in cough frequency, but the study's within-group analyses cannot establish superiority over usual care. The drink may be considered only as an age-appropriate complementary intervention and should not replace clinical evaluation or prescribed therapy. Randomized studies with larger samples and direct between-group analyses are needed.

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Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

Data Availability Statement

Data sharing is not applicable to this article.

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