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RESEARCH

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Comparison of the Effectiveness of Warm Compresses Applied to the Axillary Area and Inguinal Region in Reducing Fever in Children with Acute Respiratory Infections

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Abstract

Fever commonly accompanies acute respiratory infections (ARI) in children and may cause discomfort or other complications when body temperature remains elevated. Warm compresses are often used as a supportive, non-pharmacological measure. This study compared the change in body temperature after warm-compress application to the axillary and inguinal regions in children with ARI. Seventy children with ARI and fever were recruited purposively and allocated to two groups in a quasi-experimental study. Thirty-five children received the compress in the axillary area and 35 in the inguinal area. Temperature was measured immediately before treatment and five minutes after a 20-minute compress using a standardized digital thermometer. The mean temperature in the axillary group fell from $38.6 \pm 0.5^{\circ}\text{C}$ to $37.5 \pm 0.4^{\circ}\text{C}$, whereas the inguinal group decreased from $38.7 \pm 0.6^{\circ}\text{C}$ to $37.2 \pm 0.3^{\circ}\text{C}$. Within-group changes were significant (paired-samples t-test, $p < 0.001$). The reduction was 1.1°C in the axillary group and 1.5°C in the inguinal group, and the difference between groups was significant (independent-samples t-test, $p = 0.001$).

The larger short-term decrease was observed in the inguinal group. These results describe the temperature response under the specific conditions of the study and should not be interpreted as evidence that one application site is universally superior.

Keywords: Warm compress, axillary area, inguinal region, fever reduction, children, acute respiratory infections (ARI).

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1. INTRODUCTION

Acute respiratory infections (ARIs) remain common in childhood and contribute substantially to illness and hospitalization, particularly among younger children (Gill et al., 2025). The 2023 Indonesian Health Survey recorded 86,364 ARI cases among children under five, with a reported prevalence of 4.8% (Indonesian Health Survey, 2023).

ARIs can be caused by viral or bacterial pathogens. Infection activates inflammatory and immune responses in the respiratory tract, and inflammation may contribute to airway obstruction in young children because their airways are relatively narrow (Albishi et al., 2024). Children with ARI may present with cough, nasal congestion, malaise, respiratory distress, and elevated body temperature (Adeel & Widiatmoko, 2024; Marconi et al., 2025).

In this study, fever was defined as a body temperature of $\geq 38^{\circ}\text{C}$ (Wulandari & Keswara, 2025). An elevated temperature forms part of the host response to infection, although fever may be accompanied by discomfort, irritability, dehydration, and febrile seizures (Jayashree et al., 2024; El-Radhi, 2012; Oktaviana et al., 2025). Febrile seizures occur most often between 6 months and 5 years of age, when the developing nervous system remains more susceptible to temperature-related neuronal excitation (Tiwari et al., 2022).

Heydarian et al. (2024) reported an association between electrolyte disturbances, including low sodium, potassium, and zinc levels, and febrile or complex seizures in children. Febrile seizures may be classified as simple or complex according to duration, recurrence, and focal features. Complex episodes may be associated with a greater risk of later neurological problems (Eilbert & Chan, 2022).

Management of fever may include pharmacological treatment together with supportive measures. Warm compresses are used in some settings because the procedure is simple and may improve comfort (Corsello et al., 2025). Warm water applied to the skin can promote peripheral vasodilation and may facilitate heat transfer from the body surface (Wulandari & Keswara, 2025).

Earlier studies have reported lower body temperature following warm-compress treatment in febrile children in both community and healthcare settings (Oktaviana et al., 2025). Warm compresses have also been considered in pediatric nursing care for fever management (Souza et al., 2022).

The response to a warm compress may depend on several factors, including water temperature, duration of application, and the anatomical site selected. The axillary and inguinal regions contain relatively large blood vessels and may therefore differ in their contribution to heat transfer.

Research involving vascular areas such as the axilla and groin has suggested that these locations can be relevant to heat transfer and temperature reduction (Akbar et al., 2025; Souza et al., 2022). However, evidence directly comparing these two sites in children with ARI remains limited. Therefore, this study compared the short-term change in body temperature following warm-compress application to the axillary and inguinal regions.

2. RESEARCH METHOD

A quasi-experimental study using a two-group pretest–posttest design was conducted to compare warm-compress application at the axillary and inguinal regions in children with ARI. The study involved children aged 1–5 years who had been diagnosed with ARI and had a body temperature of $\geq 38^{\circ}\text{C}$. A total of 70 eligible participants were recruited by purposive sampling. Children were eligible if they had not received antipyretic medication during the preceding four hours. Written informed consent was obtained from a parent or legal guardian for each participant.

Random allocation was not used because of the quasi-experimental design. After screening, participants were assigned sequentially according to enrollment order: the first eligible child entered the axillary group, the second entered the inguinal group, and the sequence was continued alternately until 35 participants had been included in each group.

Age, sex, and initial body temperature were recorded before the intervention to examine baseline comparability. The analysis showed no significant baseline differences between the two groups. These characteristics were assessed to help identify potential differences between groups before the intervention.

For the intervention, two clean cloths measuring approximately 20×20 cm were soaked in warm water maintained at $37\text{--}40^\circ\text{C}$. One cloth was placed at the assigned site, either the axillary or inguinal region, while the second cloth was kept ready as a replacement. The cloth was changed every five minutes or sooner if its temperature fell below the specified range. Each intervention lasted 20 minutes. Children wore light clothing and were positioned supine or in semi-Fowler's position. Body temperature was recorded with a calibrated digital thermometer immediately before the intervention and five minutes after the compress procedure had ended. Standardized observation sheets and demographic questionnaires were used during data collection.

Descriptive statistics were used to summarize participant characteristics and temperature measurements. Data distribution was examined with the Shapiro–Wilk test. Because the data met the normality assumption ($p > 0.05$), parametric tests were used. A Paired Samples t-test assessed the change in temperature within each group, and an Independent Samples t-test compared the mean temperature reductions between groups. Statistical significance was determined at $p < 0.05$.

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Mandala Waluya (ethical clearance No. 132/KEP.UMW/X/2025). Before data collection, the parents or legal guardians received an explanation of the study procedures, potential benefits, and minimal risks and provided informed consent. Participant confidentiality was protected through identification codes rather than personal identifiers. Data were stored securely and were accessible only to the research team. Participation was voluntary, and parents or guardians could withdraw their child at any time without consequences.

3. RESULTS AND DISCUSSION

Respondent Characteristics

Table 1. Characteristics of Respondents

Variable	Intervention Group (Axilla) (n=35)		Control Group (Inguinal) (n=35)		P value
	n	%	n	%	
Age					
1-2 years	18	51.4	20	57.1	0.820
3-4 years	12	34.3	11	31.4	
5-6 years	5	14.3	4	11.4	
Sex					
Male	16	45.7	17	48.6	0.794
Female	19	54.3	18	51.4	

Table 1 shows that children aged 1–2 years formed the largest age category in both groups. Females accounted for 54.3% of the axillary group, while the sex distribution in the inguinal group was close to even. The age distributions did not differ significantly between

groups ($p = 0.820$), and neither did sex distribution ($p = 0.794$). These findings indicate that the measured baseline characteristics were comparable between the groups.

Body Temperature Before and After the Intervention

Table 2. Mean Body Temperature Before and After Warm Compress, Result mean reduction in body temperature, And Results of the paired t-test

Group	Mean before (0C)	SD	Mean after (0C)	SD	Mean reduction (°C)	SD	p-value
Axilla	38.6	0.5	37.5	0.4	1.1	0.4	0.000
Inguinal	38.7	0.6	37.2	0.3	1.5	0.3	0.000

Table 2 shows that both groups experienced a decrease in body temperature following the warm-compress intervention. In the axillary group, the mean decreased from 38.6°C before treatment to 37.5°C afterward. In the inguinal group, the mean decreased from 38.7°C to 37.2°C. The mean reduction was $1.1 \pm 0.4^\circ\text{C}$ for axillary application and $1.5 \pm 0.3^\circ\text{C}$ for inguinal application. The paired t-test results were statistically significant in both groups ($p = 0.000$), indicating a significant pretest–posttest change.

Independent Samples t-test

Table 3. Comparison of Temperature Reduction Between Groups

Variable	Mean Axilla	Mean Inguinal	p-value
Body Temperature Reduction	1.1	1.5	0.001

Table 3 shows there was a significant difference between the two groups ($p < 0.05$). The comparison of mean temperature reduction between groups produced a p-value of 0.001. Thus, the amount of temperature reduction differed significantly between the axillary and inguinal groups. The mean reduction was larger in the inguinal group (1.5°C) than in the axillary group (1.1°C) (UNICEF, 2025; WHO, 2026; Damanik et al., 2025).

Both groups showed a fall in temperature after the warm compress. One possible explanation is the local vascular response to warming. Heat applied to the skin can increase peripheral blood flow and facilitate heat exchange with the surrounding environment. The axillary and inguinal regions both contain substantial vascular structures, making them plausible sites for this type of intervention (Nisrina et al., 2026).

The observed reduction is also in line with reports describing warm compresses as a practical supportive measure for children with fever (Sabilla et al., 2026). In the present study, however, the intervention was evaluated over a short period and the participants were children with ARI.

The difference between sites was notable: the inguinal group had a mean reduction of 1.5°C compared with 1.1°C in the axillary group. Previous work has discussed the contribution of vascular areas to heat transfer (Handayani et al., 2024; Lukito et al., 2024; Cramer et al., 2022; Sabilla et al., 2026). The present data therefore suggest that application site may be relevant to the short-term temperature response.

Warm compresses are also described as an accessible intervention with relatively low cost and few reported adverse effects (Anwariyah et al., 2025; El-Radhi et al., 2019). The decrease observed in both groups is consistent with their potential role as supportive care,

although the study design does not establish that the compress alone caused the entire change in temperature.

Warming the skin can increase peripheral circulation and support heat transfer through conduction and evaporation (Setiawan et al., 2025). The larger reduction recorded at the inguinal site may be related to the vascular characteristics of that region. This interpretation should remain cautious because the study was not randomized and temperature was measured only shortly after treatment (Rahmawati et al., 2023; Kashcooli et al., 2017; Handayani et al., 2024). Areas with major blood vessels are more effective than typical peripheral regions (Oktaviana et al., 2025).

An Indonesian study reported an approximately 1°C reduction after an axillary warm compress in febrile preschool children and noted that responses may vary according to application site and physiological condition (Muhammad & Ali, 2024). The current findings are compatible with the usefulness of the axillary site, while the inguinal application produced a greater short-term reduction in this sample.

The current findings also differ from some previous reports. In a pilot randomized clinical trial, Souza et al. (2022), found that adding warm compresses to antipyretic treatment did not result in a greater temperature reduction than antipyretic treatment alone. Karra et al. (2019) reported that an early decrease associated with warm compresses in children with typhoid fever was not maintained throughout follow-up. Differences in diagnosis, participant characteristics, treatment duration, measurement timing, and compress technique may help explain these variations. In the present study, the procedure was standardized between groups and the application site was the main intervention difference.

For children with ARI, fever represents part of the physiological response to infection. Within this study, warm-compress application was associated with a short-term decline in temperature at both sites. The findings provide additional information about temperature changes following application at two vascular anatomical regions in children with ARI.

Several limitations affect interpretation of the findings. First, participants were not randomly allocated, so selection bias cannot be excluded. Second, purposive recruitment from a single healthcare facility limits the extent to which the findings can be generalized. Third, temperature was assessed only shortly after the intervention; therefore, the duration of the observed reduction is unknown. Finally, blinding was not feasible, which may have introduced observer or measurement bias.

4. CONCLUSION

In this study, warm-compress application was followed by a reduction in body temperature among children with ARI at both anatomical sites. The mean reduction was 1.1°C in the axillary group and 1.5°C in the inguinal group, with a statistically significant between-group difference ($p = 0.001$). The result represents a short-term observation under the study conditions. Further studies with random allocation, larger samples, multiple healthcare settings, and longer follow-up are needed to determine whether the difference between sites is sustained. Warm compresses may be considered a supportive measure together with appropriate management of fever in children with ARI.

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