

# Hyperthermia Management Using Tepid Sponging to Reduce Body Temperature in Children With Typhoid Fever in the Emergency Department

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**Abstract:** Typhoid fever is a systemic infectious disease caused by *Salmonella enterica* serovar Typhi and remains a major public health concern in many developing countries, including Indonesia. The disease is primarily transmitted through the consumption of contaminated food or water. Management of fever involves both pharmacological and non-pharmacological approaches, one of which is tepid sponging. This paper aims to describe the effectiveness of tepid sponging in reducing body temperature among pediatric patients with typhoid fever. A case study was conducted on a pediatric patient (An. Z) diagnosed with typhoid fever. The non-pharmacological intervention—tepid sponging—was applied using a holistic nursing process, including assessment, diagnosis, intervention, implementation, and evaluation. The findings indicate that the patient's initial body temperature was 39.0°C, which decreased to 37.8°C following the intervention. These results demonstrate the effectiveness of tepid sponging in lowering body temperature in children with typhoid fever. In conclusion, tepid sponging is an effective non-pharmacological nursing intervention for reducing fever in pediatric typhoid patients. These findings offer important clinical implications for nurses, particularly in emergency departments, as a supportive measure to improve patient comfort and facilitate recovery.

**Keywords:** Typhoid fever, Tepid Sponge Technique, Reduction of Body Temperature

## INTRODUCTION

Typhoid fever is a systemic infectious disease caused by *Salmonella enterica* serovar Typhi and remains a major health problem in developing countries, including Indonesia. The disease is transmitted through contaminated food or water and is characterized by prolonged fever, gastrointestinal disturbances, and, in some cases, altered consciousness. Globally, an estimated 9 million cases occur annually with approximately 110,000 deaths, with children representing the most vulnerable group, particularly in areas with limited access to clean water and adequate sanitation. In Indonesia, typhoid fever is classified as endemic; although the most recent Indonesian Health Survey (2023) does not report specific prevalence data, previous studies indicate that its incidence remains considerably high (1).

Poor personal hygiene is one of the contributing factors to digestive tract infections, particularly through hands contaminated with pathogenic microorganisms (2). Hyperthermia is among the most common nursing problems experienced by patients with typhoid fever. It is defined as an elevation in body temperature exceeding 37.8°C resulting from the release of endogenous pyrogens as part of the body's immune response to infection (3). If left unmanaged, this condition may lead to dehydration, electrolyte imbalance, and severe complications such as seizures and shock (4). The pathophysiological mechanism of hyperthermia involves the release of endogenous pyrogens, including interleukin-1, which

act on the thermoregulatory center in the hypothalamus and subsequently trigger an increase in body temperature (5). Management of hyperthermia may include pharmacological therapy using antipyretics or non-pharmacological approaches that utilize conduction and evaporation mechanisms, such as warm compresses or tepid sponging, to accelerate temperature reduction (6).

One non-pharmacological intervention proven to be effective is the tepid sponging technique, which combines the application of warm compresses over major blood vessels with wiping of the body surface (7). This technique involves applying compresses not only to a single area but simultaneously to several anatomical sites containing large blood vessels (8). The mechanism promotes peripheral vasodilation, enhances evaporative heat loss, and facilitates the release of excess body heat, thereby helping to restore normal body temperature (9). Several studies have demonstrated that tepid sponging is more effective than conventional warm compresses in reducing body temperature among children with typhoid fever (10). Therefore, incorporating this technique into nursing care is essential to prevent hyperthermia-related complications and to enhance patient comfort (11).

## CASES

The patient, An. Z, a 3-year-old Muslim male, presented to the Emergency Department of Ibnu Sina Hospital at 09:30 with a chief complaint of fluctuating fever for the past six days. The fever was accompanied by warm and reddened skin, as well as symptoms of flu and cough. According to the patient's mother, the child had experienced nausea, vomiting, and decreased appetite. There was no history of prior medical treatment.

*Primary Assessment:* Airway assessment revealed no abnormalities. In the Breathing assessment, the respiratory rate was 28 breaths per minute with an SpO<sub>2</sub> of 98% on room air. Circulation assessment showed tachycardia with a pulse rate of 140 beats per minute, capillary refill time (CRT) < 2 seconds, no cyanosis, pale skin appearance, and warm acral areas. The patient's body temperature was measured at 39.0°C. In the Disability assessment, the patient was fully conscious (compos mentis) with a Glasgow Coma Scale (GCS) score of 15 (E4V5M6). Exposure findings indicated warm acral temperature at 39.0°C and the absence of closed or open wounds on the extremities.

*Secondary Assessment:* Physical examination identified several abnormalities. Eyes: the conjunctiva appeared pale, the sclera showed signs of anemia, the pupils were isochoric, and extraocular movements were intact in all directions. Mouth: the lips appeared pale. Chest (Lungs and Heart): the thoracic cavity expanded symmetrically, with a respiratory rate of 28 breaths per minute; the breathing pattern was irregular, and chest expansion followed the respiratory rhythm. Extremities: an intravenous line was inserted in the right hand, delivering an Asering infusion at a rate of 10 tpm.

## METHODS

This study employed a descriptive design using a case study approach to explore nursing care management in a pediatric patient with typhoid fever. The research was conducted at Ibnu Sina Hospital Makassar in March 2025. Data were collected through interviews and direct patient observations, applying a holistic nursing care approach. The non-pharmacological intervention implemented was tepid sponging, administered for 15–20 minutes. A thermometer or thermogun was used to measure the patient's body temperature before and after the intervention.

This scientific work received official approval from the management of Ibnu Sina Hospital Makassar, and informed consent was obtained from the patient's parents or legal guardians prior to data collection and the initiation of nursing interventions.

Nursing evaluation in this case study referred to the Indonesian Nursing Diagnosis Standards (IDHS), the Indonesian Nursing Outcome Standards (SLKI), and the Indonesian Nursing Intervention Standards (SIKI) issued by the Indonesian National Nurses Association (PPNI), with hyperthermia identified as the primary nursing diagnosis. Evaluation criteria included: (1) a decrease in body temperature to the normal range (36.5–37.5°C); (2) normalization of vital signs (pulse and respiratory rate); (3) warm, moist, and non-flushed skin; (4) improved hydration status, indicated by good skin turgor and moist mucous membranes; and (5) enhanced patient comfort, demonstrated by a calm and non-fussy demeanor.

Evaluation was conducted by comparing the patient's condition before and after the intervention and was documented using the ADPIE format (Assessment, Diagnosis, Planning, Implementation, Evaluation).

## RESULT AND DISCUSSION

### *Result*

On April 11, 2025, hyperthermia management was carried out using the tepid sponging technique for a pediatric patient with typhoid fever. At 11:00 a.m. WITA, post-intervention assessment indicated improvement in the hyperthermia diagnosis. The patient's body temperature decreased from 39.0°C to 37.8°C following the procedure. The outcomes of the hyperthermia management intervention are summarized in the table below:

Table 1. Implementation of Management with Hyperthermia Diagnosis in Typhoid Fever Patients

Time	Pre Evaluation	Implementation	Time	Post Evaluation
09.32 WITA	The patient's body temperature is 39.0°C.	Monitor body temperature Collaboration on providing tepid sponge technique	11.00 WITA 11.00 WITA	The patient's body temperature is 37.8°C The patient's body temperature is 37.8°C
09.35 WITA	The patient's pulse rate is 140x/minute	Monitor pulse frequency	11.00 WITA	The patient's pulse rate is 100x/minute

On April 11, 2025, hyperthermia management was performed on a pediatric patient diagnosed with hyperthermia to reduce fever. At 9:32 a.m. WITA, the patient's initial body temperature was recorded at 39.0°C. At 9:35 a.m. WITA, the pulse rate was assessed at 140 beats per minute. Following the application of the tepid sponging technique and subsequent evaluation at 11:00 a.m. WITA, the patient's body temperature decreased to 37.8°C, while the pulse rate improved to 100 beats per minute. On the same day, hypovolemia management was also conducted through fluid therapy in the patient with typhoid fever. Initial assessment showed a weak pulse, decreased skin turgor, dry mucous membranes, and reluctance to drink. The nursing interventions included monitoring for signs and symptoms of hypovolemia, monitoring fluid intake and output, advising the patient to rest in a semi-Fowler's position, and collaborating on intravenous fluid administration. These interventions contributed to an improvement in the patient's hydration status. The outcomes of the hypovolemia management implementation are presented in the table below:

Table 1. Implementation of Management with Hypovolemia Diagnosis in Typhoid Fever Patients

Time	Pre Evaluation	Implementation	Time	Post Evaluation
09.50 WITA	The client's mother stated that her child vomited 3 times a day during the assessment.	Administering intravenous fluids	11.35 WITA	The client's skin turgor appears to have improved and the mucous membranes are moist.

During the diagnostic evaluation for hypovolemia, the patient's mother reported that the child had been vomiting three times per day. Clinical assessment showed a weak general appearance, decreased skin turgor, dry mucous membranes, and a recorded weight loss of 9 kg. These findings supported the nursing diagnosis of hypovolemia related to inadequate fluid intake. The evaluation indicated that the hypovolemia problem had not been fully resolved; therefore, ongoing nursing interventions were required. The interventions included continued monitoring for signs and symptoms of hypovolemia, monitoring fluid intake and output, advising the patient to avoid sudden position changes, and collaborating in the administration of intravenous fluids. These measures were expected to gradually improve the patient's hydration status.

### Discussion

Hyperthermia is defined as an increase in body temperature  $\geq 37.5^{\circ}\text{C}$ , generally caused by infection (12). In this case, the patient's body temperature reached  $39^{\circ}\text{C}$  as a response to endogenous pyrogens triggered by *Salmonella typhi* infection (13). One effective non-pharmacological intervention for reducing fever is the tepid sponge technique, which involves wiping the patient's body with a cloth or sponge soaked in warm water (14). This method enhances evaporative heat loss through the skin, allowing excess body heat to dissipate more quickly and thereby lowering body temperature effectively (15).

In this case study, An. Z, a 2-year-old boy, presented to the Emergency Unit of Ibnu Sina Hospital on April 11, 2025, with complaints of fluctuating fever. The assessment revealed a body temperature of  $39.0^{\circ}\text{C}$ , pulse rate of 129 beats/minute, and respiratory rate of 28 breaths/minute. The patient appeared restless, with dry skin, dry lips, and warm extremities. Laboratory tests showed leukocyte levels of 14.32 and Widal results of O: 1/420, H: 1/260, HA: negative, and HB: negative. These findings are consistent with the literature, which states that fever is the primary clinical symptom of typhoid fever (16).

The findings of this study demonstrate that warm compress therapy using the tepid sponge method is effective in reducing body temperature in febrile children. The effectiveness of this intervention is influenced by several factors, including the patient's initial temperature, the area of the body being sponged, and the temperature of the water used. Physiological factors such as metabolic rate, hydration status, and underlying infection also contribute to the rate of temperature reduction (17). During fever, the hypothalamus regulates the body to a higher temperature set point; therefore, the application of warm compresses facilitates peripheral vasodilation, promoting heat release from the body (18).

Warm compresses using the tepid sponge method reduce body temperature through conduction and evaporation, both of which enhance heat loss (19). According to thermoregulation theory, the hypothalamus acts as the body's temperature-regulating center by balancing heat production and heat loss (20). During fever, the hypothalamus elevates the temperature set point, and tepid sponging accelerates peripheral vasodilation and increases heat dissipation to the environment (21).

The results of this study are consistent with previous findings showing that tepid sponge compresses are effective in significantly reducing body temperature in febrile children within a short

period of time (22). These results also align with studies demonstrating the effectiveness of tepid sponging in lowering the temperature of children with typhoid fever (23). Similar findings reported that tepid sponge compresses are more effective than conventional warm compresses, as they increase the surface area of the body exposed to cooling, thereby accelerating heat transfer. This intervention is considered safe because it does not cause adverse effects commonly associated with cold-water use and is effective as a non-pharmacological therapy supporting pharmacological treatment (24). These findings reaffirm that tepid sponge compresses are a simple, safe, and effective intervention and may serve as a primary nursing care strategy for managing fever in children prior to administering pharmacological therapy (25).

## CONCLUSION

The assessment of patient An. Z in the Emergency Unit of Ibnu Sina Hospital on April 11, 2025, confirmed a diagnosis of typhoid fever, supported by laboratory findings of WBC 14.32; Widal O 1/420; H 1/260; and negative HA and HB results. Case analysis identified two nursing diagnoses: hyperthermia and hypovolemia. Interventions provided included hyperthermia management through continuous monitoring of body temperature and potential complications, external cooling using the tepid sponge technique, bed rest, and collaborative administration of intravenous fluids. These measures were effective in reducing the patient's body temperature from 39.0°C to 37.8°C. Therefore, it can be concluded that the intervention was effective in managing hyperthermia in children with typhoid fever.

These findings reinforce that the tepid sponge technique is a simple, safe, and effective non-pharmacological intervention for hyperthermia management in pediatric patients with typhoid fever. For nursing practice, the results support integrating the tepid sponge method into emergency room care protocols as a complementary antipyretic measure. However, this study is limited to a single case, and further research involving larger populations is needed to strengthen scientific evidence. Future studies are also recommended to evaluate the effectiveness of this technique across various clinical conditions and to explore the combined use of pharmacological and non-pharmacological interventions for optimal fever management.

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## AUTHOR'S CONTRIBUTION STATEMENT

Kartini Abd. Malik, Haeril Amir, Fitria was responsible for the research design, data collection, analysis, and drafting of the manuscript. Kartini Abd. Malik, Rahmat Hidayat supervised the research process, contributed to the theoretical framework and literature review, and revised the manuscript critically for intellectual content.

## CONFLICT OF INTEREST

All author declare No conflict of interest

## DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

Artificial intelligence tools were used to assist with language editing and grammar checking. No content generation, data analysis, or critical interpretation was performed by AI. All intellectual contributions are the sole responsibility of the authors. All research design, data collection, analysis, and interpretation were performed by the authors without AI assistance.

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