

Implementation of Warm Compress Therapy for Hyperthermia in Patients with Tropical Malaria: A Case Study

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Abstract. : Malaria is an infectious disease transmitted by infected female *Anopheles* mosquitoes. This disease is caused by the parasitic *Plasmodium* protozoa that enter the human bloodstream through mosquito bites. Among the various types of *Plasmodium* that can infect humans, *Plasmodium knowlesi*, *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae*, and *Plasmodium falciparum* are the most dangerous because they can cause death or serious complications. This case study aims to evaluate the effect of warm compresses on hyperthermia in tropical malaria patients in class I & II rooms of Serui Regional Hospital, Papua on February 18, 2025. The author uses a descriptive research method by conducting observations and observations using a nursing process approach. The results of the study showed that the application of warm compress therapy to hyperthermia combined with pharmacological therapy was effective in overcoming hyperthermia in tropical malaria patients. There was a decrease in body temperature from 39.8 °C to 36.7 °C after implementation for 1 day. Monitoring vital signs and evaluating body temperature regularly is very important to assess the effective ness of the intervention. Conclusion: This study emphasizes the effect of warm compress as a non-pharmacological approach in the management of hyperthermia in tropical malaria patients to reduce body temperature and prevent further complications.

Keywords: Hyperthermia, Tropical malaria, Warm compress

1. INTRODUCTION

Malaria is an infectious disease transmitted by the bite of infected female *Anopheles* mosquitoes. It is caused by *Plasmodium* protozoan parasites that enter the human bloodstream through mosquito bites. Among the several species of *Plasmodium* that can infect humans *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae*, *Plasmodium knowlesi*, and *Plasmodium falciparum* the latter is the most dangerous, as it can cause severe complications or death (Dayat & Banyal, 2025).

Malaria remains one of the deadliest diseases worldwide. The World Health Organization (WHO) estimates that malaria continues to be a major public health issue in 107 countries through 2025, with approximately 300–500 thousand deaths annually. In Indonesia, about 80% of regencies and municipalities are malaria-endemic, making it one of the countries at high risk for malaria transmission (Siregar et al., 2023).

Malaria, caused by *Plasmodium* parasites transmitted by female *Anopheles* mosquitoes, is primarily due to four species: *P. falciparum*, *P. vivax*, *P. malariae*, and *P. ovale*. *P. falciparum* responsible for tropical malaria is the most prevalent in Indonesia (55%), followed by *P. vivax* (45%), while *P. malariae* and *P. ovale* are rarely found (Rumbiak, 2024).

Historically, malaria has been a leading cause of mortality in Indonesia, with 94,610 cases reported in 2021. Although the number of cases has generally declined since 2018, there was a temporary increase in 2019 with 250,628 cases. In 2021, the highest incidence occurred in eastern Indonesia, particularly Papua (86,022 cases), followed by East Nusa Tenggara (2,393 cases; 2.5%) and West Papua (1,841 cases; 1.94%) (Ministry of Health, Republic of Indonesia, 2021).

Papua has the highest malaria endemicity in the country, with an Annual Parasite Incidence (API) of 42.65 per 1,000 population in 2023 far above the national average of 0.84 per 1,000. In Yapen Islands Regency, the malaria incidence rate reached 31.2 per 1,000 population. This high incidence is influenced by geographic conditions conducive to mosquito breeding, low public awareness of prevention, and limited access to health services (Papua Provincial Health Office, 2023). In September 2023, 12,562 malaria cases were recorded, compared to 20,204 in 2022 a decrease of 7,642 cases (Yapen Islands District Health Office, 2023; Arisjulyanto & Suweni, 2024).

After entering the bloodstream, *Plasmodium* parasites infect the liver and red blood cells, causing symptoms such as chills, persistent fever, and weakness. Malaria transmission is influenced by individual behavior, lifestyle, poor environmental sanitation, and occupations that increase exposure to mosquito bites (Dimi & Adam, 2020). Hyperthermia is a condition in which body temperature exceeds 38.5°C, caused by infections (viral, bacterial, or parasitic), hypothalamic dysfunction, extreme heat exposure, or certain medications. Unlike fever, which is a regulated immune response, hyperthermia occurs when the body's cooling mechanisms fail, leading to impaired sweating or heat dissipation. If untreated, hyperthermia can disrupt physiological functions and cause severe complications (Suparti et al., 2020).

Although excessive body temperature can be harmful, moderate increases serve as part of the immune defense mechanism. Hyperthermia stimulates both specific and nonspecific immune responses by activating T and B lymphocytes, enhancing phagocytic activity, promoting interferon production, and increasing immune cell mobility all of which accelerate recovery (Anisa, 2019). Management of malaria patients with hyperthermia involves both pharmacological and non-pharmacological interventions. One common non-pharmacological approach is the application of warm compresses, which lowers body temperature by dilating blood vessels and opening skin pores to release heat (Sandi, 2022). According to Faridah (2021), warm compresses using a digital thermometer and washcloth can stimulate sweating, promote natural cooling, and prevent harmful temperature fluctuations. Applying warm

compresses, especially to large blood vessel areas such as the axilla, helps stimulate the hypothalamic preoptic area to regulate body temperature (Aurelia et al., 2022).

Based on this background, the researcher conducted a study titled “The Effect of Warm Compress Therapy on Hyperthermia in Patient M with Tropical Malaria in Class I & II Wards of Serui General Hospital.”

2. METHODE

This study employed a descriptive case study design aimed at providing an in-depth description of the effect of warm compress therapy on hyperthermia in a patient with tropical malaria in the Class I and II wards of Serui Regional General Hospital (RSUD Serui). The case study approach was selected to obtain a comprehensive understanding of the patient’s clinical condition and the effectiveness of the nursing interventions provided. The subject of the study was Mr. M, a patient diagnosed with tropical malaria who experienced a nursing problem of hyperthermia. The subject was selected using a purposive sampling technique, based on specific criteria aligned with the research objectives (Sugiyono, 2022). The study was conducted in the Class I and II wards of RSUD Serui, Yapen Islands Regency, Papua Province, on February 18, 2025, during one day of inpatient care. Data collection techniques included interviews to obtain subjective patient information, observations to assess physical conditions and responses to interventions, physical examinations to identify clinical signs of hyperthermia, and the implementation of warm compress therapy as the main nursing intervention. In addition, nursing documentation was used to record the results and evaluate changes in the patient’s body temperature. The collected data were analyzed descriptively to assess the effectiveness of the intervention in reducing body temperature and improving patient comfort (Kahi, 2024).

3. RESULT AND DISCUSSION

a. Result

1) Assessment Results

The research subject was Mr. M, a 21-year-old male college student of Luwu ethnicity, unmarried, and residing on Jl. Kelapa Dua, Yapen Islands Regency. The patient was admitted to Serui Regional General Hospital (RSUD Serui) on February 17, 2025, at 19:00 WIT, with a chief complaint of high fever persisting for two days. After initial assessment in the Emergency Department, he was transferred to the Class I & II Ward with a medical diagnosis of *tropical malaria*. Assessment data

were collected on February 18, 2025, at 06:00 WIT through direct interviews and nursing observations. The patient was fully conscious (GCS E4V5M6 = 15). Vital signs showed blood pressure 126/64 mmHg, pulse 95 bpm, body temperature 39.8°C, respiration 20 bpm, and oxygen saturation 95%.

Based on the Indonesian Nursing Diagnosis Standards (SDKI), oxygenation needs were within normal limits, with regular breathing, symmetrical chest movement, vesicular breath sounds, and no cyanosis or use of accessory muscles. Nutritional and fluid needs were adequate, indicated by a BMI of 22.8, moist mucous membranes, good skin turgor, and absence of dehydration. The patient received intravenous Ringer's Lactate (1 bottle/8 hours) to maintain fluid balance. Elimination patterns were normal, with no urinary retention or abdominal tenderness. Activity and rest needs were met, as the patient was physically active and able to perform most activities with minimal family assistance. Sleep quality was good, and no fatigue was reported.

Neurological assessment showed intact orientation (time, place, person) and normal reflexes. Psychologically, the patient was calm, cooperative, and accepting of his health condition, with no signs of anxiety or distress. Growth and developmental aspects were age-appropriate, with logical thinking and adaptive social behavior. The patient demonstrated good personal hygiene and knowledge about his illness, actively participating in the treatment process.

Laboratory findings revealed WBC $7.1 \times 10^3/\mu\text{L}$ (normal) and a positive rapid test for *Plasmodium falciparum*, confirming *tropical malaria*. Medical therapy included Ringer's Lactate (IV, 1 bottle/8h), Ranitidine (IV, 1 ampoule/12h), Paracetamol (oral, 3×1), antimalarial drugs (oral, 1×3), Primaquine (oral, 1×1), and Farbion (IV, 1 ampoule/24h). These findings indicated hyperthermia due to *Plasmodium falciparum* infection. The nursing intervention of warm compress application was performed to reduce body temperature, improve comfort, and prevent complications. Continuous evaluation was carried out through monitoring vital signs, physiological responses, and patient comfort levels.

2) Nursing Diagnosis

From the environmental assessment, increased body temperature accompanied by flushed skin, dry lips, and excessive sweating indicated *hyperthermia*. The body temperature of 39.8°C confirmed thermoregulatory dysfunction that could lead to complications if untreated. Therefore, the nursing

diagnosis established was Hyperthermia related to increased body temperature (D.0130).

3) Nursing Planning, Implementation, and Evaluation

Based on the assessment, Mr. M with *tropical malaria* presented with hyperthermia (39.8°C), flushed skin, and excessive sweating. The nursing goal, according to the Indonesian Nursing Outcome Standards (SLKI), was that within 48 hours, the patient would achieve comfort improvement, as evidenced by a decrease in body temperature, reduction of skin redness, and alleviation of chills.

Nursing interventions were planned following the Indonesian Nursing Intervention Standards (SIKI), focusing on Hyperthermia Management (I.15506) through four components: observation, therapeutic action, education, and collaboration. Observation included identifying the cause of hyperthermia and monitoring body temperature regularly. Therapeutic actions involved creating a cool environment, providing oral fluids, and applying warm compresses to the forehead, axillae, and groin for 15 minutes. Educational measures encouraged bed rest to conserve energy and promote recovery. Collaborative actions included administering IV Ringer's Lactate and oral Paracetamol as prescribed.

Implementation was conducted on February 18, 2025. In the morning (06:00–09:00 WIT), the patient's temperature was 39.8°C with chills and generalized heat sensation. After the first intervention, the temperature decreased to 38.6°C, with partial relief of fever. By the afternoon (14:00–16:00 WIT), the temperature further declined to 37.8°C, with reduced flushing and chills. At night (20:00–23:30 WIT), the temperature normalized at 36.7°C, skin appeared normal, and vital signs stabilized (BP 120/71 mmHg, HR 98 bpm, RR 20 bpm, SpO₂ 96%).

Overall, the combination of warm compress application, fluid therapy, environmental adjustments, and medication collaboration effectively reduced the patient's body temperature. This result reinforces that warm compresses are an effective and safe nonpharmacological intervention for hyperthermia management, consistent with findings by Yuliani et al. (2020) and Putri & Rahmawati (2021), who reported that warm compress therapy promotes peripheral vasodilation and accelerates heat dissipation in febrile patients.

b. Discussion

1) Assessment

The assessment results in this study showed that Mr. M, a patient diagnosed with *tropical malaria*, presented with a chief complaint of high fever reaching 39.8°C, accompanied by chills, facial flushing, dry lips, and mild dehydration. Laboratory findings confirmed *Plasmodium falciparum* infection with a parasitemia level of 14,099/μL of blood, establishing the diagnosis of *tropical malaria*. These clinical manifestations reflect *hyperthermia* as the body's physiological response to parasitic infection.

A comprehensive nursing assessment was conducted, including subjective and objective data, physical examination, and laboratory results. Based on these findings, *hyperthermia* was identified as the primary nursing problem. The patient's persistent high fever corresponded to the typical pattern of *P. falciparum* infection, which shows irregular fever spikes due to asynchronous erythrocytic cycles, differing from the tertian fever pattern commonly observed in *Plasmodium vivax* infections.

These findings are consistent with the study by Palapessy et al. (2024) on 45 malaria patients in Eastern Indonesia, which reported that 95% of patients with *tropical malaria* experienced hyperthermia as the main clinical manifestation, with body temperatures ranging from 38.5°C to 40°C during the acute phase and 70% exhibiting mild to moderate dehydration. Similarly, Rumbiak (2024) found that young adults (18–25 years), such as Mr. M, displayed more pronounced clinical manifestations compared to older adults, with 90% experiencing high fever and chills. Supporting evidence from Siregar et al. (2023) involving 112 malaria patients showed that 87% had hyperthermia as the primary issue, with an average temperature of 39.5°C.

Pathophysiologically, hyperthermia in malaria results from the immune response to parasitic infection. Ashley et al. (2022) explain that body temperature elevation occurs due to the release of pro-inflammatory cytokines and endogenous pyrogens when erythrocytic schizonts rupture, releasing merozoites, hemozoin, and cell debris. These substances activate macrophages to produce interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α), which act on the hypothalamic thermoregulatory center to raise the body's set point temperature. White et al. (2023) further note that prostaglandin E2 (PGE2) plays a central role in this mechanism.

In summary, hyperthermia represents the main clinical manifestation in *tropical malaria* caused by *P. falciparum* infection. The body's immune response to the parasitic life cycle within erythrocytes triggers the release of pro-inflammatory cytokines that elevate the hypothalamic set point temperature, leading to persistent fever. Comprehensive assessment including subjective, objective, physical, and laboratory data is essential to establish the correct nursing diagnosis and guide appropriate interventions.

2) Nursing Diagnosis

Based on the assessment, the primary nursing diagnosis established was *Hyperthermia related to increased body temperature*, consistent with the Indonesian Nursing Diagnosis Standards (SDKI) code D.0130, category "Environment," subcategory "Safety and Protection." Supporting data included subjective reports of fever for two days, sensations of heat, and chills, along with objective findings of a body temperature of 39.8°C, warm and flushed skin, and signs of mild dehydration.

Hyperthermia was prioritized due to the potential risk of physiological disturbances and complications such as febrile seizures, severe dehydration, and altered consciousness if not promptly managed. This aligns with Suparti et al. (2020), who found hyperthermia to be the priority nursing diagnosis in 85% of malaria cases. Aurelia et al. (2022) demonstrated that accurate formulation of the hyperthermia diagnosis considering both subjective and objective data significantly correlated with successful intervention outcomes ($p < 0.05$). Casman et al. (2023) similarly identified hyperthermia as the primary diagnosis in febrile patients, characterized by elevated body temperature, flushing, and tachycardia.

Kozier et al. (2022) emphasize that the formulation of hyperthermia diagnoses must account for the degree of fever, physiological response, and potential complications. Potter et al. (2023) highlight the importance of differentiating between infection-induced hyperthermia and conditions such as malignant hyperthermia or heat stroke, which require distinct management strategies. In malaria, hyperthermia results from an elevated hypothalamic set point triggered by inflammatory mediators, thus nursing management must address both temperature reduction and infection control.

3) Intervention

The nursing intervention plan followed the Indonesian Nursing Intervention Standards (SIKI), code I.15506 (*Hyperthermia Management*). Interventions included:

(1) identifying the cause of hyperthermia, (2) monitoring body temperature, (3) maintaining a cool environment, (4) encouraging oral fluid intake, (5) applying warm compresses to the forehead, neck, chest, abdomen, and axillae for 15 minutes, (6) encouraging bed rest, (7) collaborating in intravenous fluid administration, and (8) collaborating in analgesic administration.

The warm compress was the primary independent nursing action, chosen for its physiological mechanism of inducing peripheral vasodilation, opening skin pores, and promoting heat dissipation through sweat evaporation. Casman et al. (2023) reported that warm compresses (37–40°C) reduced body temperature by 0.8–1.2°C within 30 minutes and provided greater comfort than cold compresses ($p < 0.05$). Similarly, Pawestri (2023) and Aurelia et al. (2022) found that warm compress therapy combined with adequate hydration decreased body temperature by an average of 1.3–1.5°C within an hour, normalizing temperature in most malaria patients within 48 hours.

Physiologically, warm compresses act via thermal conduction and central thermoregulatory stimulation. Pittara (2022) notes that heat applied to the skin activates thermoreceptors that signal the hypothalamus to lower the set point, induce vasodilation, and enhance heat loss. Potter et al. (2023) support this, explaining that warm compresses are more effective than cold ones in infection-induced hyperthermia, as they avoid vasoconstriction and shivering that can increase heat production. Wood et al. (2023) also emphasize that managing malaria-associated fever should aim to restore hypothalamic thermoregulation rather than simply suppressing temperature.

4) Implementation

Implementation was carried out on February 18, 2025, beginning at 06:00 WIT, focusing on temperature reduction and complication prevention. Initial steps included identifying the etiology (*P. falciparum* infection, parasitemia 14,099/μL), recording baseline temperature (39.8°C), improving ventilation, providing oral fluids, and applying warm compresses to the forehead, axillae, and groin for 15 minutes. Bed rest was encouraged, and Paracetamol was administered.

These actions align with Pawestri (2023), who found that warm compress application every 4–6 hours combined with environmental control and hydration significantly accelerated temperature reduction ($r = 0.78$; $p < 0.01$). Suparti et al. (2020) also reported that combining warm compresses and antipyretics shortened fever duration by 1.2 days compared to medication alone. Aurelia et al. (2022) stressed

that optimal technique including selection of vascular areas and water temperature (37–40°C) determines intervention success.

The WHO (2023) recommends combining non-pharmacological measures such as warm compresses with pharmacological therapy to eradicate the malaria parasite. Kozier et al. (2022) emphasize regular monitoring of body temperature and early detection of complications, while Potter et al. (2023) highlight the importance of patient comfort and holistic care.

5) Evaluation

Evaluation followed the SOAP method. On February 18, 2025, at 09:00 WIT, the patient reported reduced chills, with objective temperature of 38.6°C. By 16:00 WIT, temperature decreased to 37.8°C, and at 21:00 WIT it normalized to 36.7°C, with stable vital signs and improved comfort.

These findings align with Pawestri (2023), who found 89% of malaria patients normalized temperature within 48 hours of consistent warm compress application. Casman et al. (2023) similarly reported significant clinical improvement in febrile patients within 24–72 hours. Pittara (2022) and Potter et al. (2023) emphasize that comprehensive evaluation should include temperature, hydration, neurological function, and general condition. Wood et al. (2023) and WHO (2023) recommend continued monitoring for 24–48 hours to detect fever recurrence due to *P. falciparum*'s irregular cycle.

Overall, this study demonstrated that evidence-based nursing interventions particularly warm compress therapy, environmental management, and fluid support were effective in gradually normalizing body temperature within 24 hours, preventing complications, and enhancing patient comfort.

4. CONCLUSION

The case study of Mr. M with tropical malaria showed hyperthermia (39.8°C), accompanied by chills, flushed skin, and mild dehydration. Laboratory examination revealed a *Plasmodium falciparum* infection of 14,099/μL of blood. The nursing diagnosis established was Hyperthermia (D.0130) related to increased body temperature. The intervention included Hyperthermia Management (I.15506), which involved monitoring body temperature, administering antipyretics, maintaining a cool environment, applying warm compresses to the forehead, armpits, and groin for 15 minutes, and advising bed rest. The intervention was implemented over one day with adequate oral and intravenous hydration. Evaluation showed a

reduction in body temperature to 36.7°C and the disappearance of fever symptoms. It is recommended that nursing services standardize the warm compress procedure (37–40°C for 15–20 minutes) in hyperthermia management. Nursing education should strengthen materials related to hyperthermia, while further research is suggested to compare the effectiveness of different compress techniques. Community education on fever management and malaria prevention is also essential.

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