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Risk Factors and Management of Dengue Hemorrhagic Fever (DHF) in Children in 2023–2025: *Literature Review*)

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Abstract
Introduction: *Dengue Hemorrhagic Fever remains a major public health problem in Indonesia, especially among children who are vulnerable to severe complications due to their immature immune systems. Objective: This study aimed to analyze the risk factors and management of Dengue Hemorrhagic Fever in children based on national studies published between 2023 and 2025.* ***Method***: *This study used a literature review with a descriptive qualitative approach. Articles were collected from Google Scholar, PubMed, and Garuda databases using keywords related to Dengue Hemorrhagic Fever in children. The selection process followed the PRISMA method and resulted in five national journals that met the inclusion criteria.* ***Result and Discussion***: *The findings showed that the main risk factors included low parental education, poor mosquito nest eradication practices, hanging clothes inside the house, poor nutritional status, and environmental conditions supporting mosquito breeding. Effective management strategies included the implementation of the "3M Plus" program, environmental management, vector control, health education, and early medical treatment through fluid monitoring and shock detection.* ***Conclusions***: *Collaboration among healthcare workers, families, schools, and communities is important to reduce Dengue Hemorrhagic Fever incidence in children.*

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Introduction

Dengue Hemorrhagic Fever (DHF) is a public health problem that remains a major concern in various tropical and subtropical countries, including Indonesia (Antoro & Nova Nurwindasari, 2021); (Anas, Wulandari, & Anas, 2025). This disease is caused by dengue virus infection which is transmitted through the bites of *Aedes aegypti* and *Aedes albopictus mosquitoes.* To date, dengue fever remains a highly contagious disease with a high incidence and the potential to cause serious complications and even death, especially in children. Children are particularly vulnerable to dengue infection because their immune systems are not yet fully developed, resulting in a higher risk of dengue shock, severe bleeding, and other complications compared to adults (Tansil, Rampengan, & Wilar, 2021); (Koibur, Satyarsa, Gustawan, Putra, & Utama, 2021); (Sakinah, 2025). This makes dengue fever in children a health problem that requires serious attention in terms of prevention, early detection, and management (Monica Panessa Alpians et al., 2023).

Understanding the pathophysiology of DHF is essential in providing a clinical foundation for recognizing its progression and severity, particularly in pediatric patients. The hallmark of DHF lies in a cascade of immunological responses triggered by dengue virus infection. Upon viral replication, immune-activated T lymphocytes and monocytes release pro-inflammatory cytokines—including tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), and interleukin-8 (IL-8)—which induce endothelial dysfunction and increased vascular permeability. This capillary leak syndrome results in plasma leakage from the intravascular compartment into interstitial spaces, clinically manifesting as pleural effusion, ascites, and hemoconcentration. Concurrently, dengue virus directly infects megakaryocytes and induces platelet destruction through immune-mediated mechanisms, leading to thrombocytopenia—a defining laboratory feature of DHF. In children, the combination of plasma leakage and thrombocytopenia creates a particularly precarious hemodynamic state; a rapid and critical reduction in circulating plasma volume can precipitate dengue shock syndrome (DSS), characterized by narrowing pulse pressure, hypotension, and end-organ hypoperfusion. Children are especially susceptible to progressing toward DSS due to their smaller blood volume reserve, faster physiological compensation exhaustion, and immature vascular autoregulation compared to adults. Recognizing these underlying mechanisms is therefore fundamental to guiding timely clinical assessment, fluid management strategies, and early identification of warning signs in pediatric dengue care

Indonesia as a tropical country has environmental conditions that are very supportive of the development of the *Aedes aegypti mosquito.* High rainfall, air humidity, population density, poor environmental sanitation, and low public awareness of mosquito nest eradication are factors that cause dengue fever cases to continue to increase every year (Athhar et al., 2025); (Sutriyawan, Darmawan, Akbar, Habibi, & Fibrianti, 2022). According to data from the Indonesian Ministry of Health, dengue fever cases in Indonesia remain quite high and are spread across almost all provinces. School -age children are one of the most affected groups due to their high activity levels in environments that pose a risk of dengue virus transmission. Furthermore, delays in treatment in children can worsen their clinical condition, increasing hospitalizations and deaths from dengue fever (Nurhalizah, Siswanto, Pakki, Saefurrohim, & Agustini, 2025); (Pramestirini, Ekawati, & Gumelar, 2024). Dengue fever in children not only causes physical impacts, but also impacts the psychological, social and economic aspects of the family. Children who experience dengue fever often have to undergo intensive care in hospital with close monitoring of the condition of body fluids, platelets, hematocrit, and

signs of shock. Parents also experience economic burdens due to medical costs and lost productive time while accompanying their children through treatment. Therefore, dengue fever prevention and treatment efforts need to be implemented comprehensively through collaboration between health workers, the government, schools, and the community.

In recent years, research on dengue fever in children has continued to develop, particularly regarding risk factors and disease management. Various studies have shown that numerous factors influence the incidence and severity of dengue fever in children, such as nutritional status, environmental conditions, parental knowledge, delayed diagnosis, platelet count, body fluid balance, and a history of previous dengue infection. Furthermore, socioeconomic factors and healthy living habits also play a role in increasing the risk of dengue transmission in children. Other studies have also shown that a lack of public awareness of the warning signs of dengue fever leads to delays in taking children to health facilities, resulting in a more severe condition when receiving medical treatment (Fitriyani, Khumaeni, & Fauzi, 2023). Management of dengue fever in children is an important aspect in reducing the number of complications and deaths. Appropriate management includes regular monitoring of clinical conditions, adequate fluid therapy, monitoring of platelets and hematocrit, and early identification of signs of dengue shock. In certain conditions, pediatric patients require intensive care to prevent organ failure and other serious complications. Developments in health technology and the latest clinical guidelines also encourage improvements in the quality of services for pediatric dengue fever patients. However, various obstacles remain in the implementation of dengue fever management, such as limited healthcare facilities, delayed diagnosis, and a lack of education for patients' families about the danger signs of the disease (Jusuf, Umboh, & Wungouw, 2024)

Recent studies conducted between 2023 and 2025 show varying results regarding risk factors and the effectiveness of dengue fever management in children. Some studies highlight the relationship between the neutrophil-lymphocyte ratio and the incidence of dengue shock in children, while others examine the influence of body fluid balance on the recovery process in pediatric dengue patients. Furthermore, studies have examined the role of maternal knowledge in early dengue fever detection and the risk factors for dengue shock syndrome (DSS) in pediatric patients. The diverse research findings indicate that dengue fever in children remains an important topic for further study to gain a more comprehensive understanding of the factors influencing its incidence and successful management (Nurcahya, Asmarudin, & Rizkiah, 2024). Based on this description, a literature review is needed to analyze various recent studies related to risk factors and management of Dengue Hemorrhagic Fever (DHF) in children between 2023 and 2025. This literature review is expected to provide a broader picture of the factors influencing the incidence of DHF in children and effective management efforts to reduce complications and mortality. Furthermore, the results of this study are also expected to serve as a source of information and reference for health workers, students, researchers, and the community in improving efforts to optimally prevent and treat DHF in children.

Method

This study used a *literature review method* with a qualitative descriptive approach to analyze various studies related to risk factors and management of Dengue Hemorrhagic Fever (DHF) in children in 2023–2025. The *literature review method* was used to collect, identify, evaluate, and synthesize relevant research results to obtain a comprehensive picture of the factors influencing the incidence of DHF in children and the management

carried out in treating the disease. The article search process was conducted online through several scientific databases, namely Google Scholar, PubMed, and Garuda. Keywords used in the article search process included "Dengue Hemorrhagic Fever in Children," "Dengue Fever in Children," "Dengue Hemorrhagic Fever in Children," "Risk Factors for DHF in Children," and "Dengue Fever Management in Children." The selected articles were research articles published between 2023 and 2025 to ensure the data obtained was more up-to-date and relevant to the latest research developments.

The inclusion criteria for this study included: 1) research articles discussing dengue fever in children; 2) articles published between 2023 and 2025; 3) articles available in *full text*; 4) articles with an ISSN or e-ISSN; and 5) articles using clear research methods. The exclusion criteria included: 1) articles that were not fully available; 2) articles in the form of opinions, editorials, or unpublished theses; and 3) articles that did not address the topic of risk factors and management of dengue fever in children. The article selection stage was carried out using the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*) method. During the identification stage, researchers identified several articles from the databases used. They then conducted a screening process based on title, abstract, year of publication, and relevance to the research topic. Duplicate articles were then eliminated to obtain articles that met the criteria for further analysis. After the selection process, five articles met the inclusion criteria and were used in this literature review. The data obtained were then analyzed descriptively by comparing the research objectives, research methods, samples, research results, and conclusions of each article. The analysis results are presented in narrative form and a literature review matrix table to facilitate understanding of the risk factors and management of dengue fever in children based on the latest research.

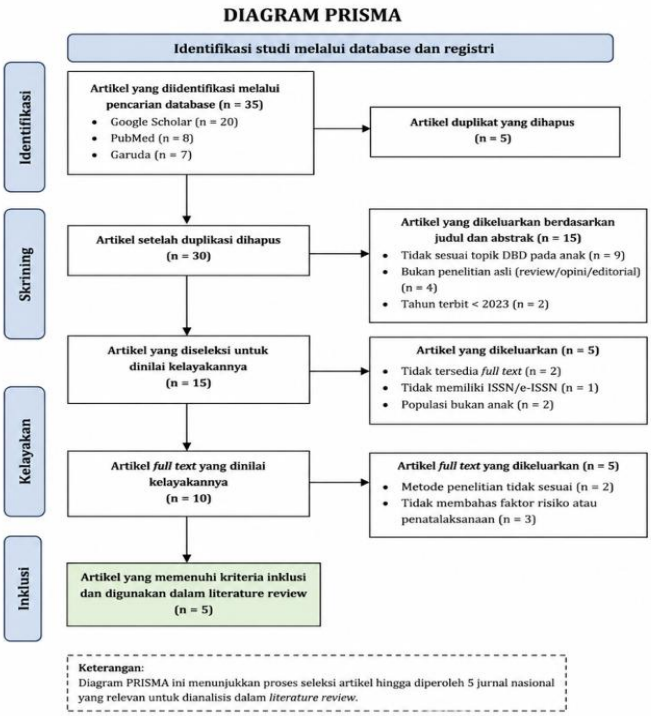

Figure 1. Prisma stages

Result and Discussion

Based on the results of an article search through the Google Scholar, PubMed, and Garuda databases, 35 articles were obtained related to the risk factors and management of Dengue Hemorrhagic Fever (DHF) in children. After a selection process using the PRISMA method based on inclusion and exclusion criteria, five national articles were obtained that met the requirements for analysis in this study. The articles used were research articles published between 2023 and 2025 and had an ISSN or e-ISSN.

The study results indicate that risk factors for dengue fever in children are influenced by various factors, such as parents' lack of knowledge regarding early dengue detection, the patient's fluid balance, platelet count, neutrophil-lymphocyte ratio, and the risk of developing Dengue Shock Syndrome (DSS). Furthermore, management of dengue fever in children focuses on monitoring the patient's clinical condition, regulating fluid therapy, observing for signs of shock, and providing prompt and appropriate medical treatment to prevent more serious complications (Alvin Faiz Bara Mentari & Hartono, 2023).

Tabel 1
Literature Review Matrix

No	Author(s)	Method	Sample	Location	Results
1	Fitriyani, Khumaeni, & Fauzi (2023)	Community education webinar and descriptive approach	University students and community participants	Ajibarang, Indonesia	Environmental factors such as mosquito breeding sites, humidity, and population density were identified as major risk factors for DHF. The study found that the “3M Plus” strategy and integrated vector control were effective in preventing dengue transmission.
2	Azzahra et al. (2023)	Analytical observational study (*case-control*)	Children aged 6–12 years	Public health center area in Indonesia	Children whose mothers had low educational levels and who did not use mosquito repellent or protective clothing had a higher risk of DHF. Family support and mosquito nest eradication practices reduced dengue incidence among children.
3	Tansil, Rampengan, & Wilar (2023)	Literature review/meta-review	Secondary data from previous studies	Indonesia	The study identified sociodemographic, environmental, climatological, and behavioral factors as significant risk factors for DHF. Hanging clothes indoors, poor environmental sanitation, and lack of 3M practices increased dengue risk.

4	Winarti, Nugroho, & Lubis (2025)	Observational and case-control study	Children under 15 years old	Bintaro, Indonesia	Poor nutritional status, younger age, mosquito larvae presence, poor sanitation, and lack of self-protection behaviors were significantly associated with DHF incidence in children. Health education and early detection were important preventive measures.
5	Rumaf et al. (2025)	Community intervention and health education program	Elementary school students and teachers	SD Negeri 1 Motoboi Kecil, Kotamobagu, Indonesia	Health education, interactive discussions, and ovitrap implementation improved students' knowledge and awareness regarding dengue prevention. School-based vector control and 3M Plus practices were effective in reducing DHF risk among children.

Based on the review of five national journals published between 2023 and 2025, Dengue Hemorrhagic Fever (DHF) in children is strongly influenced by environmental, behavioral, and socio-demographic factors. Environmental conditions such as mosquito breeding sites, poor sanitation, humidity, and high population density create favorable conditions for the spread of *Aedes aegypti* mosquitoes. In addition, behavioral factors including hanging clothes indoors, not using mosquito repellent, and poor implementation of mosquito nest eradication practices (3M) significantly increase the risk of dengue infection among children. Several studies also highlighted that low parental education, especially mothers' educational background, contributes to limited knowledge regarding dengue prevention and early detection (Nurcahya et al., 2024)

In terms of management and prevention, the reviewed studies emphasized that the "3M Plus" strategy remains the most effective preventive approach in reducing dengue transmission. Community participation, health education, school-based interventions, and vector control programs such as ovitrap implementation were shown to improve public awareness and preventive behavior. Early detection, environmental management, and continuous health promotion are essential to minimize severe complications and reduce the incidence of DHF in children. Therefore, collaboration among families, schools, healthcare workers, and communities is necessary to establish sustainable dengue prevention and control programs.

Beyond preventive strategies, clinical management of DHF in children constitutes an equally critical dimension that warrants discussion. According to the WHO 2009 and 2012 dengue management guidelines, fluid therapy is the cornerstone of DHF treatment in pediatric patients. Children with DHF without shock should receive isotonic crystalloid solutions—such as Ringer's Lactate or 0.9% Normal Saline—at carefully titrated rates, guided by clinical signs of perfusion including capillary refill time, urine output (target ≥0.5 mL/kg/hour), pulse quality, and level of consciousness. The minimum effective fluid volume should always be prioritized, as fluid overload itself can lead to serious complications such as pulmonary edema and respiratory distress, particularly in younger children with limited cardiorespiratory reserve.

Serial monitoring of platelet count and hematocrit remains fundamental throughout the course of illness. A hematocrit rise of ≥20% above baseline signals significant plasma leakage and impending hemodynamic compromise, while a falling platelet count below 100,000/mm³ accompanied by clinical warning signs warrants close inpatient observation. Platelet transfusion is generally reserved for counts below 10,000–20,000/mm³ with active bleeding, as prophylactic transfusion has not demonstrated clinical benefit and may worsen plasma leakage through volume expansion. When Dengue Shock Syndrome (DSS) is identified—characterized by rapid weak pulse, narrowing pulse pressure ≤20 mmHg, cold extremities, and altered consciousness—an immediate IV fluid bolus of 10–20 mL/kg over 15–30 minutes is indicated, with repeated reassessment after each bolus. If the hemodynamic status fails to improve after repeated crystalloid administration, colloid solutions may be considered as rescue therapy. Hospitalization is indicated when children present with platelet counts below 100,000/mm³ with warning signs, hematocrit rise, persistent vomiting, bleeding manifestations, signs of plasma leakage, or any degree of hemodynamic instability, with a lower threshold applied to children under five years of age or those with underlying comorbidities. Regarding pharmacological support, paracetamol remains the only recommended antipyretic, while NSAIDs and aspirin are strictly contraindicated due to their platelet-inhibiting and gastric-bleeding risks. Corticosteroids are similarly not routinely recommended under current WHO guidelines.

It is important to acknowledge, however, that none of the five national articles reviewed in this study specifically addressed these clinical management aspects. The reviewed studies were predominantly focused on preventive, epidemiological, and community-based dimensions of DHF, and therefore the clinical management discussion above was constructed based on established WHO guidelines rather than primary data from the reviewed articles. This represents a notable limitation of the current review and highlights the need for future national studies in Indonesia to address the clinical management of pediatric DHF with greater depth, particularly in resource-limited healthcare settings.

Conclusion

Based on the results of a literature review of five national journals from 2023–2025, it can be concluded that Dengue Hemorrhagic Fever (DHF) in children remains a health problem influenced by various risk factors, including environmental, behavioral, and biological factors. The most dominant risk factors include low levels of parental education and knowledge regarding DHF prevention, the habit of hanging clothes indoors, lack of mosquito nest eradication (PSN) practices, the presence of mosquito breeding sites, unclean environmental conditions, and poor nutritional status of children. These factors play a role in increasing the risk of dengue virus transmission in children.

In addition to risk factors, management of dengue fever in children encompasses both preventive and clinical dimensions. The most effective preventive approach remains the routine implementation of the "3M Plus" method, supported by community-based vector control programs such as health cadre training, family and school education, and ovitrap use. On the clinical side, management focuses on isotonic fluid therapy to counter plasma leakage, serial monitoring of platelet count and hematocrit, early recognition and prompt resuscitation of Dengue Shock Syndrome (DSS), appropriate hospitalization based on warning signs, and the use of paracetamol as the only recommended antipyretic

while avoiding NSAIDs and aspirin. It is noted, however, that the reviewed articles did not specifically address these clinical aspects, which represents a limitation of this review.

Overall, successful management of DHF in children requires collaboration between healthcare workers, families, schools, and the community. Both clinical vigilance at the facility level and community-based prevention efforts are equally essential in reducing the incidence, complications, and mortality of DHF in children in Indonesia.

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