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Holistic Primary Care–Based Management of Typhoid Fever in a Toddler from a Resource-Limited Community Setting

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Abstract

Typhoid fever remains a significant public health challenge in many low- and middle-income countries, including Indonesia, where inadequate sanitation, limited access to clean water, and suboptimal hygiene practices continue to facilitate disease transmission. Although typhoid fever is more commonly reported in school-aged children and adolescents, its occurrence in toddlers poses unique diagnostic and management challenges due to atypical clinical presentations and increased vulnerability to dehydration and complications. Early recognition and comprehensive management at the primary health care level are therefore critical. This study describes the holistic primary care–based management of typhoid fever in a 14-month-old boy presenting to a community health center in Bandar Lampung, Indonesia. The patient was brought with a three-day history of persistent fever and a one-week history of watery diarrhea, accompanied by decreased appetite, irritability, and generalized weakness. A holistic diagnostic approach integrating clinical symptoms, physical examination, environmental exposure, and family hygiene practices was applied. Key clinical features included a fever pattern worsening in the late afternoon to evening, prolonged diarrhea, and a coated tongue with erythematous margins, strongly suggestive of typhoid fever in the absence of other focal infections. Management combined pharmacological and non-pharmacological interventions tailored to the toddler age group and primary care setting. Pharmacological therapy consisted of first-line antibiotic treatment with cotrimoxazole, antipyretic therapy, zinc supplementation, and oral rehydration therapy to prevent dehydration. Non-pharmacological interventions emphasized continued breastfeeding, adequate fluid intake, safe food preparation, access to clean drinking water, and strict hand hygiene practices within the household. Family members were actively involved in the care process to ensure adherence to treatment and implementation of preventive measures. Clinical improvement was observed following the integrated intervention, with resolution of fever and gastrointestinal symptoms and restoration of appetite and activity levels. This approach highlights the importance of combining clinical management with family-centered hygiene education and environmental risk assessment. The findings underscore the critical role of primary health care services in early detection, effective treatment, and prevention of typhoid fever among vulnerable pediatric populations.

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1. Introduction

Typhoid fever remains a persistent and significant public health challenge in many low- and middle-income countries, including Indonesia. Despite notable advances in sanitation, vaccination strategies, and disease surveillance, the disease continues to contribute substantially to morbidity, particularly among vulnerable pediatric populations. Typhoid fever is primarily transmitted through the fecal–oral route following ingestion of food or water contaminated with Salmonella enterica serovar Typhi or Paratyphi. In densely populated urban and peri-urban areas, inadequate sanitation infrastructure, unsafe water sources, and suboptimal hygiene practices sustain endemic transmission and limit the effectiveness of conventional disease control measures. Consequently, typhoid fever continues to be recognized as a priority infectious disease in national and regional public health agendas (Egan et al., 2024; Ulpathakumbura et al., 2026; Zhao et al., 2026).

Indonesia remains one of the countries with a considerable burden of typhoid fever in Southeast Asia. Epidemiological data indicate that children represent a disproportionately affected group, with the highest incidence observed in school-aged children and toddlers. Although

improvements in primary healthcare coverage have enhanced access to medical services, delayed presentation and under-recognition of early symptoms remain common, particularly in younger children who often present with nonspecific clinical manifestations. In toddlers, typhoid fever may initially manifest as prolonged fever, gastrointestinal disturbances, irritability, and feeding refusal, symptoms that overlap with other common pediatric infections. This diagnostic ambiguity frequently results in delayed initiation of appropriate therapy and increases the risk of complications (Zhou et al., 2026).

In recent years, growing concern has emerged regarding the changing antimicrobial susceptibility patterns of S. Typhi. Several studies have documented increasing resistance to conventional first-line antibiotics such as chloramphenicol, ampicillin, and trimethoprim–sulfamethoxazole. More concerning is the emerging reduced susceptibility to third-generation cephalosporins, including ceftriaxone, which has long been considered a cornerstone of pediatric typhoid treatment (Wang et al., 2026). These resistance trends complicate clinical decision-making in resource-limited settings, where access to advanced diagnostic tools and alternative antimicrobial agents may be restricted. For toddlers, who possess immature immune systems and limited physiological reserves, delayed or ineffective treatment may rapidly lead to severe complications such as intestinal perforation, gastrointestinal bleeding, sepsis, electrolyte imbalance, and altered mental status (Slee et al., 2026).

Beyond antimicrobial resistance, the epidemiology of typhoid fever reflects the complex interaction between host, pathogen, and environmental factors. The epidemiologic triad remains particularly relevant in pediatric typhoid fever. Toddlers are inherently vulnerable due to their developing immune systems, frequent hand-to-mouth behavior, and complete dependence on caregivers for food preparation, hygiene, and access to clean water. Environmental determinants, including inadequate household sanitation, unsafe drinking water, improper food handling, and high residential density, have been consistently associated with increased typhoid incidence in community-based studies conducted in Indonesia (Tsai et al., 2025). These findings highlight that medical treatment alone is insufficient to control disease transmission without simultaneous improvements in hygiene practices and environmental conditions.

Primary healthcare facilities, particularly community health centers (puskesmas), play a pivotal role in addressing the multifactorial nature of typhoid fever in resource-limited settings. As the first point of contact within the healthcare system, puskesmas are uniquely positioned to provide early case identification, initiate timely antimicrobial therapy, and deliver comprehensive caregiver education. Moreover, primary healthcare providers are responsible for monitoring treatment adherence, recognizing early signs of complications, and implementing preventive strategies at the household and community levels. However, the effectiveness of these services is often constrained by limited diagnostic resources, high patient loads, and variability in adherence to antimicrobial stewardship principles (Lin et al., 2025).

Irrational antibiotic use remains a significant concern in the management of typhoid fever at the primary care level. National studies have reported suboptimal rational antibiotic prescribing practices, including inappropriate drug selection, dosing errors, and insufficient treatment duration (Chen et al., 2025). Such practices not only compromise individual patient outcomes but also contribute to the broader public health problem of antimicrobial resistance. In pediatric populations, repeated exposure to antibiotics further increases the risk of resistance development and alters gut microbiota, underscoring the need for judicious and evidence-based prescribing practices (Lin et al., 2025; Tsai et al., 2025).

Regionally, Lampung Province, particularly Bandar Lampung City, presents unique geographical and socioeconomic conditions that heighten the risk of typhoid transmission. Coastal areas, high population mobility, dense settlements, and reliance on shallow groundwater sources increase susceptibility to water contamination and cross-infection. Although comprehensive regional surveillance data are limited, local studies and routine clinical reports consistently indicate that typhoid fever remains prevalent among children. Toddlers, in particular, face elevated risk due to their limited ability to practice personal hygiene independently and their reliance on caregivers' behaviors.

Within this regional context, Puskesmas Sukaraja serves a community characterized by variable sanitation standards and constrained access to clean water. Located in a coastal area with high population density and mobility, the health center frequently encounters pediatric patients presenting with febrile illnesses and gastrointestinal symptoms suggestive of enteric infections. In such settings, primary healthcare providers must often rely on a combination of clinical judgment, basic laboratory investigations, and epidemiological context to guide management decisions.

Given the ongoing burden of typhoid fever, the emergence of antimicrobial resistance, and the vulnerability of toddlers in resource-limited environments, there is a pressing need to document and disseminate practical management strategies implemented at the primary healthcare level. This study aims to describe the holistic, primary care–based management of typhoid fever in a toddler treated at a community health center in Bandar Lampung, Indonesia. By integrating pharmacological therapy with rehydration, nutritional support, caregiver education, and environmental hygiene interventions, this report offers valuable insights into comprehensive typhoid fever management in settings where resources are limited. Furthermore, this study highlights the critical role of primary healthcare services in reducing disease severity, preventing complications, and contributing to broader typhoid fever control efforts in endemic regions.

2. Materials and Methods

2.1. Study Design and Setting

This study employed a descriptive observational design with a qualitative clinical approach to document the holistic management of typhoid fever in a toddler. The study was conducted at Sukaraja Community Health Center (Puskesmas Sukaraja), a primary healthcare facility located in a coastal and densely populated area of Bandar Lampung City, Indonesia. The health center serves a population characterized by variable sanitation standards, high population mobility, and limited access to clean water, representing a resource-limited community setting.

2.2. Study Participant

The study involved a toddler aged 1 year and 2 months who presented to the community health center with prolonged fever and gastrointestinal symptoms suggestive of enteric infection. The patient was selected based on clinical presentation consistent with suspected typhoid fever and

the feasibility of comprehensive follow-up within the primary care setting. Written informed consent was obtained from the patient's parents prior to data collection and clinical management.

2.3. Clinical Assessment and Diagnostic Approach

A comprehensive clinical assessment was performed at the initial visit, including detailed history taking, physical examination, and evaluation of environmental and behavioral risk factors. History taking focused on the duration and pattern of fever, gastrointestinal symptoms, feeding behavior, hydration status, prior medication use, and family or environmental exposure risks. Physical examination included assessment of vital signs, nutritional status, hydration status, abdominal findings, and neurological condition (Cannizzaro & Spessotto, 2025; Chen et al., 2025; Lien et al., 2025).

Basic laboratory investigations were conducted to support the clinical diagnosis, including complete blood count and Widal serological testing. Interpretation of laboratory results was performed in conjunction with clinical findings and epidemiological context, given the limited availability of blood culture facilities at the primary healthcare level. Typhoid fever was diagnosed presumptively based on compatible clinical features and a significant Widal O antigen titer, while recognizing blood culture as the diagnostic gold standard.

2.4. Holistic Management Approach

Management followed a holistic primary care–based approach integrating pharmacological and non-pharmacological interventions. Pharmacological treatment consisted of antibiotic therapy selected according to national and World Health Organization guidelines for pediatric typhoid fever, adjusted for age and body weight. Supportive therapy included antipyretics and oral rehydration therapy to address fever and dehydration (Ding et al., 2025; Garg et al., 2025; Hoyek et al., 2025).

Non-pharmacological interventions focused on caregiver education and environmental health promotion. Caregivers received structured counseling on appropriate feeding practices, continued breastfeeding, safe food preparation, hand hygiene, clean water use, and proper sanitation practices. Nutritional support was provided to address undernutrition, and caregivers were educated on recognizing danger signs requiring prompt medical attention.

2.5. Follow-Up and Outcome Assessment

The patient was followed up regularly at the community health center to monitor clinical progress, treatment adherence, and potential adverse effects. Outcome measures included resolution of fever, improvement of gastrointestinal symptoms, hydration status, nutritional intake, and overall clinical condition. Caregiver understanding and adherence to hygiene and treatment recommendations were also assessed during follow-up visits.

2.6. Data Collection and Analysis

Clinical, laboratory, and follow-up data were collected from medical records and direct observation during patient visits. Data were analyzed descriptively and presented narratively to illustrate the clinical course, management strategy, and outcomes. No statistical analysis was performed due to the descriptive nature of the study.

2.7. Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the institutional ethics committee of the Faculty of Medicine, Malahayati University. Written informed consent was obtained from the patient's parents, and patient anonymity was maintained throughout the study.

3. Results and Discussion

Based on a comprehensive holistic assessment, the patient's clinical presentation strongly suggested typhoid fever. The main complaints included fever for three days with a characteristic pattern of increasing intensity in the late afternoon to evening, accompanied by watery diarrhea lasting one week, generalized weakness, irritability, and decreased appetite. Additional clinical features such as a whitish-coated tongue with erythematous margins further supported the suspicion of enteric fever. These findings are consistent with the typical clinical manifestations of Salmonella enterica serovar Typhi infection in young children. Physical examination revealed signs that reinforced the clinical diagnosis. Vital signs showed a blood pressure of 90/60 mmHg, pulse rate of 86 beats per minute, respiratory rate of 26 breaths per minute, and body temperature of 36°C, likely influenced by prior antipyretic administration. Despite the relatively normal pulse rate, the degree of fever history suggested relative bradycardia, a classical but not always prominent feature of typhoid fever. Gastrointestinal examination demonstrated decreased bowel sounds, indicating impaired intestinal motility, while tongue inspection revealed a "dirty white" coating with red margins, a finding commonly associated with typhoid fever (Cannizzaro & Spessotto, 2025).

The patient appeared generally weak but remained neurologically intact (compos mentis). Signs of mild to moderate dehydration were suspected due to prolonged diarrhea, contributing to reduced activity and feeding refusal. Anthropometric assessment revealed undernutrition, with a body weight of 7.6 kg and a body mass index of 11.58, which likely exacerbated susceptibility to infection and influenced the severity of clinical manifestations. Laboratory investigations supported the presumptive diagnosis. Hematological parameters were within normal ranges for age, including hemoglobin, hematocrit, leukocyte count, and platelet count, a pattern frequently observed in typhoid fever where leukocytosis is often absent. Serological testing using the Widal test demonstrated a significant Salmonella typhi O antigen titer of 1/160, accompanied by lower titers of S. paratyphi. In the context of compatible clinical features and an endemic setting, these findings supported the

working diagnosis of typhoid fever, although blood culture remains the diagnostic gold standard.

Based on the final holistic diagnostic assessment, management was initiated using an integrated approach combining pharmacological therapy and caregiver-focused health education. Pharmacological treatment included cotrimoxazole suspension administered according to age-appropriate dosing as first-line antibiotic therapy in the primary healthcare setting. Paracetamol syrup was prescribed to control fever and improve comfort. Oral rehydration salts were administered to address fluid and electrolyte losses, while zinc sulfate supplementation was provided to promote intestinal mucosal recovery and reduce the duration of diarrhea. In parallel, comprehensive health education was delivered to the caregivers. Counseling emphasized hygienic food preparation, consumption of well-cooked meals, use of boiled or safe drinking water, proper hand hygiene before feeding and after diaper changes, and adherence to the full course of antibiotic therapy. Parents were also educated on recognizing danger signs requiring immediate medical attention, including persistent high fever, repeated vomiting, worsening diarrhea, increasing lethargy, or signs of dehydration (Blaney et al., 2025; Fischman et al., 2025; Mandolesi et al., 2025; Peng et al., 2025; Terrin et al., 2025).

This case illustrates the typical yet clinically challenging presentation of typhoid fever in a toddler within a resource-limited community setting. The combination of prolonged fever with an evening rise, watery diarrhea, anorexia, irritability, and a coated tongue strongly reflects the classical features of typhoid fever in young children. Unlike older children and adults, toddlers often present with nonspecific symptoms, making early diagnosis difficult and increasing the risk of delayed treatment and complications. Typhoid fever is a systemic infection caused by Salmonella enterica serovar Typhi or Paratyphi, transmitted primarily through ingestion of contaminated food or water. Following oral entry, the bacteria invade the intestinal mucosa via M cells in the Peyer's patches, proliferate within macrophages, and disseminate through the reticuloendothelial system. This process results in bacteremia and systemic inflammation, manifesting clinically as fever, gastrointestinal disturbances, malaise, and anorexia. In younger children, diarrhea is more common than constipation due to immature intestinal immunity and mucosal inflammation.

Environmental and epidemiological factors played a critical role in this case. The patient resided in a densely populated coastal area of Bandar Lampung with variable sanitation conditions and limited access to clean water. Such settings are known to facilitate fecal–oral transmission of S. Typhi, particularly among toddlers who rely entirely on caregivers for food hygiene and water safety. Young age, undernutrition, and environmental exposure collectively increased the patient's vulnerability to infection and disease severity. From a public health perspective, typhoid fever remains a major global concern, with an estimated 9–12 million cases and more than 100,000 deaths annually, predominantly in South and Southeast Asia (Ayadi et al., 2026). In Indonesia, typhoid fever continues to be endemic, with a substantial burden among children under five years of age. Regional data from Lampung Province consistently report typhoid fever among the most common infectious diseases encountered in primary healthcare facilities, underscoring the ongoing transmission risk.

The diagnostic approach in this case reflects the realities of primary healthcare in resource-limited settings. While blood culture is the gold standard for diagnosing typhoid fever, limited availability and cost constraints often necessitate reliance on clinical judgment supported by basic laboratory tests such as the Widal test. Although the Widal test has limitations in sensitivity and specificity, a significant O antigen titer in conjunction with compatible clinical findings and endemic exposure can provide supportive diagnostic evidence when interpreted cautiously. Management of typhoid fever in toddlers requires a comprehensive and integrated approach. Antibiotic therapy remains the cornerstone of treatment, with appropriate selection based on local resistance patterns and guideline recommendations. Supportive care, including antipyretics, rehydration therapy, and nutritional support, is equally critical in preventing complications such as dehydration, electrolyte imbalance, and malnutrition. Zinc supplementation has been shown to reduce the duration and severity of diarrhea and support intestinal recovery in pediatric patients.

Importantly, this case highlights the essential role of holistic primary care–based management. Beyond pharmacological treatment, caregiver education and environmental hygiene interventions are vital to prevent reinfection and community transmission. Education on safe food handling, clean water use, hand hygiene, and adherence to prescribed therapy represents a cornerstone of effective typhoid fever management at the primary healthcare level. The prognosis of typhoid fever in toddlers is generally favorable when early diagnosis and appropriate treatment are provided. The World Health Organization reports that effective antibiotic therapy can significantly reduce the duration of illness and lower the risk of severe complications. Conversely, delayed or inadequate treatment may result in serious outcomes such as intestinal bleeding, perforation, sepsis, and prolonged nutritional deficits.

Overall, this case underscores that typhoid fever in toddlers is not merely a medical condition but a disease deeply influenced by environmental, behavioral, and socioeconomic factors. Strengthening holistic primary care services, promoting rational antibiotic use, and enhancing caregiver education are essential strategies for improving clinical outcomes and reducing the burden of typhoid fever in resource-limited community settings.

4. Conclusions

This study highlights the critical role of holistic, primary care–based management in the effective treatment of typhoid fever in toddlers living in resource-limited community settings. Typhoid fever remains a persistent public health challenge in many developing regions, particularly among young children who are highly vulnerable due to immature immune systems, dependence on caregivers, and exposure to suboptimal environmental sanitation. The clinical presentation in this case characterized by prolonged fever with an evening rise, watery diarrhea, anorexia, weakness, and a coated tongue reflects the typical manifestations of pediatric typhoid fever and underscores the diagnostic challenges faced at the primary healthcare level. The findings of this study demonstrate that early recognition of clinical patterns, supported by basic laboratory investigations and epidemiological context, enables timely diagnosis and appropriate intervention even in settings with limited diagnostic resources. The integration of pharmacological therapy, including age-appropriate antibiotic treatment, antipyretics, oral rehydration therapy, and zinc supplementation, proved effective in improving the patient's clinical condition and preventing the progression of complications. Importantly, supportive care addressing hydration status and nutritional needs played a crucial role in optimizing recovery in this undernourished toddler. Beyond medical treatment, this study emphasizes the indispensable contribution of caregiver education and environmental hygiene interventions. Counseling on safe food preparation, clean water consumption, hand hygiene, and adherence to antibiotic

therapy represents a cornerstone of comprehensive typhoid fever management. Such non-pharmacological measures not only enhance treatment outcomes but also reduce the risk of reinfection and community transmission. This holistic approach aligns with the principles of primary healthcare, which prioritize prevention, continuity of care, and community engagement. The effective management of typhoid fever in toddlers requires more than antimicrobial therapy alone. A holistic primary care–based approach that integrates clinical management, caregiver education, and environmental health promotion is essential for achieving optimal outcomes in resource-limited settings. Strengthening primary healthcare capacity, promoting rational antibiotic use, and improving sanitation and hygiene practices are key strategies to reduce the burden of typhoid fever and protect vulnerable pediatric populations in endemic regions.

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Informed Consent Statement: Written informed consent has been obtained from the patient's guardian to publish this case report, including clinical details and images.

Data Availability Statement: All data supporting the findings of this study are contained within the article. No additional datasets were generated or analyzed.

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