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Overview of Routine Blood Tests for Typhoid Fever Patients at Bendan Regional General Hospital, Pekalongan City

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ABSTRACT

Background & Objective: Typhoid fever is an acute infectious disease that remains a health problem in Indonesia due to its high morbidity and mortality rates. This disease is caused by Salmonella typhi or Salmonella paratyphi and can be diagnosed through routine blood tests. This study aims to determine the routine blood profile of typhoid fever patients at Bendan Regional General Hospital in Pekalongan City. **Method:** This study used a descriptive design with a sample of 30 patients. Routine blood tests were performed using an automatic hematology analyzer. **Results:** The results showed that 18 samples (60%) had normal leukocyte counts, 6 samples (20%) had high leukocyte counts, and 6 samples (20%) had low leukocyte counts. For monocytes, 22 samples (73.34%) were within normal levels, 7 samples (23.33%) showed high levels, and 1 sample (3.33%) showed low levels. **Conclusion:** In general, routine blood tests showing white blood cell and monocyte counts in samples from typhoid fever patients at Bendan Regional General Hospital in Pekalongan City were within normal limits.

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Introduction

Infectious diseases remain a major challenge in the field of health in Indonesia to this day. The high morbidity and mortality rates caused by infectious diseases have a significant impact on the quality of life of the community and the burden on the health care system. Infectious diseases are conditions caused by microorganisms such as viruses, bacteria, parasites, and fungi that can be transmitted from sick individuals to healthy people through various transmission mechanisms, either directly or indirectly. One of the infectious diseases that is still commonly found in Indonesia is typhoid

fever. This disease can affect various age groups, from children to adults (Maksum et al., 2022).

Typhoid fever is an acute infectious disease of the digestive system caused by the bacteria Salmonella typhi or Salmonella paratyphi. Typhoid fever is a global infectious disease, especially in developing countries. Typhoid fever is transmitted through food or drinks contaminated with Salmonella typhi bacteria, as well as direct contact with the feces, urine, or body fluids of typhoid fever patients. In other words, sanitation hygiene is a major factor in the spread of this disease (Levani & Prastya, 2020).

This disease is still commonly found in endemic areas such as Indonesia and affects various age groups, including children and adults. The World Health Organization (WHO, 2023) reports that there are approximately 9 million cases of typhoid fever each year with 110,000 global deaths. The highest risk occurs in populations without access to clean water and good sanitation, especially children. In Indonesia, the incidence of typhoid fever ranges from 350 to 810 per 100,000 population, with a mortality rate of around 1.6%. The province of Aceh has the highest incidence rate, at 2.96% of the total population. This disease ranks 15th among the causes of death in Indonesia (Tobing, 2024).

The prevalence of typhoid fever in Central Java reaches 1.6% and is found in all districts/cities with a range of 0.2% to 3.5% (Indonesian Ministry of Health, 2008). In Pekalongan District, there were 1,904 cases of typhoid fever out of a total population of 937,714, with a death toll of 17 people. Typhoid fever cases show an increasing trend, with an average of 500 cases per 100,000 population each year, and the mortality rate is estimated to range from 0.6% to 5% (Nabila et al., 2024; Putri et al., 2023).

Typhoid fever can cause changes in hematological parameters in the body, as it can affect systems such as the bone marrow. Common abnormalities found in hematological examinations of typhoid fever patients are a decrease in the number of leukocytes (leukopenia) and relative monocytosis, which are strong indicators of a diagnosis of typhoid fever (Waryidah & Risnawati, 2020).

The study conducted by Zaitul Widati, Asri Jumadewi, and Siti Hadijah at Zainal Abidin General Hospital in Banda Aceh aimed to determine the leukocyte count profile in typhoid fever patients. Of the 20 samples studied, 16 samples (80%) showed normal white blood cell counts, 3 samples (15%) showed leukocytosis, and 1 sample (5%) showed leukopenia (Widat et al., 2022). Similar results were found in a study by Siti Melda Suryatin and Agus Sudrajat, which recorded normal leukocyte counts in 29 samples (72.5%) out of 40 samples, leukocytosis in 5 samples (12.5%), and leukopenia in 6 samples (15%) (Suryatin & Sudrajat, 2024). Meanwhile, research by Ronald Situmarong and Apriani on monocyte counts in 66 samples showed that 53 samples (80.3%) had normal monocyte counts, but 13 samples (19.69%) experienced monocytosis (Situmarong & Apriani, 2022).

Based on the above explanation, further research is still needed on the number of leukocytes and monocytes in typhoid fever patients. This is important considering

that hematology test results can vary and are not yet fully consistent across studies. This study is expected to provide additional data that strengthens the understanding of the pattern of leukocyte and monocyte changes in typhoid fever patients.

Objective

The purpose of this study was to determine the routine blood profile of typhoid fever patients at Bendan Regional General Hospital in Pekalongan City.

Method

The type of research used in this study is descriptive research. The population consists of all patients diagnosed with typhoid fever at RSUD Bendan, Pekalongan City, during the period of January to February 2025, totaling 30 patients. Sampling was carried out using the total sampling method, with inclusion and exclusion criteria. The inclusion criteria were patients with typhoid fever who were hospitalized from January to February 2025 and who received antibiotic therapy. The exclusion criteria included typhoid fever patients who were discharged against medical advice, deceased, or who withdrew from participation during the sampling process.

This research was conducted from September 2024 to February 2025 at RSUD Bendan, Pekalongan City. Sample examinations were performed using an automatic method. The research data were obtained from both primary and secondary sources. Primary data were collected from routine blood tests performed in the RSUD Bendan laboratory, while secondary data were gathered from scientific journals, official websites of the Ministry of Health and WHO, as well as medical records of typhoid fever patients at RSUD Bendan. All data collected were then processed and presented descriptively in tables and explained through narrative form.

Results

A study of routine blood tests on 30 samples from typhoid fever patients at Bendan Regional General Hospital in Pekalongan City, conducted at the Bendan Regional General Hospital Laboratory from January 1 to February 28, 2025, yielded the following results:

TABLE 1. White Blood Cell Count Results in Typhoid Fever Patients at Bendan Regional General Hospital, Pekalongan City

Hasil	N	%
Normal	18	60
Leukositosis	6	20
Leukopenia	6	20
Total	30	100

Based on Table 1, the results of leukocyte cell count tests on typhoid fever patients at Bendan Regional General Hospital in Pekalongan City show that 18 samples (60%) had normal leukocyte counts, 6 samples (20%) had leukocytosis, and 6 samples (20%) had leukopenia.

TABLE 2. Results of Monocyte Cell Examination in Typhoid Fever Patients at Bendan Regional General Hospital, Pekalongan City

Hasil	N	%
Normal	22	73,34
Monositosis	7	23,33
Monositopenia	1	3,33
Total	30	100

Based on Table 2, the results of monocyte cell examination in typhoid fever patients at Bendan Regional General Hospital in Pekalongan City showed that 22 samples (73.34%) had normal monocyte cell counts, 7 samples (23.33%) had monocytosis, and 1 sample (3.33%) had monocytopenia.

Discussion

Based on the data presented in Table 1 regarding the leukocyte count in patients with typhoid fever, it can be explained that this study was conducted in the laboratory of RSUD Bendan, Pekalongan City, during the period of January–February 2025. The study involved 30 patient samples, consisting of both children and adults with typhoid fever. The analysis results showed that of the total samples examined, 18 samples (60%) had leukocyte counts within the normal range, 6 samples (20%) had leukocyte counts above the normal limit (leukocytosis), and another 6 samples (20%) had leukocyte counts below the normal limit (leukopenia).

The results of this study are consistent with the research conducted by Siti Melda Suryatin and Agus Sudrajat, who observed the distribution of leukocyte counts in patients with typhoid fever and found that the majority of the 40 samples examined, namely 29 samples (72.5%), had leukocyte levels within the normal range of 4–10 x 10^9/L. However, some samples showed deviations from the normal value, with 5 samples (12.5%) having leukocyte levels above normal and 6 samples (15%) below normal (Suryatin & Sudrajat, 2024). Nevertheless, the findings of this study differ from those of Jenny Ria Sihombing, Helena Rugun Nauli Nainggolan, Nathalia Elizabeth Rouli Sipahutar, and Sarah Elisabet Siagian, who studied the characteristics of leukocyte counts in typhoid fever patients. Their research revealed that most patients actually experienced leukocytosis, with 13 samples (44%) showing increased leukocyte counts, 10 samples (33%) within the normal range, and 7 samples (23%) with leukopenia (Sihombing et al., 2024). These differences indicate that the hematological response to typhoid fever infection can vary depending on several factors, such as infection severity, individual immunological status, and the timing of blood sample collection during the disease phase.

In typhoid fever patients who exhibit leukocytosis, this is thought to be caused by the ongoing infection due to Salmonella typhi bacteria that have not been completely eradicated by antibiotics. Factors influencing the increase in leukocyte counts among typhoid patients reflect the presence of infection in the body, as leukocytes increase to initiate and maintain defense mechanisms against infection (Widat et al., 2022). On the other hand, leukopenia is caused by bone marrow depression due to the effects of endotoxins and endogenous mediators. Moreover,

although Salmonella typhi may no longer be detectable in the blood by the end of the second week, the bacteria can still be found in the bone marrow. This condition interferes with the production of erythrocytes and leukocytes, leading to leukocyte counts below normal levels (Aeni & Saptaningtyas, 2023).

Leukocyte counts in typhoid fever patients may also remain within the normal range, which is attributed to the pathogenesis of typhoid fever itself. Salmonella typhi penetrates the intestinal mucosa and is then phagocytosed by phagocytic cells. However, the bacteria can survive inside these cells, which provides protection for them to spread throughout the body and shields them from antibodies and antimicrobial agents. As a result, the body does not respond by increasing leukocyte production (Sihombing et al., 2024).

Based on Table 2 regarding monocyte counts in typhoid fever patients, the results of examinations on 30 patient samples, both children and adults, at RSUD Bendan laboratory in January–February 2025 showed that 1 sample (3.33%) had low monocyte levels, 22 samples (73.34%) were within the normal range, and 7 samples (23.33%) showed elevated monocyte counts. This is consistent with the research conducted by Ronald Situmarong and Apriani (2022), which reported that the majority of monocyte counts were normal in 53 samples (80.3%), although 13 samples (19.69%) had levels above normal (Situmarong & Apriani, 2022).

An increase in monocyte counts in typhoid fever patients can occur due to chemotaxis stimulation and enhanced phagocytic activity in the body. The macrophages formed become more metabolically active, making them more effective in phagocytosis as well as killing and digesting microorganisms. Monocyte levels also tend to increase in infections caused by tuberculosis, Salmonella, and protozoa. Meanwhile, a decrease in monocyte counts in typhoid fever patients is generally due to disturbances or suppression of immune system function, particularly cellular immunity, caused by Salmonella typhi infection. This infection can inhibit the production and function of monocytes in the bone marrow and trigger their migration to infected tissues, thereby reducing their levels in peripheral blood circulation.

In some typhoid fever patients, monocyte counts remain within the normal range because the immune system still functions optimally, allowing sufficient monocyte production to fight infection and maintain balance without significant increases or decreases during Salmonella typhi infection. The pathogenesis mechanism of typhoid fever also plays a role in maintaining these cell levels. Although the average leukocyte and monocyte counts remain within normal limits, some subjects experienced increases or decreases in these values. This imbalance is likely influenced by various factors, including personal habits such as diet and hygiene, as well as environmental conditions such as sanitation and climate. Other factors, such as additional infections, bone marrow disorders, duration of fever, and the use of certain medications, may also play a role, although they were not further discussed in this study.

Conclusion

Based on the results of a study of routine blood tests in typhoid fever patients at Bendan Regional General Hospital in Pekalongan City involving 30 samples, it was found that the white blood cell count was normal in most cases, with 18 samples (60%). Six samples (20%) showed leukocytosis, while 6 samples (20%) experienced leukopenia. Regarding the monocyte count parameter, the majority were normal in 22 samples (73.34%). Seven samples (23.33%) showed monocytosis, and 1 sample (3.33%) showed monocytopenia.

Recommendations for future researchers include expanding the scope by analyzing other routine blood parameters to obtain a more comprehensive picture of the hematological condition in patients with typhoid fever.

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