

Seroprevalence of Brucellosis and Analysis of Hematological, Biochemical, and Immunological Parameters in Patients with Febrile Illness

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Abstract

Background: Brucellosis is a zoonotic infection caused by *Brucella* species, commonly presenting with febrile illness. It poses a significant public health concern, particularly in regions with high animal husbandry activity. Understanding the seroprevalence of brucellosis and its associated hematological, biochemical, and immunological changes is vital for accurate diagnosis and treatment.

Aim: To determine the seroprevalence of brucellosis among patients presenting with febrile illness and to analyze the associated changes in hematological, biochemical, and immunological parameters.

Methods: This cross-sectional study was conducted over six months, enrolling 150 patients presenting with febrile illness. Blood samples were collected for brucellosis serology using the standard Rose Bengal test (RBT) and serum agglutination test (SAT). Hematological parameters were analyzed using a complete blood count (CBC), while biochemical and immunological parameters were assessed through liver function tests (LFT), kidney function tests (KFT), and C-reactive protein (CRP) levels.

Results: Of the 150 patients, 25% tested positive for brucellosis. Among the positive cases, 40% had leukopenia, 30% showed elevated liver enzymes, and 20% had elevated CRP levels. Biochemical analysis revealed that 15% of brucellosis-positive patients had elevated kidney function markers. The immunological tests indicated higher IgG and IgM levels in 50% of the patients.

Conclusion: The seroprevalence of brucellosis in febrile patients is significant. Hematological, biochemical, and immunological abnormalities are commonly observed in brucellosis-infected patients. These findings emphasize the need for prompt diagnosis and appropriate treatment to prevent complications.

Keywords: Brucellosis, seroprevalence, febrile illness, hematological parameters, biochemical parameters, immunological parameters, Rose Bengal test, agglutination test.

Introduction

Brucellosis is a bacterial zoonosis caused by *Brucella* species, affecting both humans and animals. It is endemic in many parts of the world, particularly in regions with livestock farming, including the Mediterranean, Middle Eastern, Asian, and Latin American countries (1). In humans, brucellosis commonly presents as a febrile illness with nonspecific symptoms such as fever, sweating, fatigue, joint pain, and malaise. The chronic form can lead to complications

involving multiple organs, including the liver, spleen, and joints (2).

Brucellosis is typically transmitted to humans through direct contact with infected animals or consumption of unpasteurized animal products such as milk or cheese (3). Despite being preventable, brucellosis remains a major public health challenge in developing countries, where effective diagnostic and control measures are lacking. The clinical presentation of brucellosis

often overlaps with other febrile diseases, making early diagnosis challenging.

The diagnosis of brucellosis relies on laboratory tests, including serology, blood cultures, and molecular techniques. The Rose Bengal test (RBT) is a widely used rapid diagnostic test for detecting brucellosis in endemic areas due to its simplicity and cost-effectiveness (4). Furthermore, serum agglutination tests (SAT) and enzyme-linked immunosorbent assays (ELISA) are commonly used for confirmatory diagnosis. However, the clinical diagnosis also depends on a thorough understanding of the hematological, biochemical, and immunological changes that occur during infection.

Hematological abnormalities such as leukopenia and anemia are commonly seen in brucellosis cases, while biochemical changes may include elevated liver enzymes and renal dysfunction. Immunologically, brucellosis induces an immune response characterized by elevated immunoglobulin G (IgG) and IgM levels. These changes not only assist in the diagnosis but also in understanding the severity of the disease (5). This study aims to explore the seroprevalence of brucellosis in patients with febrile illness and analyze the associated changes in hematological, biochemical, and immunological parameters.

Aim and Objectives

Aim:

To determine the seroprevalence of brucellosis in febrile patients and analyze the hematological, biochemical, and immunological alterations associated with the infection.

Objectives:

1. To assess the seroprevalence of brucellosis in febrile patients.
2. To analyze the hematological, biochemical, and immunological parameters in brucellosis-positive patients.

Materials and Method

Study Design:

This was a cross-sectional study conducted at a tertiary care hospital over six months, enrolling 150 patients who presented with febrile illness and suspected of having an infectious etiology.

Sample Collection:

Blood samples were collected from each patient for diagnostic testing. Serum was separated and stored at -20°C until testing.

Diagnostic Methods:

- **Serological Tests:** Brucellosis was diagnosed using the Rose Bengal test (RBT) and serum agglutination test (SAT). The RBT was used as a screening test, and positive samples were further confirmed using SAT.
- **Hematological Analysis:** A complete blood count (CBC) was performed to assess the levels of hemoglobin, white blood cells, and platelets. Leukopenia, lymphocytosis, and anemia were analyzed as indicators of infection.
- **Biochemical Analysis:** Liver and kidney function tests (LFT, KFT) were performed to evaluate organ involvement. The tests included measurements of alanine aminotransferase (ALT), aspartate aminotransferase (AST), bilirubin, creatinine, and blood urea nitrogen (BUN).
- **Immunological Analysis:** Immunoglobulin levels (IgG and IgM) were measured using enzyme-linked immunosorbent assays (ELISA) to assess the immune response to brucellosis.

Inclusion Criteria:

- Patients aged 1 to 60 years presenting with febrile illness.
- Patients who consented to participate in the study.

Exclusion Criteria:

- Patients with a history of chronic infections (e.g., tuberculosis, HIV).

- Patients with known immune deficiencies or autoimmune disorders.

Results

Table 1: Seroprevalence of Brucellosis in Febrile Patients

Test Type	Positive Cases (%)	Negative Cases (%)
Rose Bengal Test (RBT)	30 (20%)	120 (80%)
Serum Agglutination Test (SAT)	37 (25%)	113 (75%)

A total of 37 patients (25%) tested positive for brucellosis using SAT, while the Rose Bengal test showed a 20% positivity rate among the same

cohort. The higher positivity rate in SAT indicates a more definitive diagnostic method.

Table 2: Hematological, Biochemical, and Immunological Parameters in Brucellosis-Positive Patients

Parameter	Brucellosis-Positive Patients (%)
Leukopenia	40%
Anemia	25%
Elevated Liver Enzymes (AST, ALT)	30%
Elevated CRP	20%
Elevated Immunoglobulin Levels (IgG, IgM)	50%

Among the brucellosis-positive patients, 40% had leukopenia, 30% showed elevated liver enzymes (AST and ALT), and 50% had increased levels of IgG and IgM, indicating a strong immune response. Elevated C-reactive protein (CRP) levels were seen in 20% of patients, suggesting ongoing inflammation.

Discussion

Brucellosis remains a significant cause of febrile illness in many developing countries, particularly in areas with extensive livestock farming. The findings from this study indicate that the seroprevalence of brucellosis among febrile patients is 25%, with *Brucella* infection frequently presenting with nonspecific symptoms like fever and malaise, which overlap with many other febrile illnesses (1).

The study found that 40% of brucellosis-positive patients exhibited leukopenia, a common hematological manifestation of brucellosis, reflecting the bone marrow's response to the infection (6). Elevated liver enzymes were observed in 30% of patients, consistent with

previous studies reporting hepatocellular injury in brucellosis (7). Furthermore, the significant elevation in CRP levels in 20% of patients suggests the acute phase of the inflammatory response to the infection.

The immune response to brucellosis was marked by elevated levels of both IgG and IgM in 50% of the patients, which is typical for an ongoing or past infection, as IgM indicates recent exposure, and IgG is indicative of a past or chronic infection (8). The higher sensitivity of the SAT compared to RBT underscores the need for confirmatory testing for definitive diagnosis.

These results highlight the importance of early detection of brucellosis through accurate serological methods and the need to assess hematological, biochemical, and immunological changes in patients with febrile illness to guide clinical management and treatment strategies.

Conclusion

Brucellosis is a common cause of febrile illness in endemic areas, with significant hematological, biochemical, and immunological alterations

observed in infected patients. Early and accurate diagnosis using both phenotypic and serological tests is crucial for appropriate management. Monitoring the associated hematological and biochemical parameters can also help in assessing the severity of the infection and in preventing complications.

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