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Original Research Article

Haematological profile in typhoid fever: an update from a tertiary rural hospital

Vaibhavi Chaudhary, Bharath Raj R., Karuna Ramesh Kumar*

Mithra Multispeciality Hospital Bangalore, Karnataka, India

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***Correspondence:**
Dr. Karuna Ramesh Kumar,
E-mail: karunark@yahoo.com

ABSTRACT

Introduction: Understanding hematological alterations in typhoid fever aids in diagnosis, assessment of disease severity and to monitor treatment response. To assess alterations in hematological parameters in patients with confirmed typhoid fever.
Methods: A cross-sectional, retrospective study was conducted (1 May 2024-30 April 2025). All patients who had fever and tested for Typhoid and dengue were included in screening. Only confirmed typhoid positive on WIDAL with significant titres of 1:160 and 1:320 were included If patient had any dengue parameters positive, it was noted. Patients with only dengue were excluded.
Results: Among 295 patients screened, 251 were diagnosed with typhoid fever. 24 patients (adults–22 children-2) were only typhoid positive and 227 patients (adults-204, children-23) had both typhoid and Dengue positive. In patients with only typhoid TLC (total leucocyte count) was high up to 17000cell/mm^3. TLC of patients with 1:160 and 1:320 titres were compared using Student t-test. 't' value was significant indicating titres played a significant role in clinical management (p value <0.05). In patients with Typhoid and dengue positive, mild to moderate anemia and moderate to severe thrombocytopenia were observed, which was not observed in typhoid only patients.
Conclusion: This study highlights relationship of TLC and titres in clinical management. Dengue fever and typhoid fever may overlap especially in endemic areas and may have effect on hemoglobin and platelet count. Widal positivity with observations in these alterations will serve as supportive indicators for diagnosis and management where blood culture is not available.

Keywords: Typhoid, Widal test, Anaemia, Total leucocyte count, Thrombocytopenia

INTRODUCTION

The bacterium Salmonella is a genus from the family Enterobacteriaceae. Salmonella enterica serotype Typhi is a Gram-negative, usually motile bacterium with peritrichous flagella, facultative anaerobic, non-spore-forming bacilli. The lipopolysaccaride portion of the capsule acts as an endotoxin and is crucial to the virulence of the bacteria. Salmonella possesses three major antigens H Antigen- Flagellar antigen, O Antigen-Somatic antigen, Vi antigen- surface antigen.[1] *Salmonella typhi* causes typhoid fever. It is acquired through the ingestion of water or food contaminated with feces or urine of an infected person. It spreads through a lack of hygiene practices. The incubation period is 1-2 weeks. The patient complains of step ladder pyrexia, muscle aches, vomiting, malaise, abdominal pain, constipation, diarrhoea, and anorexia. On examination, patients are observed to have bradycardia, which is called Faget's sign.

Along with coated tongue, hepatomegaly, splenomegaly, lymphadenopathy, and sometimes even a rash "rose spots".[2] The culture of *S. typhi* is the most specific method and is considered the gold standard. It can be done using blood, bone marrow aspirate, stool, and urine sample from the suspected infected person.[3] The widal

test is a serological test is less sensitive and specific but the titers in the dilutions of 1:160 and 1:320 for anti-H antigen and anti-O antigen are considered markers for *S. typhi*.[4] A complete blood count is helpful in determining the total white count, and the differential count of neutrophils, lymphocytes, and platelet count which can help in monitoring the disease.

METHODS

The study was a cross-sectional retrospective study. The records from 1st May 2024 to 30th April 2025 were retrieved for demographics and details of the screening tests for all patients who had presenting symptom of fever. They were screened for typhoid by Widal test done in titers and dengue by testing for NS1, Ig G and Ig M. Only patients with Widal tests positive with significant titers (Dilution 1:160 and/or 1:320) were included. Complete blood count values were obtained by using automated analyzer.

For analysis anemia was defined as moderate when in the range of 8-10 gm/dl, and severe if less than 8 gm/dl. Thrombocytopenia was defined as mild when in the range of 1-1.3 Lakh/cum, moderate when in the range of 0.5-1 Lakh/cum, and severe when in the range of <0.5 lakh/cum.

The difference in total WBC count between 1:160 and 1:320 titers was correlated with Widal titres to analyse the significance of titres in the clinical management. In patients who had both widal and Dengue positivity, the type of antigens present in the dengue profile was noted against the widal positive titres.

RESULTS

A total of 295 patients were screened, among whom 24 were positive for only typhoid (Adults–22 children-2), and 227 (Adults-203 children-23) were positive for both typhoid and dengue. The age ranged from 4 years to 81 years. The maximum number of patients who tested positive were in the age group of 30-39 years, followed by 20-29 years. 44 patients who were only dengue positive were excluded.

In only typhoid patients, mean hemoglobin was 13.5 gms/dl. Only 3 patients had moderate anemia in the range of 8.7 to 9.4 gms/dl. Thrombocytopenia was not observed. TLC was high as 17,800 cells/ccm. TLC of patients with 1:160 and 1:320 titers were compared using the student t-test (The t-value :2.09836. The p value is <0.05) indicating the titers played a significant role in clinical management.

In patients with both typhoid and dengue positive, mean hemoglobin was 12.7 gms/dl. Moderate anaemia was observed in 7 of the children. 80 patients showed thrombocytopenia including 8 patients with severe thrombocytopenia.

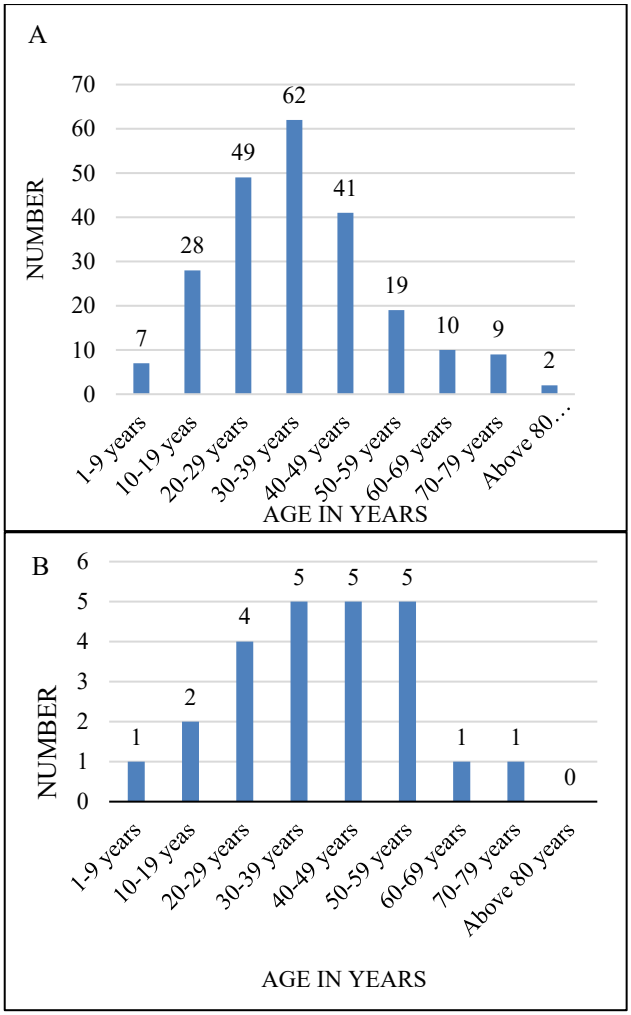

Figure 1: (A) Typhoid and dengue patients and (B) typhoid only.

DISCUSSION

S. typhi colonizes the human small intestine at the terminal ileum, and it binds to the receptors of microfold cells and enterocytes. It can directly penetrate the intestinal mucosa or can remain dormant within the mononuclear phagocytic cells of different organs. Once there is primary bacteremia and the cascade of disease manifestations starts.[1]

The definitive diagnosis of typhoid fever requires the isolation of *Salmonella enterica* serotype typhi from the patients, but this requires culture in the initial 3 days.[3] Widal test is the only specific diagnostic investigation available, which requires follow up.

Hence in this study Widal test done in titres was included for diagnosis of typhoid. So, among the 295 patients screened 24 were only typhoid positive and 227 were both dengue and typhoid positive. The maximum number of patients who tested positive were in the age group of 30-39 years, followed by 20-29 years (Figure 1 A and B). This may be due to outdoor activities in this age group

including food intake. Typhoid and dengue fever are among the most endemic diseases in the tropics.[5] Though caused by different agents; they have similar clinical presentation. Etiological diagnosis is important in the management of these diseases which are associated with population density, urbanization, endemicity and mobility all favoring the disease spread. With the availability of rapid serodiagnostic tests for these infections, it has been observed that patients' samples frequently show seropositivity for two or more infections posing challenges in clinical diagnosis and treatment.

The reasons could be endemicity of the disease leading to raised IgG antibody level and sharing of antigen and cross-reacting antibodies.[6] 227 patients who showed both typhoid and dengue could be because of this reason. the actual reason for concurrent dengue typhoid co infection remains unclear. The possibility could be either a camouflaging of symptoms in a true co infection or it could be a superimposed secondary infection.[7] The definitive diagnosis can be established only by culture. Analysis of only typhoid patients showed significant changes only in TLC. The comparison of TLC in 1;160 and 1:320 titres by student t test showed significant t test indicating the titres played a significant role in indicating the severity of disease and thus the clinical management. (The t-value is:2.09836, the p value is <0.05). The reports on thrombocytopenia in only typhoid patients vary and severe thrombocytopenia is seen only in complications of typhoid fever.

In the present study in patients with both typhoid and dengue positivity, mild to moderate anaemia and moderate to severe thrombocytopenia were observed. In dengue, cause of thrombocytopenia is multifactorial-Immune-mediated destruction, where antibodies mistakenly attack and destroy platelets; bone marrow suppression, where the virus directly infects and impairs the bone marrow's ability to produce new platelets; and increased consumption in severe cases due to vascular leakage and clot formation.[7] In typhoid with dengue, probably it may be immune mediated by cross reacting antibodies.[8-10] This may be the reason for 35.2% of patients showing thrombocytopenia (Table 1).

Table 1: Summary of hematological parameters.

Patient group	Hemoglobin gm/dl	Platelets count lakh/mm^3	Total WBC count cells /mm^3
Only typhoid n=24 patients (22 adult and 2 children)	Mean 13.5, range 18.0-11.1, 3 patients had moderate anemia (12.5%)	Mean 2.1, no thrombocytopenia patients	Range 17,000-3600
Typhoid and dengue positive n=227 (Adult 204 and children 23)	Mean 12.72, range 17.9-6.9, total-92 patients, with anemia (40.5%), mild–59, moderate–27, severe-6	Mean 1.79, total 80 patients with thrombocytopenia, (35.2%) mild-64, moderate-8, severe-8	Range 17,780-2230

Antibiotics is the main stay of treatment in typhoid fever.[11] Based on the findings, in the hospital, following protocol is followed. If only Ig G positive, with thrombocytopenia, to be treated with dengue protocol with adequate fluid management, irrespective of Widal positivity. If IgG or IgM positive, with stable platelet count and Widal positive above 1:160 consider as typhoid positive and treated with typhoid protocol with inj. ceftriaxone and sulbactum 1.5 gm bd for 3 days followed by oral antibiotics. If NS1 positive with Widal 1:320, to be treated with both protocols. All patients were followed up for four weeks. No deaths were reported in this series.

CONCLUSION

A total of 295 patients were screened, among whom 24 were positive for only typhoid (Adults–22 children-2), and 227 (Adults-203 children-23) were positive for both typhoid and dengue. The age ranged from 4 years to 81 years. The maximum number of patients who tested positive were in the age group of 30-39 years, followed by 20-29 years. Widal test remains the main stay of diagnosis in endemic areas. This study highlights relationship of TLC and widal titres in clinical management. Dengue fever and typhoid fever may overlap especially in endemic areas and may have effect on platelet count as seen in 35.2 % of patients with typhoid and dengue with thrombocytopenia.

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