

Study of hematological parameters in pulmonary tuberculosis patients attending tertiary care center

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ABSTRACT:

Background: pulmonary tuberculosis is still among the leading cause of mortality and morbidity.

Aims and objectives: The aim of the study was the assessment of hematological parameters in pulmonary tuberculosis

Material and methods: A retrospective study was conducted on 127 patients attending the department of Pulmonary Medicine, Andhra medical college, Visakhapatnam diagnosed with pulmonary tuberculosis on the basis of history, clinical examination, chest x-ray, sputum examination, and laboratory parameters.

Results: out of 127 patients. The disease was present significantly more in males and the middle-aged population

The mean age group of the presentation was 44.15 ± 16.56 years

mean Hemoglobin value was low 10.06 ± 2.24 g/dl

mean total leucocyte count value was 10054 ± 5830 (normal 73.2%)

mean platelet value was 3.68 ± 1.33 (normal 68.5%)

mean RBC count value was 4.32 ± 0.9 (normal 50.3%).

mean value of MCV was (low 52.7%, normal 44.8%) 77.03 ± 11.5 .

mean value of MCHC was (low 52%) 31.43 ± 3.6 .

mean value of RDW was 15.74 ± 2.93 (normal 50.3%)

Conclusion:

mean values of hemoglobin, MCV, MCHC, and RDW were low. Anemia is a common hematological abnormality in new patients with pulmonary tuberculosis. Moderate anemia and hypochromic microcytic anemia is the most common type of anemia in this study. The severity of anemia has a significant association with the nutritional status of the patients assessed by BMI. We have to focus on the nutritional improvement of patients with tuberculosis for a better outcome.

Key Word: Mycobacterium tuberculosis, Pulmonary Tuberculosis, Anemia, Leukocytosis, Thrombocytosis.

Date of Submission: 01-02-2023

Date of Acceptance: 11-02-2023

I. INTRODUCTION

In 2021, an estimated 10.6 million (95% confidence interval 9.9-11 million) people fell ill with TB worldwide, of which 6.0 million were men, 3.4 million were women and 1.2 million were children. People living with HIV accounted for 6.7% of the total⁽¹⁾.

Approximately 25% of the world's population is infected with M. tuberculosis. Around 90% of those who acquire the illness were adults, with more instances in males than in women⁽²⁾.

Pulmonary TB frequently coexists with reversible peripheral blood abnormalities. Understanding mycobacterial infection's immunology has provided insight into the connection between hematological abnormalities and mycobacterial infection. There is little information available regarding the frequency of these hematological abnormalities and how antituberculosis treatment affects different hematological parameters in the Indian subcontinent⁽³⁾.

Hematological abnormalities associated with tuberculosis are anemia and leucocytosis, the most common manifestations, whereas leucopenia is rare. Mild thrombocytosis is typically seen in patients with pulmonary or disseminated TB, most likely as a result of an enhanced thrombopoiesis reflecting an acute phase response⁽¹⁹⁾.

Aims and objectives

The aim of the study was the assessment of hematological parameters in pulmonary and extrapulmonary tuberculosis

Methods

A retrospective study was conducted on 127 patients attending the department of Pulmonary Medicine, Andhra medical college, Visakhapatnam diagnosed with pulmonary and extrapulmonary tuberculosis on the basis of history, clinical examination, chest x-ray, sputum examination, and laboratory parameters.

Inclusion criteria

1. Patients who are not on anti-tuberculosis drugs,
2. Nonpregnant women
3. HIV-negative patients

Exclusion criteria

1. Patients with signs of concomitant chronic or acute infection other than pulmonary tuberculosis,
2. bleeding manifestations,
3. endocrine disorders,
4. other organ dysfunction or systemic disorders and
5. chronic inflammatory disease,
6. pregnant women and HIV patients

Pertinent information regarding the history of illness was collected according to the questionnaire through personal interviews. A thorough clinical examination was done and the findings were complemented by findings in case records. Ethical clearance was obtained from the institutional Ethical committee and informed consent was obtained from all patients participating in the study.

The criteria essential for the diagnosis of pulmonary tuberculosis include: Clinical features were suggestive of pulmonary tuberculosis. Positive sputum smear acid-fast bacilli or sputum CBNAAT.

The peripheral blood was evaluated for hemoglobin (Hb), total leukocyte count (TLC), differential leukocyte count (DLC), Platelet count, hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) were analyzed using fully automated hematology analyzer, using EDTA anticoagulated fresh venous blood samples.

Anemia was defined as per WHO guidelines: hemoglobin levels less than 12 gm/dl. Anemia was further subdivided into mild (11.9–10 gm/dl), moderate (9.9–8 gm/dl), and severe (<8 gm/dl) as per severity.[7] Microcytic anemia was defined as MCV (<80 fl), normocytic (MCV = 80–95 fl), and macrocytic (MCV > 95 fl).

The data were entered in an Excel chart and all the hematological parameters were analyzed using proportions or percentages.

II. RESULTS:

127 patients who were sputum positive for AFB or CBNAAT and clinically diagnosed cases of tuberculosis were included in the study. The mean age of the total population was 44.15±16.56 years, 72.4% of patients were in the age group 20-60 years. 10.2% of the total population was below the age of 20 years and 17.3% was above 60 years old. There were 94(74.01%) males and 33(25.9%) females.

Anemia was identified in 111 patients at the time of diagnosis of tuberculosis. 83 men and 28 women had anemia. In 23.6% (30) of cases had mild anemia, 46.9% (59) of cases had moderate anemia and 17.3(22) of cases had severe anemia and 12.5% (16) of cases had normal hemoglobin.

The mean Hb level was 10.06± 2.24 g/dl, the mean hemoglobin level in males was 10.3±2.28g/dl and the range was 16.2g/dl -5.2g/dl. In females, the mean hemoglobin level was 9.39 g/dl, and the range was 14.2 g/dl -6 g/dl.

Microcytic anemia was the most common and was identified in 67(52.7%) patients, normocytic anemia was next common, and 57(44.8%) patients were identified with Normocytanemia.

52% of patients had low MCHC values and 48% of patients had normal MCHC values.

Tubercular patients with anemia (111) had lower BMI as compared to patients without anemia (26).

Normal RDW values were observed in 48.8% of patients and 51.1% of patients had high RDW values.

46.4% (59) of patients had a low RBC count and 50.3 % (64) of patients had a normal RBC count. 3% of patients had elevated RBC values

In spite of the infection, 81(73.2%) patients had a normal leucocyte count. Leukocytosis as a response to infection was observed in 30(23.6%) patients, and 4 had leucopenia.

Thrombocytosis was observed in 32 (25.1%) patients while thrombocytopenia was observed in 8 (6.2%) patients. Other 87 (68.5%) patients had a normal platelet count.

	LOW	NORMAL	HIGH	Mean
MCV- 80-95	52.7%	44.8%	2%	77.03±11.5
MCHC- 33-37	52%	48%		31.43±3.6
RDW 11.5-14.5		48.8%	51.1%	15.74±2.93
RBC 4.3-5.9	46.4%	50.3%	3%	4.32±0.9
WBC-4.8-10.8	0.03%	73.2%	23.6%	10054±5830
PLATELETS 1.5-4.5	6.2%	68.5%	25.19%	3.68±1.33

III. DISCUSSION:

Tuberculosis continues to be an important communicable disease in the world and is a major public health problem in India. In fact, WHO declared tuberculosis a global emergency in 1993. Various hematological manifestations have been described in association with tuberculosis. There is a paucity of literature about the hematologic abnormalities in pulmonary tuberculosis patients from the Indian population. In the present study, an attempt has been made to study a complete hematological profile of pulmonary tuberculosis.

Anemia is a frequent hematological finding in TB, and individuals with this condition have a higher mortality risk. According to numerous research, anemia-related death rates in TB range from 31.9% to 88%⁽⁵⁾.

Although the majority of the participants in our study were males, anemia was highly prevalent among both males and females with tuberculosis.

Reduced hemoglobin, RBC count, MCV, and MCHC values were used as indicators of anemia. The prevalence of significant anemia in tuberculosis may be caused by iron sequestration brought on by chronic inflammation and by diminished erythropoietin production^(5,6).

The bone marrow study by Singh KJ et al² found blunted erythropoietic response of bone marrow. It is postulated that the tumor necrosis factor- α (TNF- α) and other cytokines released by activated monocytes suppress erythropoietin production leading to anemia⁽⁷⁾. Although microcytic hypochromic anemia was most common in this study, other types of anemias including, normocytic and macrocytic (2%) were also noted.

The underlying pathogenesis of anemia in patients with tuberculosis is the suppression of erythropoiesis by inflammatory markers, nutritional deficiency, and malabsorption syndrome^(3,4).

In our study, 93 (69.29%) anemia patients with pulmonary tuberculosis were malnourished (BMI < 18.5 kg/m²). Malhotra et al. described a similar result, showing lower BMI in anemic patients with pulmonary tuberculosis⁽¹²⁾. Previous studies have highlighted that malnourished tubercular patients have reduced levels of iron and zinc as compared to healthy patients⁽¹³⁾. Iron deficiency has been found to impair T- cell immunity by interfering with the effector cell activity⁽¹⁴⁾.

	Present study	Kassa et al ⁽¹⁶⁾	Abay et al ⁽¹⁷⁾	Rajesh et al ⁽¹⁵⁾	Ababa et al ⁽¹⁸⁾
Hb	10.06±2.24	12.7	12.0±3.4	11.4±1.9	14.1±2.4
MCV	77.03±11.5	88.8	91.7±5.9	78.07±5.9	86.9±19.2
MCHC	31.43±3.6	30.13	34.2±3.8	30.3±2.1	32.4±1.7
RDW	15.74±2.93	17.6			
Platelets	3.68±1.33	268	336±152	182.2±107.6	391±129.2
WBC	10±5.8	7.5	7.3±3.1	11.84±10.54	8.9±3.9
RBC	4.32±0.9	4.25	4.6±0.85	4.1±0.54	4.9±0.9

Patients with TB typically have an increased likelihood of developing gastrointestinal absorption complications that ultimately cause anemia⁽¹¹⁾ and increased RDW is linked to anemia. Lee et al.⁽¹¹⁾, and Baynes et al⁽¹⁰⁾ note that RDW values in chronic inflammatory disorders such as TB are comparable to RDW values in iron-deficiency anemia. RDW values of the present study were similar to Kassa et al study.

The mean MCV and MCHC values of the study show low values which means microcytic and hypochromic anemia were more common in this study. Mean RDW values were also high which is similar to iron deficiency anemia. MCV values of the present study were similar to Rajesh et al study. MCHC values of the present study were similar to Kassa et al, abay et al, Rajesh et al, ababa et al studies

Thrombocytosis has been reported in patients with military/ disseminated tuberculosis⁽⁸⁾. The stimulus for increased platelet production in reactive thrombocytosis is not clear. Thrombopoiesis reflects an acute phase reaction and is partly driven by inflammatory cytokines, such as interleukin-6 [IL-6]. The IL-6 is known to increase the megakaryocytes⁽¹⁹⁾. Platelet values in the present study were similar to Abay et al study.

Leucocyte response varied from leucocytosis to leukocytopenia. Mild leucocytosis is documented in 8-40% of patients with pulmonary tuberculosis⁽⁹⁾. In this study, 23.6% of cases showed leucocytosis.

The underlying pathogenesis of anemia in patients with tuberculosis is the suppression of erythropoiesis by inflammatory markers, nutritional deficiency, and malabsorption syndrome^(3,4).

In our study, 93 (69.29%) anemia patients with pulmonary tuberculosis were malnourished (BMI < 18.5 kg/m²). Malhotra et al. described a similar result, showing lower BMI in anemic patients with pulmonary tuberculosis⁽¹²⁾. Previous studies have highlighted that malnourished tubercular patients have reduced levels of iron and zinc as compared to healthy patients⁽¹³⁾. Iron deficiency has been found to impair T- cell immunity by interfering with the effector cell activity⁽¹⁴⁾.

IV. Conclusion:

Anemia is a common hematological abnormality in new patients with pulmonary tuberculosis. Moderate anemia and hypochromic microcytic anemia is the most common type of anemia in this study. The severity of anemia has a significant association with the nutritional status of the patients assessed by BMI. BMI is an independent predictor of anemia in patients with pulmonary tuberculosis. Thus, the frequent occurrence of anemia in new cases of pulmonary tuberculosis demands routine screening for anemia in all cases of pulmonary tuberculosis.

Limitation of the study:

A small number of cases

Couldn't able to see results after the initiation of ATT.

couldn't able to follow up on the cases

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Dr.k.komali, et. al. "Study of hematological parameters in pulmonary tuberculosis patients attending tertiary care center." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(2), 2023, pp. 22-25.