Original Research Article

A prospective study on variations in haematological parameters in pulmonary tuberculosis

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ABSTRACT

Background: In India tuberculosis is a communicable infectious bacterial disease caused by Mycobacterium tuberculosis causing major public health problem. The present study is a prospective study of various haematalogical parameters in sputum positive pulmonary tuberculosis.

Materials and Methods: The study included thirty patients of fresh pulmonary tuberculosis with sputum positive for acid fast bacilli (AFB). It was conducted for a period of three months in the institution of Coimbatore medical college hospital. The various hematological parameters were analyzed by means of automated cell counter and peripheral smear examination. The smears were stained with Ziehl Neelsen stain used to identify acid-fast organisms mainly mycobacteria.

Results: The study included 30 cases of newly detected pulmonary Tuberculosis patients who were positive for acid fast bacilli out of which 6 were females and 24 were males. Maximum number of cases were found in between 40-60 years of age. The commonest hematological findings were anemia 100% then raised ESR 93.33%, followed by, thrombocytosis 16.66%., neutrophilia 56.66%, leukocytosis 56.66% and lymphocytosis 6.66%. The commonest peripheral smear picture was microcytic hypochromic anemia 63.33% followed by normocytic normochromic anemia 30% then macrocytic anemia 6.6%.

Conclusion: Various changes in haematological parameters has been observed in patients with patients who are sputum positive for pulmonary tuberculosis. The present study is being done to evaluate the hematological profile in tuberculosis and analyse the variations in hematological manifestations. These parameters acts as a valuable tool to reduce the morbidity and mortality thus aids in improving then prognosis in patients with pulmonary tuberculosis.

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1. Introduction

Tuberculosis (TB) is a chronic infectious disease highly prevalent in developing nations like India.[1] The causative agent of tuberculosis is Mycobacterium tuberculosis (M. tb) a species of pathogenic bacteria of the family Mycobacteriaceae. It is a curved rod shaped acid fast facultative intracellular bacterium. The cause for the virulence is due to localization of the bacterium in macrophages with a slow generation time.[2] In the world it is an important communicable disease and causing major public health problem in India. It affects humans medically, socially and economically.[3]

TB remains as an epidemic at the Global level affecting one-third of world population.[4] It is ranked the second leading cause of death from an infectious disease worldwide after the Human Immunodeficiency Viruses affecting millions of people per year.[5] People infected with HIV are more susceptible to rapidly progressive tuberculosis. The bacterium thrives well wherever there is crowding, poverty and chronic debilitating illness.

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TB is a social disease with both medical and non-medical aspects. The non-medical or social factors include poor quality of life, improper housing structure and overcrowding, increase in population, malnutrition, smoking, alcohol consumption, illiteracy, large families, early marriages and lack of awareness about cause of illness. All the mentioned factors are interrelated, contributing to the occurrence and spread of Tuberculosis.[6] Tuberculosis acts as a marker or indicator of social organization and living standard in the population or community.[7]

According to geographic representation, the burden of tuberculous cases is highest in Asia and Africa, while India and China together account for almost 40% of the world's TB cases. Around 10% of tuberculosis cases are in the under 20s, with the most affected age group being the 20-49 years old, accounting for 70% of all those affected. Poverty, poorly ventilated and crowded living and working environments, undernutrition are risk factors for tuberculosis transmission and developing active disease.[8] In the affected population male to female ratio is 3:1.

Tuberculosis can infect any organ but lung is usual sites involved.[9] Hematopoietic system is another organ severely affected by tuberculosis.[10] A variation of haematological changes occurred in association with pulmonary tuberculosis and these haematological abnormalities act as marker for the diagnosis, prognosis and response to therapy. This can cause an increase in Erythrocyte Sedimentation Rate (ESR), anaemia, lymphocytosis and increase in platelet counts in pulmonary tuberculosis.[11]

The present study is undertaken to analyse the haematological parameters in patients positive for sputum smear for AFB and to evaluate their diagnostic and prognostic significance.

2. Materials and Methods

This prospective study was done in the department of pathology, Coimbatore Medical College hospital, Coimbatore. Total of thirty patients of fresh pulmonary tuberculosis with sputum positive for acid fast bacilli (AFB) were included in this study. This study was conducted for a period of three months from August 2019 to October 2019.

The study population included both adult male and female in the age group of 20 to 80 years. TB patients on treatment, patients positive for HIV and patients with other associated systemic diseases like liver diseases, renal diseases, endocrine disorder and children were excluded from the study. Ethical clearance was obtained from the institutional ethical committee and informed consent was obtained from all patients participating in the study.

2.1. Study design

Prospective study.

2.2. Study population

30 patients of fresh pulmonary tuberculosis with sputum positive for acid fast bacilli (AFB) were included (Figure 1) and subjected to complete blood count analysis, ESR estimation and peripheral smear examination. All cases were also stained by fluorescent stain and examined under fluorescent microscope (Figure 2)

2.3. Sample size

Cases of fresh pulmonary tuberculosis patients with sputum positive for acid fast bacilli.

2.4. Inclusion criteria

Only New cases of sputum positive TB patients adult male and female patients in the age group 20-80 years.

2.5. Exclusion criteria

1. Children
2. TB patients on treatment
3. Patients who are positive for HIV
4. Patients with other associated systemic diseases like liver disease, renal disease and endocrine disorders.

2.6. Collection of blood sample and processing

Under aseptic precautions about 3-4 mL of venous blood was drawn with the help of sterile syringe. Two mL was transferred into a tube containing 0.2 mL of 4% Ethylene Diamine Tetra Acetate (EDTA) solution and analysed in haematology analyser for evaluation of different parameters like Haemoglobin, total WBC count, RBC count and platelet count.

About two mL of anticoagulants added blood was drawn into Westergren tube up to the mark for the determination of Erythrocyte Sedimentation rate. In addition, peripheral smear examination was done in all patients.

3. Results

Table 1: Age and sex distribution (AFB positive cases)

Age group (in years)	Male	Female	Total
<20	1	-	1(3.33%)
20-40	7	2	9(30.00%)
40-60	14	4	18(60.00%)
>60	2	-	2(6.66%)

Of the 30 subjects included in the study, 24(80%) were males and 6(20%) were females with the mean age group of 37 years. Most prevalent age group of both male and female is between 40 to 60 years (60%).And mean age group of male is around 33 years and mean age for female

Table 2: Peripheral blood findings in tuberculosi

Peripheral blood smear findings	Number of cases	Percentage
Red Blood Cells:		
Normocytic anemia	9	30.00%
Microcytic Hypochromic anemia	19	63.33%
Macrocytic anemia	2	6.66%
White Blood Cells:		
Normal	12	40.00%
Leucopenia	1	3.33%
Leucocytosis	17	56.66%
Lymphocytosis	2	6.66%
Neutrophilia	17	56.66%
Eosinophilia	1	3.33%
Monocytosis	3	10.00%
Platelets:		
Normal	24	80.00%
Thrombocytopenia	5	16.66%
Thrombocytosis	1	3.33%
Erythrocyte Sedimentation Rate		
Normal	2	6.66%
Raised	28	93.33%

Fig. 1: Mycobacterium tuberculosis visualization using the Ziehl-Neelsen stain

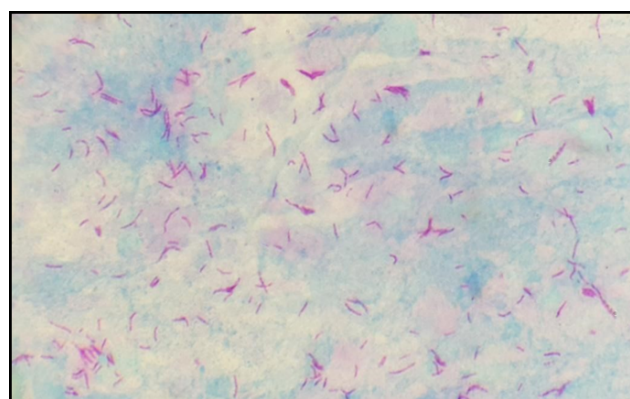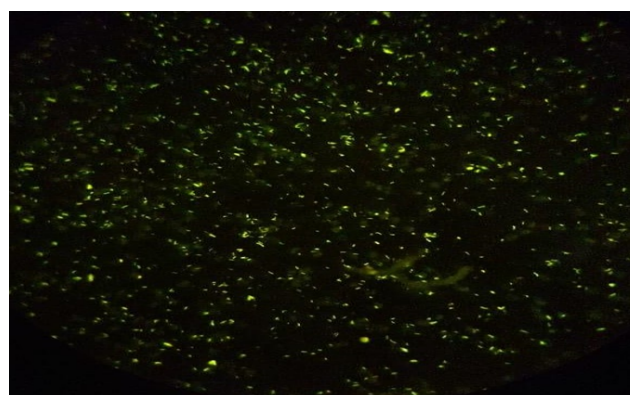**Fig. 2:** Acid fast bacilli as seen under Fluorescent Microscope

is around 47 years.(TABLE 1) Based on the peripheral smear findings, Anemia is seen in almost all the patients the most common type being Microcytic hypochromic anemia of about 63.33% and Normocytic Normochromic anemia being the second most common of about 30.00% while Macrocytic anemia being the least of about 6.66%.(TABLE 2) In cases of WBC abnormalities, Leucocytosis was observed in 56.66% and Leucopenia was observed in 3.33%. In patients with leucocytosis 17 patients (56.66%) had neutrophilia, two patient (6.66%) had lymphocytosis, three patient (10%) had monocytosis, one person (3.33%) had eosinophilia.(TABLE 2) Normal platelet count was seen in 24 patients (80%). Thrombocytosis was observed in five patient (16.66%) and thrombocytopenia (3.33%) was observed in one patient.(TABLE 2) .

Platelet indices such as Platelet Distribution Width, Mean Platelet Volume and Plateletcrit was found to be normal.

On observation ESR was found to be raised in 28 patients (93.33%), among the 28 patients 12 patients (42.8%) had an increased in ESR of about more than 91mm/hr and in two patients (6.66%) it was found to be normal.

4. Discussion

Tuberculosis is a chronic infectious disease with varied haematological parameters. These haematological parameters have been studied by various authors showing results of variable in nature. Thirty patients were included in the study in which 24 were males and 6 were female in the ratio of 4:1. This type of sex distribution is similar to the Molay Banerjee et al.[8] Most prevalent age group for both male and female is 40-60 years comprising of about 60%. This finding was line with the study conducted by Shafee M et al.[2]

Higher incidence of Tuberculosis in old age group may be due to poor immune status and exposure to number of people. Anemia was observed in almost in all cases with Microcytic Hypochromic anemia being the most common type of about 66.66%, Normocytic Normochromic anemia being the second most common type (26.66%) and Macrocytic anemia was observed in few cases.

Anemia was due to ineffective erythropoeitic response of the bone marrow, chemokine and TNF-alpha release by the activated macrophages. These factors suppress the erythropoietin production and prevent the reticuloendothelial transfer of iron to the red blood cell. This has been viewed as the pathogenesis of anemia in Tuberculosis.[7] This finding was little different from other studies by Sulochana et al,[6] Dr.Kotresh et al in which Normocytic Normochromic anemia was the predominant type while Microcytic anemia being the second most common type.

WBC Showed various abnormalities in which Leucocytosis and Neutrophilia was found to be most

prevalent.56.66% of patients showed leucocytosis. All the patients who showed leucocytosis had neutrophilia. Three persons showed Monocytosis. This finding was found to be similar with the study done by Parasappa Joteppa Yaranal et al.[12] Increases in leucocyte count and neutrophilia may be found to be associated in response to infection. Platelet was found to be normal in 80% of cases. The prevalence of Thrombocytosis and thrombocytopenia was in line with the study conducted by Hungund et al.[7] Thrombocytosis may occur due to inflammatory response to the pathogenic organism.

Casual factors of Thrombocytopenia involve varied mechanisms like bone marrow fibrosis, drug immune mechanisms, granulomatous involvement of bone marrow and hypersplenism.[8]

Erythrocyte Sedimentation Rate (ESR) was found to be increased in 93.33% cases which serve as an indicator and prognostic tool. Sulochana et al[6] and study by Molay Banerjee et al.[8] shows increased in ESR similar to our study.

Ergun Tozkoparan et al[13] suggested changes in Platelet indices which was not observed in the present study. The significance of platelet indices in tuberculosis immunopathogenesis remains to be under research.

5. Conclusion

This study shows male were more affected than female within the age group of 40 to 60 years. Anemia was observed in almost all cases with microcytic hypochromic being the most common type.

ESR was raised in almost all the cases. Leucocytosis along with neutrophilia was observed in most cases. Hematological investigations are one of the routine investigations done in all clinical practices. Thus, the variations in hematological parameters seen in pulmonary tuberculosis should reassure us to look watchfully at Tuberculosis as one of the differential diagnosis in patients having hematological findings. Thus, it aids in the diagnosis as well as prognosis of the disease.

6. Source of Funding

None.

7. Interest of Conflicts

None.

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