

Tuberculosis As A Cause Of Change In Hematological Parameters In A Tertiary Care Hospital

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Abstracts: Background & Aim: Hematopoietic system is another organ seriously affected by tuberculosis. The hematological changes sometimes act as useful factors providing a clue to diagnosis, assessing the prognosis, indicating the complication of underlying infection as well as therapy and response to therapy. Aim is to study the various hematological parameters in Z-N positive pulmonary tuberculosis patients. Methodology & Results: Present study was conducted on hematological parameters in pulmonary tuberculosis patients in the department of Pathology in MM institute of Medical Science and Research, Mullana, Ambala. The study was conducted for a period of one year from March 2013 to march 2014. Total numbers of 80 subjects were selected of Z-N positive and changes were compared with normal hematological parameters. The testing protocol was followed in the hospital laboratory. Result: showed decreased values of hemoglobin (Hb), red blood cell (RBC), packed cell volume (PCV), mean cell volume (MCV) and mean cell hemoglobin (MCH) while increased value observed in total leukocyte count (TLC), mean cell hemoglobin concentration (MCHC), erythrocyte sedimentation rate (ESR), and platelet count. Anemia noticed in 59% patients, including mild, moderate and severe. In peripheral blood film examination, microcytic hypochromic blood picture was most common. Conclusion: Various hematological abnormalities have been demonstrated in patients with pulmonary tuberculosis. These all parameters can be used as indicator in assessment of response to therapy. [Bala J NJIRM 2015; 6(4):31-35]

Key Words: Erythrocyte sedimentation rate, leukocytosis, PBF, Pulmonary Tuberculosis and Zeihl Neelson stain.

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Introduction: Tuberculosis (TB) has been there in human since antiquity. TB remains the single infectious disease causing the highest mortality in humans, leading to 3 million deaths annually – about 5 deaths every minute¹. TB remains a major global health problem and ranks as the second leading cause of death from an infectious disease worldwide, after the human immunodeficiency virus (HIV). It is the first infectious disease declared by the World Health Organization (WHO) as a global health emergency².

TB continues to dominate infectious diseases globally due to its ability to infect, remain latent in the host for an indefinite period and then reappear later as obvious disease. Mycobacterium tuberculosis is the most common cause of TB. Other rare causes are *M. bovis* and *M. africanum*³. Geographically, the burden of TB is highest in Asia and Africa. India and China together account for almost 40% of the world's TB cases. In India, TB kills five persons every minute – nearly 1,000 every day⁴.

Mycobacterium tuberculosis show branching filamentous forms resembling fungal mycelium.

M. tuberculosis is a straight or slightly curved rod, about 3 x 0.3 µm in size, occurring singly, in pairs or as small clumps. Tuberculosis bacilli have been described as gram positive.

M. tuberculosis causes natural infection in humans, other primates, dogs and some other animals which have close contact with humans.

The mode of infection is by direct inhalation of aerosolized bacilli contained in droplet nuclei of expectorated sputum. Coughing, sneezing and speaking release numerous droplets as many as 3000 infectious nuclei per cough. Dried bacilli in dust are much less infections⁵. In pulmonary tuberculosis many hematological and biochemical abnormalities are common and they are valuable aids to diagnosis⁶.

Hematopoietic system is another organ seriously affected by tuberculosis. It exerts a dazzling variety of hematological effects involving both cell lines

and plasma components. The hematological changes sometimes act as useful factors providing a clue to diagnosis, assessing the prognosis, indicating the complication of underlying infection as well as therapy and response to therapy ⁷.

The occurrence of anemia among patients diagnosed as active pulmonary tuberculosis was very high and it was contributed to anemia of chronic disease. Reactive thrombocytosis is found in a number of clinical situations including infectious diseases such as pulmonary tuberculosis ⁸.

Reversible peripheral blood abnormalities are commonly associated with pulmonary tuberculosis. Insight into the relationship between hematological abnormalities and mycobacterial infection has come from an understanding of the immunology of mycobacterial infection. The atypical and varied spectrum of clinical presentation of tuberculosis poses a diagnostic and therapeutic challenge to the physicians. Little is known about the prevalence of these hematological abnormalities and the effect of antituberculosis treatment on the various hematological parameters in the Indian subcontinent ⁹.

Mycobacterium Tuberculosis can occur in a patient with a primary blood disorder due to malnourishment, alcoholism, diabetes mellitus, drug treatment and impaired immunological defenses and cause diagnostic and therapeutic problems ¹¹.

Material and Methods: After the approval of the Institutional Ethics Committee MMIMSR, Mullana, then the study was conducted on hematological parameter in 80 pulmonary tuberculosis patients in the department of pathology in MM institute of medical science and research Mullana Ambala. Prior authority was taken from Chest and TB Department.

Study design-

Study was conducted on patients showing Z-N positive smears.

Inclusion criteria-

1. Patients of Ziehl Neelson smear positive were included.

Exclusion criteria-

Sample of patients with ZN smear negative.

Sample of patients with extra pulmonary tuberculosis.

This testing protocol was following in the hospital laboratory. Venous blood sample were collected from each subjects and performed hematological investigation (Hb, RBC, TLC, DLC, Platelet, Erythrocyte sedimentation rate, packed cell volume, mean cell volume, mean cell hemoglobin, mean cell hemoglobin concentration and PBF.

Complete blood count (CBC) is done by automated cell counter (MS9-SH) MELET Scholoesing laboratory. (Dacie and Lewis, 2010) ¹⁸.

The automated cell counter work on the principle of the impedance method (also known as coulter method), whereby it cell counts and sizes of cell by detecting and measuring changes in electrical impedance when a partical in a conductive liquid passes through a small capture.

Erythrocyte sedimentation rate was done by using westergren's method (Dacie and Lewis, 2010) ¹⁸.

Venous blood was taken in 3.8% trisodium citrate anticoagulant. The sample was diluted accordely in the preparation of 1 volume of 3.8% trisodium citrate to 4 volumes of blood and mix throughly. Result was expressed as ESR = X mm in 1 hours.

Peripheral blood film:

Staining of the smears was carried out using Leishman's stain which stains red Cells, white cells and platelets.

Leishman's Staining techniques:-

The staining of slides was done as per Dacie and Lewis Practical Hematology ¹⁹

Results: The age distribution of patients of pulmonary tuberculosis is as follows .It varied over a wide range from 10 years to 80 years of age, however the majority of patients(24) belonged to the age of 51 – 60 years whose percentage is 30% .The other age wise distribution is 7 patient

(8.75%) in 10-20 yrs age group, 6 patients 7.5 % in 21-30 yrs age group ,10 patients (12.5%) in age group 31-40 yrs ,19 patients 23.75% in 41-50 yrs, 11 patients (13.75%) in 61-70 yrs age group , 3 patients (3.75%) in in 71-80 years age group.

In the present study mostly patients 60 (75.0%) are male and remaining 20 (25 %) are female. Ratio of male patients to female patients is 3:1.

Table 1: Distribution of hemoglobin, PCV, MCV, MCH, MCHC in pulmonary tuberculosis patients

		Normal (%)	Increased (%)	Decreased (%)
Hb	Male	10	0	90
	Female	15	0	85
PCV	Male	5	-	95
	Female	5	-	95
MCV		28.75	5	66.25
MCH		37.5	8.75	53.75
MCHC		31.25	45	23.75

Maximum number of the patients had decreased Hb, PCV, MCV, MCH and MCHC values.

The peripheral blood films were examined in details for RBC morphology, including size and shape of RBC's, chromia and inclusions. and the distribution of morphological picture is as follows. The most common blood picture was microcytic hypochromic in (51.25%) cases , normocytic normochromic in (47.5%) cases , Normocytic hypochromic in (1.25%) patients.

Table 2: Distribution of blood cell count in pulmonary tuberculosis patients

		Normal (%)	Increased (%)	Decreased (%)
Red Blood Cells	Male	20	0	80
	Female	40	0	60
White Blood Cells		40	60	-
Platelets		77.74	12.50	10
Differential WBC count-				
Polymorph		46.25	52.5	1.25
Lymphocyte		48.75	3.75	47.5
Eosinophil		92.5	7.25	-
Monocyte		48.75	-	51.25
Basophil		100	-	-

Maximum number of patients shows decreased RBC count where as WBC count increased and platelet count normal.

ESR values are increased in almost all the patients.

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

The present study is a prospective study of 80 pulmonary tuberculosis cases conducted in the department of pathology, MMIMSR Mullana.

In this study, a detailed history was taken. Complete blood count and peripheral blood film examination were performed. Thorough clinical and hematological evaluation of all the 80 patients was done and various observations were made. The present discussion is based on the following observations.

Comparative studies showing relationship of age and sex with positive pulmonary tuberculosis.

AGE – The maximum number of 24 (30%) patients were seen in age group of 51-60 years. Present study was similar to the other study, Chakarbarti AK et al 13, Kannan S et al ¹¹.

SEX – Majority of the pulmonary tuberculosis cases were seen in male patients (75%). Causes of this predominance in men in relation to women have been cited as biological differences such as immunity, exposure to M. tuberculosis associated with different social miscegenation profiles and social behaviors including smoking (Watkins 2006).

Hb- Majority of the patients had decreased hemoglobin level in both female as well as in males. The prevalence of anemia in the present study was similar to the other studies 10,14,4015,16,17 and microcytic hypochromic was the most common type.

Although a microcytic hypochromic anemia was most common in this study, other types of anemia including, normocytic normochromic in 47.5% patients and normocytic hypochromic in 1.25% patients were also noted. The incidence of macrocytic blood picture was similar to study done by Yaranal P J et al 17, Chakarbarti A K et al¹³

Leukocyte response varied from leukocytosis to leukopenia. Mild leucocytosis is documented in 60% of patients with pulmonary tuberculosis. The prevalence of leukocytosis in present study was similar to study done by Sinha KNP et al 12. All patients with leukocytosis had neutrophilia in 52.5% patients and none of patients had monocytosis. The reported prevalence of leukopenia was seen in 47% patients. Neutrophilia was the predominant finding in these patients.

Red blood cell - In our study 20% male patients had normal erythrocyte count while 80% male patients had decreased erythrocyte count. In case of female patients, 40% patients had normal erythrocyte count while 60% patients had decreased erythrocyte count.

Thrombocytosis has been reported in 12.50% patients. Similar study done by Yaranal PJ et al¹⁷.

RBC indices: - PCV- In present study, out of 60 male patients decreased PCV (packed cell volume) was seen in 95% patients. Whereas in 20 female patients, 95% patients had decreased PCV value.

MCV – In our study it was found that, 66.25% patients had decreased MCV, 28.75% patients had normal and remaining 5% patients had increased MCV value. Lee S Wet al¹⁰ showed of decreased MCV found in 71.9% patients, normal in 13.9% and increased MCV found in 4.6% patients, Chakarbarti A K et al¹³ on 39 disseminated tuberculosis patients, in those 4 (10%) patients had decreased MCV, 3 (7.6%) had increased MCV and remaining 32 (82%) patients had normal MCV.

MCH – In our study 80 patients were included in which, 53.75% patients found with low MCH values, 37.5% with normal MCH and remaining 8.75% found with high MCH. Lee S W et al¹⁰ results showed on 281 tuberculosis patients and detected 49 (17.43%) patients had decreased MCH,

229 (81.48%) patients had normal MCH values remaining 3 (1%) had increased MCH.

MCHC – In our study it was found that 31.25% patients had normal MCHC while 45% patient had increased MCHC values whereas 23.75% patient had decreased level of MCHC.

ESR – Studies reported on the value of the ESR as a test of activity in pulmonary tuberculosis have concluded that the ESR is useful practical method of obtaining accurate and dependable information about the actual progress or retrogression of tuberculous lesion, before these can be demonstrated by other clinical and laboratory procedures. Changes in the sedimentation rate exactly parallel alteration in the tuberculous focus. Previous studies have documented an elevated ESR level in majority of patients 1. 97.5% of patients with increased ESR in the present study are in concordance with the reported literature. Similar study given by Yaranal P J et al 17, 99% patients had increased ESR and 1% patients had normal ESR.

Conclusion: Many hematological abnormalities have been demonstrated in pulmonary tuberculosis patients in the present study.

In peripheral blood film examination, most common finding were microcytic hypochromic blood picture along with Normocytic Normochromic and Normocytic hypochromic in some cases. Most of the patients showed increased WBC count . ESR values were increased in almost all the cases . Hematological indices PCV , MCH and MCV were decreased in all the cases while MCHC was increased in most cases.

While many of them are consistent with reported literature and reinforce the fact that they can become valuable tools in monitoring pulmonary tuberculosis such as increased ESR. All these parameters can be used as indicator in assessment of response to therapy.

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Conflict of interest: None

Funding: None

Cite this Article as: Bala J, Bagdi R, Bedi S, Kumar A. Tuberculosis As A Cause Of Change In Hematological Parameters In A Tertiary Care Hospital. <i>Natl J Integr Res Med</i> 2015; 6(4): 31-35
