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Original Research Article

Study of the various hematological parameters in Z-N positive pulmonary tuberculosis patients of urban population of Central India**Kuldeep Singh^{*1}, Kamal Kachhawa², Rajni Bagdi³ and Seema Tamrakar⁴**¹Demonstrator, Department of Microbiology, Mahaveer Institute of Medical Sciences & Research, Bhopal, India²Assistant Professor, Department of Biochemistry, Mahaveer Institute of Medical Sciences & Research, Bhopal, India³Assistant Professor, Department of Paramedical Science, NRI Institute of Nursing & Paramedical Sciences, Bhopal, India⁴Demonstrator, Department of Biochemistry, Mahaveer Institute of Medical Sciences & Research, Bhopal, India**QR Code*****Correspondence Info:**Mr. Kuldeep Singh
Demonstrator,
Department of Microbiology,
Mahaveer Institute of Medical Sciences & Research, Bhopal, India***Article History:****Received:** 08/06/2017**Revised:** 11/06/2017**Accepted:** 11/06/2017**DOI:** <https://doi.org/10.7439/ijbr.v8i6.4224>**Abstract****Background:** 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.**Methodology & Results:** Present study was conducted on hematological parameters in pulmonary tuberculosis patients in the department of Microbiology in Mahaveer institute of Medical Science and Research, Bhopal. The study was conducted for a period of one year from December 2015 to November 2016. Total 100 patients were selected by Ziehl Neelson positive and changes were compared with normal hematological parameters. The testing protocol was followed in the hospital laboratory.**Result:** Most of the parameters showed decreased values like hemoglobin (Hb), red blood cell (RBC), packed cell volume (PCV), mean cell volume (MCV) and mean cell hemoglobin (MCH), total leukocyte count (TLC) and mean cell hemoglobin concentration (MCHC), while erythrocyte sedimentation rate (ESR) showed significantly increased level.**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. Especially ESR showed significantly increased level and hemoglobin showed significantly decreased level.**Keywords:** ESR, leukocytosis, Pulmonary Tuberculosis and Zeihl Neelson stain.**1. Introduction**

Tuberculosis is a highly prevalent chronic infectious disease caused by Mycobacterium tuberculosis. Pulmonary tuberculosis (PTB) is still a common disease in developing countries [1]. One third of world population is infected and approximately 3 million people die annually from pulmonary tuberculosis [2]. The following people are at high risk for active tuberculosis elderly, infants and people with weaken immune system, for instance, AIDS. The risk for contracting tuberculosis increases if one is in frequent contact with people living with the disease, poor

nutrition and living in crowded or unsanitary living condition. The following factors may increase the rate of Tuberculosis infection in a population: Increase in HIV infections, increase in number of homeless people (poor environment and nutrition) and the appearance of drug resistant strains of Tuberculosis (TB) [3]. TB is a curable disease although drug resistance is one of the major challenges in the treatment, prevention and control of the disease. However, the use of anti-TB drugs is not free from side effects. Allergic reactions, fever, rash, vasculitis,

nausea, vomiting, hepatotoxicity, hepatocellular inflammation, peripheral neuropathy and others are some of the common side effects associated with TB treatment [4]. 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 anti-tuberculosis treatment on the various hematological parameters in the Indian subcontinent [5]. This study was undertaken to analyse the hematological parameters in patients with sputum smear positive for AFB and to evaluate their diagnostic and prognostic significance.

2. Materials and methods

The study was conducted on Hematological parameters in pulmonary tuberculosis patients in the Department of Microbiology in Mahaveer Institute of Medical Science & Research, Bhopal, Madhya Pradesh. In this study total 100 pulmonary tuberculosis patient's blood specimens were taken who attending to indoor patient (IPD). Prior authorities were taken from Chest and TB Department Mahaveer Institute of Medical Science & Research, Bhopal. In all cases patient's name, age, weight, clinical history and laboratory investigation were recorded. Studies were conducted on patients showing Ziehl Neelson smear positive and changes were compared with hematological parameters. Patients of Ziehl Neelson smear positive were included.

2.1 Sputum collection and slide preparation

Sputum samples from all the suspected TB patients were collected in sterile container and smears were prepared and all the smears were stained with Ziehl Neelsen stain by using standard protocol [6].

2.2 Blood collection and CBC profile test

Blood samples were collected from patient into EDTA containers and tested on automated cell counter with complete profile including Hb, total WBC count, RBC count, and Platelet count. Hemoglobin (Hb) estimation was done calorimetrically, ESR done by Wintrobe's method, differential WBC count was done by counting 100 WBCs [7].

2.3 Study design

Study was conducted on patients showing ZN smear positive and changes were compared with hematological parameters.

2.4 Inclusion criteria

Patients of Ziehl Neelson (ZN) smear positive were included.

2.5 Exclusion criteria

Sample of patients with ZN smear negative.

Sample of patients with extra pulmonary tuberculosis.

2.6 Ethical consideration

The present study was approved by the Ethical Committee of Mahaveer Institute of Medical Sciences and Research Bhopal. The approval was on the agreement that patient anonymity must be maintained, good laboratory practice, quality control ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only. All the work was performed according to the International Guidelines for Human Experimentation in Biomedical Research. Approval was obtained from the subjects by taking the informed consent.

2.7 Statistical analysis

During data collection completed question were checked regularly to rectify any discrepancy, logical errors or missing information. The data entry was carried using Microsoft Office Excel worksheet and then exported to statistical software and analyzed using appropriate statistical tests by using Statistical Package for Social Services (SPSS vs 21 for Mac.IBM Inc. Chicago).

3. Results

In the present study including total 100 patients, where 65 were male patients and 35 were female patients. Ratio of male patients to female patients is approximate 2:1 (Figure 1). Who were included in this study after sputum positive for AFB. All patients were in age group of 10-80 years. 9% of the total population was between in the age of 10-20 years and 5 % of the total population between 70-80 years.

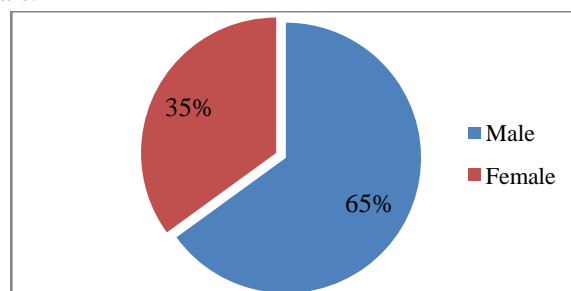


Figure 1: Sex distribution of patients

Table 1: Age distribution of patients

S. No.	Age In Years	No. of Patient	Mean \pm SD
1	10-20	9	18.61 \pm 1.31
2	21-30	7	24.9 \pm 2.11
3	31-40	12	38.6 \pm 2.32
4	41-50	23	47.55 \pm 2.52
5	51-60	30	58.81 \pm 2.12
6	61-70	14	67.12 \pm 3.56
7	71-80	5	75.54 \pm 2.51

The age distribution of patients of pulmonary tuberculosis varied over a wide range from 10 years to 80 years of age. However, majority of patients belonged to the age of 51-60 years (no = 30), shows mean 58.81 ± 2.12 and only 5 patients are belong to age 71-80 years, shows mean 75.54 ± 2.51 . A mostly patients come in between 41-50 and 51-60 age of study groups. Both group having more than 50% of patients (Table 1, Figure 2).

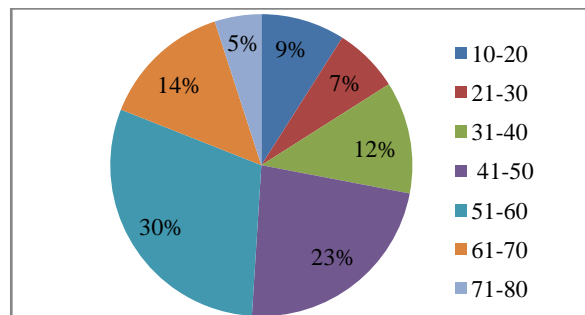


Figure 2: Age distribution of patients.

Table 2: Distribution of Hb, RBC, PCV and ESR in pulmonary tuberculosis patients

S. No	Parameter	Sex	Normal		Increase		Decrease	
			Mean \pm SD	No	Mean \pm SD	No	Mean \pm SD	No
1	Hb	Male	14.12 ± 0.84	06	--	--	10.52 ± 1.62	59
		female	11.9 ± 0.51	08	--	--	9.23 ± 1.11	27
2	RBC	Male	4.76 ± 0.31	10	--	--	3.65 ± 0.61	55
		female	4.41 ± 0.31	06	--	--	2.81 ± 0.41	29
3	PCV	Male	43.85 ± 2.31	04	--	--	28.91 ± 5.54	61
		Female	41.11 ± 1.81	05	--	--	27.74 ± 3.52	30
4	ESR	Male	8.1 ± 1.21	05	74.1 ± 36.5	60	--	
		female	5.5 ± 0.21	03	68.86 ± 41.24	32	--	

- In this study maximum tuberculosis patients in both sexes found decreased level of Hb. Mean value of Hb in male patients have 10.52 ± 1.62 and female patients have 9.23 ± 1.11 . Hemoglobin level of Female patients lower than to male patients (Table 2).
- The study showed total erythrocyte count (RBC) decreased in both sexes. Mean value of decrease RBC in male is 3.65 ± 0.61 and in female is 2.81 ± 0.41 . Some patients of both sexes found normal value of RBC. None of the patients in both sexes found increased erythrocyte count (Table 2).
- The Study showed decreased level of packed cell volumes (PCV) in both sexes. While some patients had normal level of packed cell volume. None of them patients had increased level of packed cell volume (Table 2).
- In this study all patients of both sexes have increased level of erythrocyte sedimentation rate (ESR) exceptionally few patients have normal level of erythrocyte sedimentation rate. None of them have decreased level of ESR (Table 2).

Table 3: Distribution of WBC, Platelet, MCV, MCH and MCHC in pulmonary tuberculosis patients

S. No	Parameter	Normal		Increase		Decrease	
		Mean \pm SD	No	Mean \pm SD	No	Mean \pm SD	No
1	WBC	8652.36 ± 1771.8	40	18431.31 ± 4191.76	56	$3541.12 \pm 514.12 \pm 23$	04
2	Platelet	2.71 ± 0.74	72	5.45 ± 1.32	16	1.16 ± 0.32	12
3	MCV	88.74 ± 4.41	29	109.12 ± 4.51	08	71.33 ± 12.23	63
4	MCH	28.51 ± 1.23	36	37.11 ± 6.72	11	23.51 ± 3.01	53
5	MCHC	32.11 ± 0.66	32	36.15 ± 3.71	46	27.91 ± 4.23	22

- The majority of patients in both sexes had increased leukocyte counts (WBC) (18431.31 ± 4191.76) and some patients had normal level of WBC (8652.36 ± 1771.84). While few patients had decreased level of leukocyte count (3541.12 ± 514.23) in the both sexes (Table 3).
- The study found normal level of platelet counts (2.71 ± 0.74) in maximum number of patients in both sexes. Some patients had increased level of platelet (5.45 ± 1.32) and some patients had decreased level of platelet count (1.16 ± 0.32) in both sexes (Table 3).
- The study found decreased level mean corpuscular volume (MCV) in maximum patients (71.33 ± 12.23). Some patients had normal level of MVC (88.74 ± 4.41) and few patients had increased level of MCV (109.12 ± 4.51) in the both sexes (Table 3).
- In this study showed decreased level of Mean corpuscular hemoglobin (MCH) (23.51 ± 3.01) in maximum patients. Some patients had normal MCH (28.51 ± 1.23) and few patients had increased level of MCH (37.11 ± 6.72) in the both sexes (Table 3).

5. The study found increased level of Mean corpuscular hemoglobin concentration (MCHC) (36.15 ± 3.71) in majority of patients in both sexes. Some patients found normal counts OF MCHC (32.11 ± 0.66) and few patients found decreased level of MCHC (27.91 ± 4.23) in both sexes (Table 3).

4. 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 is a global emergency in 1993. Various hematological manifestations had been described in association with tuberculosis. There is paucity of literature about the hematologic abnormalities in pulmonary tuberculosis patients from Indian population. In the present study an attempt has been made to study a complete hematological profile of pulmonary tuberculosis. Most prevalent age group was 51-60 years (58.81 ± 2.12). The male to female ratio was approximate 2:1 and the present study was similar to Pravat Kumar Thatoi et al [8] and BR Hungund et al [9].

According to Zaman et al found that men are more commonly affected by PTB than women. Thus the PTB case notification rates in most of countries are higher in male patients than female patients, which are also consistent with our study. This study showed the gender distribution where male patients higher (65%) in number [10].

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. ESR level increased in the both sexes. However, male patients found higher value compare than female patients. This study also concordance with the reported literature given by Bala J et al [11]. He found that maximum patients had increased level of ESR. This study also showed 94% patients had higher ESR level which indicates likelihood to detect tuberculosis since higher ESR rate may be due to this infectious disease. Thus ESR could be used as a diagnostic marker for the diagnosis of tuberculosis by correlating the higher ESR value to this infectious disease.

ESR is regarded as test of activity in pulmonary tuberculosis. Elevated ESR to different level is one of the indicators of severity of disease and a prognostic tool, was evident in our study. It elevates in those patients with increase in sputum positivity. In earlier studies the elevated ESR is also reported by different scientists in tuberculosis patients. These findings are in agreement with previous studies by Chakraborti et al and Janssens et al [12,13].

In this study PTB patients found increase level of platelets count in both sexes. This result is similar to studies

by Awodu et al, AL-Omar et al [13-15]. Also they found thrombocytosis more common than thrombocytopenia in patients with PTB. Some authors found reactive thrombocytosis in a number of clinical situations including infectious diseases such as PTB [16]. The cause of thrombocytosis in PTB patients in our study might be attributed to an immune phenomenon due to production of platelet antibodies which leads to reactive myeloid hyperplasia [17]. Thrombocytosis is assumed to be due to increased thrombopoietic factors as an inflammatory response. Varied mechanisms like drugs immune mechanisms, bone marrow fibrosis and hypersplenism have all been implicated as possible causal factors for thrombocytopenia. Interleukin-6 has also been regarded as potent thrombotic factor released by inflamed cells [18].

Several studies demonstrated that the Hb level, WBC count, red blood parameters, ESR and high platelet count are useful indicator of severity in tuberculosis, and the return of these indices to normal level is a good indication of disease control in that they correlate with sputum conversion to acid-fast bacilli negative [19,20]. Haematological and biochemical abnormalities in pulmonary TB are common and may be valuable aids in diagnosis.

5. Conclusion

This study shows male was more infected than female in which 51-60 years age group was common among them hematological abnormalities were common, with pulmonary tuberculosis. ESR was raised in all of patient. So, patients infected with TB should be monitored hematological it will help in diagnosis and prognosis of the disease.

Conflicts of interest - Nil

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