

## STUDY OF HEMATOLOGICAL PROFILE BEFORE DURING AFTER COMPLETION OF DOTS THERAPY IN PULMONARY TUBERCULOSIS

Shidram Kamate<sup>1</sup>, B. Ramesh<sup>2</sup>, N. Bhaktavatchalam<sup>3</sup>

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**ABSTRACT:** Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB). Pulmonary tuberculosis may produce reversible abnormalities of peripheral blood. TB can cause diverse laboratory abnormalities such as anemia, increased Erythrocyte, Sedimentation rate and thrombocytopenia. To study complete hematological parameters namely Hb%, total count, differential count, platelet count, reticulocyte count, ESR, peripheral smear. The aim of the present study is Comparison of hematological profile before, during and after completion of DOTS in pulmonary tuberculosis. 100 patients were included in the study with symptoms suggestive of TB in Dr. B. R. Ambedkar Medical College & Hospital, Bangalore from Oct 2011 to December 2012. The incidence of Tuberculosis infection was greater in males (70%) compared to females (30%). Anemia was present in 99% of cases, among which normocytic, normochromic in 84% cases followed by microcytic hypochromic in 11% cases. Most of the patients (92%) had total count more than 11,000. Among these 49%, had lymphocytopenia, 35% had neutrophilia, monocytosis in 38%, basophilia in 45% cases. 50% had normal platelets and 33% had thrombocytopenia. 100% had elevated ESR levels. In this study there is a significant post treatment changes in Hb, TC, Monocyte, Platelet count, ESR, RBC count. No significant post treatment changes in Lymphocyte, Neutrophill, Basophill, Eosinophill, Reticulocyte count. Hematological profile of patients improved during and after completion of Anti Tubercular treatment under DOTS.

**KEYWORDS:** Tuberculosis, sputum, AFB, dots, Haematology.

**INTRODUCTION:** Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB). The disease spreads by droplet infection when people suffering from pulmonary TB expel bacteria, for example by coughing. In general, a relatively small proportion of people infected with *Mycobacterium tuberculosis* will go on to develop TB disease; however, the probability of developing TB is much higher among people infected with HIV. TB is also more common among men than women, and affects mostly adults in the economically productive age groups; around two-thirds of cases are estimated to occur among people aged 15–59 years.<sup>1</sup>

Despite dramatic improvements in public health and medical care, *Mycobacterium tuberculosis* remains as much of a threat in the 21<sup>st</sup> century as it was when first identified as a pathogen by Koch in 1882. Tuberculosis (TB) is a major cause of

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morbidity and mortality throughout the world. One-third of the world's population is infected with the TB bacillus. The WHO cites TB as the single most important fatal infection, with around 8.8 million new cases and 1.4 million deaths per year, 95% in developing countries.<sup>2</sup>

Tuberculosis is a major public health problem in India. In 2010, there were to 2.5 million new cases accounting for one quarter of the total cases worldwide.<sup>1</sup> The impact of tuberculosis (TB) can be devastating, especially in developing countries suffering from high burdens of both TB and human immunodeficiency virus (HI infections. Tuberculosis is a major barrier to economic development of the count costing India about Rs. 12,000 crore a year. Pulmonary tuberculosis may produce reversible abnormalities of peripheral blood.<sup>4</sup> Hematological abnormalities have been associated with tuberculosis and response to drug therapy. However changes in response to therapy have not been fully been determined in pulmonary tuberculosis patients living in developing countries. TB can cause diverse laboratory abnormalities such as anemia, increased Erythrocyte Sedimentation rate, Leucocytosis and thrombocytopenia

**MATERIAL AND METHODS:** 100 pulmonary tuberculosis patients were randomly selected and subjected to detailed medical history, general physical and systemic examination.

**Inclusion Criteria:** Pulmonary tuberculosis with both sputum smear positive and negative TB patients selected for the study, the patients selected were more than 15 years and less than 65 years.

**Exclusion Criteria:** Old healed pulmonary tuberculosis lesion, Diabetes and other metabolic disorder, Bronchial carcinoma, HIV, Patients on steroid, iron therapy or vitamin therapy. Pregnancy, Past intake of ATT, Renal disorders Among the selected patients following variables were taken into consideration. Gender, Age, Hemoglobin. Total count, Differential count- neutrophil, lymphocyte, monocyte, basophil, eosinophil, Platelet count, Peripheral smear, ESR, RBC count, Reticulocyte count, Chest x ray Sputum AFB.

Routine investigations such as haemogram that is, haemoglobin, total count, differential count, platelet count and erythrocyte sedimentation rate; reticulocyte count; RBC count were done, before starting treatment, 2 months after treatment and 6 months after treatment. RENAL FUCTION TESTS (blood urea, serum creatinine), LIVER FUNCTION TESTS (total, direct, indirect bilirubin, SGOT, SGPT, PROTEIN, ALBUMIN, GLOBULIN., HIV 1&2, Sputum for malignant cells. RBS

**DISCUSSION:** 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.<sup>5</sup>

**ANEMIA:** In this study most of patients had anemia (99%) before starting treatment, most commonest being Normocytic Normochromic (84%), Microcytic Hypochromic (11%) rest Having Macrocytic Hypochromic anemia. After treatment hemoglobin levels improved Significantly

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strong. ( $p < 0.001$ ). Al Omar et al 2009, recorded that anemia occurred in 60% male patients and 45% female patients, normocytic normochromic in 80% cases and microcytic hypochromic in 20% cases.<sup>6</sup> Post treatment hemoglobin levels were significantly higher than ( $p < 0.001$ ) than pre-treatment values in the patient.<sup>6</sup> Morris et al 1989, also recorded that anemia as common feature in PTB patients and majority had normocytic normochromic, 14% had microcytic hypochromic and 18% had macrocytic anemia.<sup>7</sup>

**CHANGE IN TOTAL COUNT:** In this study most of the patients (92%) had  $>11,000/\text{cumm}$  TC before treatment, Normal TC in 5% and  $<4,000/\text{cumm}$  in 3% cases. After treatment there is strongly significant improvement in TC ( $p < 0.001$ ) Al Omar et al 2009, also observed that leucocytosis observed initially in PTB patients in the study, became normal both in male and female patients.<sup>6</sup> which is consistent with our study. Morris et al 1989, study revealed the prevalence of leucocytosis in more than 40% cases.<sup>7</sup>

**CHANGE IN LYMPHOCYTE COUNT:** In this study most of the patients (49%) had lymphocytopenia ( $<20\%$ ), normal count in 43% cases and rest having lymphocytosis ( $>50\%$ ). Post treatment there is significant improvement in lymphocyte count ( $p = 0.05-0.1$ ). Onwubalili et al 1990, Akintude et al 1995 shown some conflicting reports only lymphocytosis and lymphocytopenia.<sup>8&9</sup>

**CHANGE IN MONOCYTE COUNT:** In our study monocytosis ( $>8\%$ ) present in 38% cases; monocytopenia ( $<4\%$ ) in 24% cases and normal count in 38% cases. After treatment there is significant change in values ( $<0.001$ ). Lombard et al 1993, recorded that monocytosis in small number of patients while monocytopenia in 50% of patients.<sup>10</sup> Singh et al observed monocytosis in 65% patients with disseminated/military Tuberculosis and 69% patients with pulmonary tuberculosis.<sup>11</sup>

**CHANGE IN PLATELET COUNT:** In our study majority of patients (50%) having normal level, 33% having thrombocytopenia and rest having increased levels. Post treatment there is significant change in platelet count. ( $p = 0.029$ ) A significant increase in platelet count ( $p < 0.001$ ) was observed in PTB patients as compared to normal individuals.<sup>6</sup> Maartens et al, 1990 reported 24 out of 104 (23%) cases of thrombocytopenia with Tuberculosis.<sup>12</sup>

**CHANGE IN ESR:** In our study all cases had increased ESR before treatment. Post treatment there is significant change in p value ( $<0.005$ ) PJ Yarnal et al 2013 revealed 99% of patient had increased ESR. Only one patient had a normal ESR. 13 patients had ESR ranging from 20 to 40 mm in first hour, 30 patients had ESR in the range of 40–60 mm in first hour, 35 patients had from 60 to 80 mm in first hr and 11 patients had ESR value more than 100 mm in first hr. The numbers of males were more in all ranges.<sup>13</sup> Morris et al study showed 80% patients with pulmonary tuberculosis.<sup>7</sup> The ESR value at post treatment were extremely significant ( $p < 0.0001$ ) with pretreatment denotes gradual decrease in TB infection and good response to treatment.

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**CONCLUSION:** Anemia was present in 99% of cases, among which normocytic normochromic in 84% cases followed by microcytic hypochromic in 11% cases. Most of the patients (92%) had total count more than 11,000. Among these 49% had lymphocytopenia, 35% had neutrophilia, monocytosis in 38%, basophilia in 45% cases. 50% had normal platelets and 33% had thrombocytopenia. 100% had elevated ESR levels. 25% patient had right upper zone opacity; 15% had right lower zone opacity. In this study there is a significant post treatment changes in Hb, TC, Monocyte, Platelet count, ESR, RBC count. DOTS treatment is very effective.

Variables	Period of Study			Differences			Significance		
	Before	During	After	Before-During	Before-after	During-After	Before-During	Before-After	During-After
<b>Monocyte</b>	7.83±5.26	6.73±3.84	5.48±2.52	1.101	2.343	1.242	0.001**	<0.001**	<0.001**
<b>Basophil</b>	3.16±3.93	2.65±1.75	2.87±1.84	0.515	0.296	-	0.166	0.445	-
<b>Eosinophil</b>	3.66±2.49	3.87±2.39	4.04±2.36	-0.212	-0.384	-0.172	0.259	0.123	0.428

**Table 1: An Evaluation of patients based on Clinical variables**

Variables	Period of Study			Difference			Significance		
	Before	During	After	Before-During	Before-After	During-After	Before-During	Before-After	During-After
<b>Platelet count</b>	2.65±1.45	2.85±1.23	5.48±2.52	-0.162	-0.311	-0.153	<0.001**	0.001**	0.029*
<b>ESR</b>	41.35±11.99	2.65±1.75	21.82±5.17	4.616	19.535	14.919	<0.001**	<0.001**	<0.001**
<b>RBC</b>	3687.36±480.54	3772.74±515.96	3933.79±891.87	-85.374	246.424	161.051	0.259	0.002**	0.028*
<b>RET</b>	1.60±0.31	1.67±0.32	1.74±0.32	-0.064	-0.111	-0.048	<0.001**	<0.001**	0.001

**Table 2: An Evaluation of patients based on Clinical variables**

<b>Hemoglobin %</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
Normal (0)	1 (1%)	1 (1%)	41 (41.0%)	+ 40%
Anemia (1)	99 (99%)	99 (99%)	59 (59.0%)	- 40%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 3: An evaluation of patients for improvement based on Hemoglobin**

<b>Total count</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
<4000	3(3%)	3(3%)	7(7.0%)	+4%
4000-11000	5(5.0%)	9(9.0%)	52(52.0%)	+47%
>11000	92(92.0%)	88(88.0%)	41(41.0%)	-51%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 4: An evaluation of patients for improvement based on total count**

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<b>Lymphocytes</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
<20	49(49.0%)	40(40.0%)	10(10.0%)	-39.0%
20-50	43(43.0%)	53(53.0%)	89(89.0%)	+43.0%
>50	8(8.0%)	7(7.0%)	1(1%)	-7%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 5: An evaluation of patients for improvement based on Lymphocytes (L)**

<b>Neutrophil</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
<40.0	7(7.0%)	6(6.0%)	1(1%)	-6%
40.0-70.0	58(58.0%)	68(68.0%)	96(96%)	+38%
>70.0	35(35.0%)	26(26.0%)	3(3%)	-32%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 6: An evaluation of patients for improvement based on Neutrophil (N)**

<b>Monocytes</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
<4.0%	24(24.0%)	19(19.0%)	18(18.0%)	-6%
4-8.0%	38(38.0%)	54(54.0%)	74(74.0%)	+36%
>8.0%	38(38.0%)	27(27.0%)	8(8.0%)	-30%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 7: An evaluation of patients for improvement based on Monocytes**

<b>Basophils</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
0-2%	55(55.0%)	61(61.0%)	57(57.0%)	+2%
>2%	45(45.0%)	39(39.0%)	43(43.0%)	-2%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 8: An evaluation of patients for improvement based on Basophils**

<b>Eosinophil</b>	<b>Before</b>	<b>During</b>	<b>After</b>	<b>% change</b>
0-6%	87(87.0%)	86(86.0%)	85(85.0%)	-2%
>6.0%	13(13.0%)	14(14.0%)	15(15.0%)	+2%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

**Table 9: An evaluation of patients for improvement based on Eosinophil**

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Platelet counts	Before	During	After	% change
<1.50	33(33.0%)	11(11.0%)	0(0%)	-33%
1.50-4.0	50(50.0%)	69(69.0%)	83(83.0%)	+33%
>4.0	17(17.0%)	20(20.0%)	17(17.0%)	0%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

Table 10: An evaluation of patients for improvement based on Platelet counts

ESR	Before	During	After	% change
Normal (0)	0(0%)	1(1%)	29(29.0%)	+29%
Abnormal (1)	100(100%)	99(99%)	71(71.0%)	-29%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

Table 11: An evaluation of patients for improvement based on ESR

Peripheral Smear	Before	During	After	% change
NN	84(84.0%)	84(84.0%)	96(96.0%)	+12.0
MAH	5(5.0%)	5(5.0%)	1(1.0%)	-4.0
MH	11(11.0%)	11(11.0%)	3(3.0%)	-8.0
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

Table 12: An evaluation of patients for improvement based on peripheral Smear

RBC	Before	During	After	% change
<4500	93(93.0%)	94(94.0%)	91(91.0%)	-2.0
4500-5500	7(7.0%)	6(6.0%)	8(8.0%)	+1%
>5500	0(0%)	0(0%)	1(1%)	+1%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

Table 13: An evaluation of patients for improvement based on RBC Smear

RET	Before	During	After	% change
Normal (0)	100(100%)	100(100%)	91(91.0%)	-9%
Abnormal (1)	0(0%)	0(0%)	9(9.0%)	+9%
<b>Total</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>100 (100%)</b>	<b>-</b>

Table 14: An evaluation of patients for improvement based on RET

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## **AUTHORS:**

1. Shidram Kamate
2. B. Ramesh
3. N. Bhaktavatchalam

## **PARTICULARS OF CONTRIBUTORS:**

1. Junior Resident (PG), Department of General Medicine, Dr. B. R. Ambedkar Medical College.
2. Associate Professor, Department of General Medicine, Dr. B. R. Ambedkar Medical College.
3. Professor, Department of General Medicine, Dr. B. R. Ambedkar Medical College.

## **NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. B. Ramesh,  
Associate Professor,  
Department of Medicine,  
Dr. B. R. Ambedkar Medical College,  
Bangalore-40.  
E-mail: drrameshsargur@gmail.com

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