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Assessment of changes in haematological parameters in patients of pulmonary tuberculosis at a tertiary care hospital

[1]Manjari Kumari, [2]Esha Singhal[2] , [3]Vidhu Upadhyaya, [3]Prashant Bhardwaj[*]
[1]*Department of Pharmacology, Rajshree Medical Research Institute, Bareilly*
[2] *Department of Microbiology, Rajshree Medical Research Institute, Bareilly*
[3]*Department of Pathology, Rajshree Medical Research Institute, Bareilly*

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ABSTRACT:
Background: Tuberculosis (TB) is a chronic debilitating infectious disease affecting multiple organs. Hematopoietic system is also seriously affected by tuberculosis. The changes in haematological parameters may serve as worthy component to backing the diagnosis, assessing the prognosis, early identification of complication due to underlying infection as well as therapy and lastly response to therapy.
Methodology: This was a retrospective cross-sectional study conducted on haematological parameters of pulmonary tuberculosis patients. Data pertaining to haematological parameters were obtained from records of blood reports of study subjects at the time of first visit to our hospital or at the time of admission. A total 137 cases between January 2018 to December 2020 who had acid fast bacilli on Z-N stained smears of sputum and positive TruNAAT for sputum sample were enrolled in the study.
Result: A total 33 (45.20%) male and 32(50%) female patients presented with anaemia. Reduced level of mean cell volume (MCV) and mean cell haemoglobin (MCH), and mean cell haemoglobin concentration (MCHC) were observed in 57(41.60%), 27(19.70%) and 26(18.98%) patients respectively. Total 14(10.21%) patients were found to have thrombocytopenia and 41(29.93%) patients with thrombocytosis. Erythrocyte sedimentation rate (ESR) showed significantly increased level in 125(91.24%) patients.
Conclusion: In pulmonary tuberculosis various types of haematological abnormalities have been identified. These haematological parameters may be helpful in assessment of disease severity and response to therapy.
Keywords: Pulmonary Tuberculosis, Haematological changes, ESR, Thrombocytosis

I. INTRODUCTION

Tuberculosis is a chronic infectious disease caused by Mycobacterium tuberculosis, and highly prevalent in developing countries [1].In 1993 WHO declared TB as a 'global public health emergency'[2].Persons lie in extreme age groups like elderly and infants are at high risk and human immunodeficiency virus (HIV) infection with tuberculosis has made the situation worse[3]. About one third population is infected and approximately 3 million people with pulmonary tuberculosis die annually [4].TB-related mortality in India is much higher and second highest in world. HIV-associated TB is also common in India and the share around 9% of global burden. 11,000 Indians lost their life of HIV-associated TB every year [5].

Pulmonary tuberculosis is commonly associated with reversible peripheral blood abnormalities and they are valuable aids to diagnosis[6].TB modulates normal haematopoiesis which leads to peripheral blood abnormalities and the disease become more severe when immunity is depressed like infected with HIV[7].Knowledge regarding prevalence of these hematological abnormalities in tuberculosis is less in the India[8]. The main objective of our study is to assess the changes in hematological parameters in patients with pulmonary tuberculosis.

II. MATERIALS AND METHODS

This was a retrospective cross-sectional study and carried out at the Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India. We identified cases of adults >18years who tested positive for acid fast bacilli on Z-N stained smears of sputum and positive TruNAAT for sputum sample. Cases with extra pulmonary tuberculosis were not enrolled in the study.

Considering the inclusion and exclusion criteria we collected data of 137 patients attending OPD and emergency department from January 2018 to December2020. Data were obtained from records of blood reports of study subjects at the time of first visit to our hospital or at the time of admission. Complete blood count was determined by five part analyzer Mindray BC-5150 and

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Westergren pipette was used for ESR determination.

Statistical analysis of collected data was done by appropriate statistical tests by using Statistical Package for Social Services (SPSS vs. 21 for Mac.IBM Inc. Chicago) after transcribing it into an excel sheet. All study variables depending on the data type were summarized using appropriate measures of central tendency (mean, median) and dispersion - standard deviation (SD) or interquartile range (IQR). Categorical variables were expressed as frequencies and percentages.

III. RESULTS

137 confirmed cases of pulmonary tuberculosis were enrolled in our study. A total 73(52.28%) were males and 58(46.71%) were females. (**Figure-1**) The mean age of males, females and total study group was 40.02(±14.74), 37.60(±13.84) and 38.90 (±14.33) years respectively.

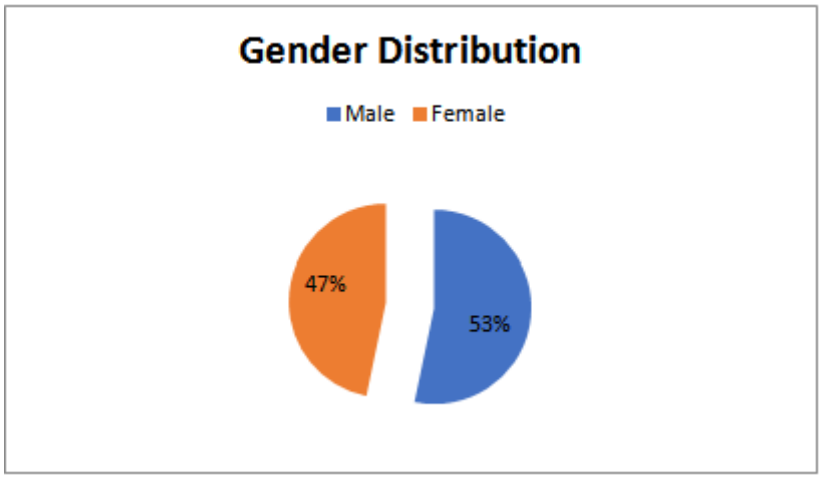

Figure 1- Showing Gender Distribution

In laboratory findings mean haemoglobin of males and females were 12.57(±1.45)gm/dl and 10.96(±1.97) gm/dl respectively. A value 3.20(±1.54)×10^5/microlit was the mean of platelet and the mean values value of other parameters like MCV, MCH and MCHC were 83.47(±7.1) fl, 28.47(±1.64) pg and 32.27(±1.19) gm/dl respectively. The mean value of ESR in male was 62.12(±24.11) and in female it was 64.37(±20.18). **(Table-1)**

	Mean ±SD	**Reference Values [9]**
Hemoglobin	Female- 10.96±1.97	Female- 135±15 gm/L (13.5±1.5 gm/dl)
	Male- 12.57±1.45	Male- 150±20 gm/dl (15±2 gm/dl)
Platelets	1.93±0.71	280±130 ×10^9 /L (2.8±1.3×10^5 / mcql)
MCV	83.47±7.1	92±9 fl
MCH	28.47±1.64	29.5±2.5pg
MCHC	32.27±1.19	330±15gm/L (33±1.5gm/dl)
ESR	Female- 64.37±20.18	≤12 (17-50 years)
	Male- 62.12±24.11	≤10 (17-50 years)

Table 1- Mean and Standard deviation of different haematological parameters

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The normal reference values in both genders are different and haemoglobin level below 13gm/dl in males and 12gm /dl in females is considered as anaemia. 33 (45.20%) male patients and 32(50%) female were founded anaemic in study population. Platelet count between 1.5× 10^5/ to 4.5 ×10^5microl is considered as normal. Thrombocytopenia was reported in 14(10.21%) patients and 41(29.93%) patients had thrombocytosis. Normal MCV, MCH and MCHC values are 92±9fl, 29.5±2.5pg and 33±1.5gm/dl respectively [9]. We observed 57(41.60%), 27(19.70%) and 26(18.98%) patients had reduced MCV, MCH and MCHC respectively. Similar to haemoglobin concentration the values of ESR differ in both genders. Raised ESR was observed in 125(91.24%) patients. **(Table-2)**

	Prevalence	**Total**
Hemoglobin<12gm/dl (Female)	32 (50%)	65(47.45%)
Hemoglobin<13 gm/dl (Male)	33(45.20%)	
Platelet>4.5mcql	41(29.93%)	
Platelet<1.5mcql	14(10.21%)	
MCV<83 fl	57(41.60%)	
MCH<27 pg	27(19.70%)	
MCHC<31.5 gm/dl	26(18.98%)	
ESR> 12 Female	60(93.75%)	125(91.24%)
ESR>10 Male	65(89.04%)	

Table 2- Prevalence of different Haematological Abnormalities in study population

IV. DISCUSSION

M. tuberculosis is an acid fast, non-motile, facultative intracellular, rod shaped, obligate aerobe bacterium. It has long generation time and preferably localized in macrophages [10]. In developing countries tuberculosis remains a major public health problem because of higher morbidity and mortality from a single infectious disease. The diagnosis of pulmonary tuberculosis is done by collection of sputum samples from all the suspected TB patients in sterile container, smears were prepared and all the smears are stained with Ziehl Neelsen stain by using standard protocol [11].

The response of erythropoietin in hematopoesis is blunted in tuberculosis patients who lead to anaemia. Tuberculosis is a chronic infection and it is postulated that the levels of different cytokines including tumor necrosis factor–α (TNF- α) are elevated due to large numbers of activated monocytes and suppress the erythropoietin production leading to anemia[3]. The prevalence of anemia in the our study was comparable to the other studies [3,12,13].

In our study thrombocytosis is more prevalent than thrombocytopenia. Other studies are also suggest that thrombocytosis more common than thrombocytopenia in patients with pulmonary tuberculosis [14,15,16]. Reactive thrombocytosis is common in various clinical situations including chronic infectious disease such as tuberculosis [17]. The immunological mechanism play crucial role in pulmonary tuberculosis patients for reactive thrombocytosis. In those individual, production of antibodies against platelets leads to reactive

myeloid hyperplasia [18]. Due to chronic inflammation the level of various types of thrombotic factors increases.Interleukin-6 has also been regarded as potent thrombotic factor released by inflamed cells. Thrombocytopenia in tuberculosis patient is caused by several mechanisms like adverse effect of treatment, immune mechanism, bone marrow fibrosis and hypersplenism [19,20].

The value of the ESR is directly related to the activity of disease in pulmonary tuberculosis. Because of this ESR is considered as a useful practical method for obtaining the information about disease severity. The level of ESR increased in the both sexes. However, male patients found higher value compare than female patients. A study was conducted by Bala J et al showed that 94% patients had higher ESR level which indicates likelihood to detect tuberculosis since higher ESR rate may be due to this infectious disease[21]. Chakraborti et al and Janssens et al were also found similar observation in their respective studies [14, 22].

V. CONCLUSION

Hematological abnormalities in pulmonary tuberculosis are common and maybe valuable aids in diagnosis. The value of ESR rises at substantial level is quite common in patients with pulmonary TB and physicians must maintain a high index of suspicion for diagnosis of pulmonary TB. However hematological parameters can be used as indicators in the assessment of response to chemotherapy.

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