Content available at: iponlinejournal.com

Indian Journal of Pathology and Oncology

Journal homepage: www.innovativepublication.com

Original Research Article

Evaluation of hematological profile in pulmonary tuberculosis

H Rajesh[1], B S Sangeetha[1,*], S Indhu[1], Manimaran[1], M Nishanth[1]

[1] *Dept. of Pathology, Tagore Medical College and Hospital, Chennai, Tamil Nadu, India*

ARTICLE INFO

Article history:
Received 16-04-2019
Accepted 03-07-2019
Available online 22-02-2020

Keywords:
Erythrocyte Sedimentation Rate
Haematology
Peripheral smear
Tuberculosis

ABSTRACT

Introduction: Tuberculosis not only affects lungs but also the bone marrow and causes significant haematological abnormalities such as anaemia in 93.8%, leucoytosis in 22.3%, neutrophilia in 45.2%, lymphopenia in 4.8%, decreased platelet count and also elevated ESR in the patients. This study was carried out to explore the early changes in the haematological profile of TB patients which will aid in identification of hematological risk factors and also help in minimizing the risk of transmission among vulnerable groups.

Materials and Methods: A total of 40 newly diagnosed tuberculosis patients and 60 healthy controls were selected by purposive sampling in this case control study. About 4 ml of venous blood was collected with aseptic precautions. About 2 ml in EDTA tube was used for haematological analysis using Sysmex KX 21 haematology analyser as well as for peripheral smear examination. The remaining 2 ml blood was used for determining ESR by Westergren tube method.

Results: The Haemoglobin, PCV, RBC count, MCV, MCH values were significantly lower compared to healthy controls in both sexes and were found to be statistically significant (p-value < 0.05). Though the platelet count was within normal range, the count was significantly lower among the cases compared to controls. The total leukocyte, ESR values were significantly higher in both sexes compared to controls and the difference was statistically significant (p-value < 0.05).

Conclusion: Our study calls for a prospective analysis of the hematological profiles with respect to the management of tuberculosis in order to derive candid guidelines for clinical case management.

1. Introduction

Tuberculosis (TB), caused by mycobacterium tuberculosis, is one of the world's most deadly disease.[1] TB is highly prevalent affecting more than 2 billion people worldwide. Around 1.8 million deaths occurs due to tuberculosis which amounts to 4,500 deaths each day making it the 4^{th} highest cause of death in the world. It is a well known fact that 48% of TB deaths occur in highly populated countries like India, china, Pakis tan, Bangladesh and Indonesia.[2] Tuberculosis not only affects lungs but also the bone marrow and causes significant haematological abnormalities such as anaemia in 93.8%, leucoytosis in 22.3%, neutrophilia in 45.2%, lymphopenia in 4.8%, decreased platelet count and also elevated ESR in the patients.[3,4] The most common risk factors associated with tuberculosis include HIV (human immunodeficiency virus), diabetes mellitus, smoking, tobacco use, alcohol abuse, low socioeconomic status, malnutrition and illiteracy.[2,5–7] An effective implementation of tuberculosis control program is possible only with effective identification and prevention of risk factors. This study was carried out to explore the early changes in the haematological profile of TB patients which will aid in identification of hematological risk factors and also help in minimizing the risk of transmission among vulnerable groups.

2. Objectives

This study was carried out to -

* *Corresponding author*.
E-mail address: drsangeethabs@gmail.com (B. S Sangeetha).

https://doi.org/10.18231/j.ijpo.2020.008

1. Compare the hematological profile between patients with pulmonary tuberculosis and normal controls.
2. Determine the socio demographic and clinical risk factors of patients suffering from tuberculosis.

3. Materials and Methods

3.1. Study setting and participants

This case control study was carried out in the outpatient facility of the Department of Tuberculosis and Chest Diseases of our tertiary teaching institution for a period of two months. All the patients with pulmonary tuberculosis who visited the outpatient facility during the study period were selected for the study. A total of 40 newly diagnosed tuberculosis patients were taken up as cases. The control group consisted of 60 healthy individuals who were selected by purposive sampling.

3.2. Selection criteria

Adults beyond 18 years of age, belonging to both the genders with a confirmed diagnosis of tuberculosis were included as cases. Pregnant women, pediatric cases and patients without a confirmatory diagnosis of tuberculosis were excluded. For controls, all healthy adults who did not have any past/ current history of tuberculosis were included in the study.

3.3. Ethical approval and informed consent

Approval was obtained from the Institutional Ethics Committee prior to the commencement of the study. Each participant was explained in detail about the study and informed consent was obtained prior to the data collection.

3.4. Data collection

A structured interview schedule was used to record background information and personal history of the study participants. About 4 ml of venous blood was collected with aseptic precautions. About 2 ml in EDTA tube was used for haematological analysis using Sysmex KX 21 haematology analyser as well as for peripheral smear examination. The remaining 2 ml blood was used for determining ESR by Westergren tube method.

3.5. Data analysis

Data was entered and analyzed using SPSS ver.20 software. Prevalence of hematological abnormalities between the groups was expressed as percentages. The association between hematological parameters was analyzed using chi square test. A p value <0.05 was considered statistically significant.

4. Results

A total of 40 newly diagnosed tuberculosis patients 60 healthy controls were included in the study. Smoking history was present in 73.9% of the participants. (Table 1) Majority of the cases were males (57.5%) while in controls, the proportion of males and females were equal (50%).(Figure 1)

The Haemoglobin, PCV, RBC count, MCV, MCH values were significantly lower compared to healthy controls in both sexes and were found to be statistically significant (p-value < 0.05). Though the platelet count was within normal range, the count was significantly lower among the cases compared to controls. The total leukocyte, ESR values were significantly higher in both sexes compared to controls and the difference was statistically significant (p-value < 0.05). Though the percentage of lymphocytes was within normal range, it was significantly higher in TB patients compared to controls. (Table 2)

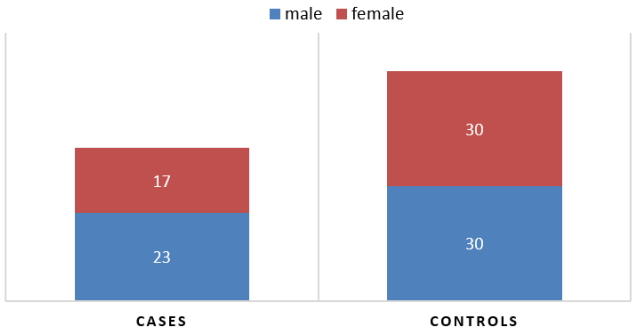

Fig. 1: Gender distribution between cases and controls

5. Discussion

Anaemia is a common haematological finding in tuberculosis and these patients are at increased risk of mortality. The mortality rates associated with anemia in tuberculosis varies from 31.9% to 88% in various studies.[1] Although majority of the participants in our study were males, anemia was highly prevalent among both males and females with tuberculosis. Presence of anemia was evidenced by a decrease in haemoglobin, RBC count, PCV, MCV, MCH and MCHC. Probable reason for the presence of profound anemia in tuberculosis could be the iron sequestration due to chronic inflammation and through decreased pr oduction of erythropoietin.[1,2]

Leucocytosis is a cardinal feature of tuberculosis. Many published studies have shown an increase in total leucocyte count in TB patients.[1,4] Our study also showed an increase in total WBC counts among the cases. Although the percentage of lymphocytes remained within range, it was found to be significantly elevated in comparison with the controls. In addition, neutrophilia was present in nine cases.

Table 1: Background characteristics of the cases

S. No	Characteristics	Frequency N (40)	Percentage (%)
1	**Age**		
	20-30	6	15.0
	31-40	7	17.5
	41-50	13	32.5
	51-60	11	27.5
	61-70	3	7.5
2	**Socio economic status**		
	Higher Socio economic status	8	20.0
	Lower socio economic status	32	80.0
3	**History of participants**		
	Smoking and alcohol	17	73.9
	Drugs	6	26.1

Table 2: Hematological parameters for tuberculosis patients and healthy control in both sexes

S. No	Characteristics	Male			Female		
		TB Patient mean ± SD	Healthy control mean ± SD	P-value	TB Patient mean ± SD	Healthy control mean ± SD	P-value
1	**WBC X 10 3 cells/μl**	11.84 ±10.54	7.27 ± 1.62	< 0.05	10.66 ±7.84	6.73 ± 1.23	< 0.05
2	**RBC X 10 6 cells/μl**	4.1 ± 0.54	4.47 ± 0.34	< 0.05	4.1 ± 0.7	5.1 ± 0.6	< 0.05
3	**Hb(g/dl)**	11.4 ± 1.9	13.2 ± 0.8	< 0.05	11.5 ±2.1	15.2 ± 0.9	< 0.05
4	**PCV (%)**	34.9 ± 6.8	38.3 ± 2.8	< 0.05	35.1 ± 5.6	44.1 ± 2.7	< 0.05
5	**MCV (fl)**	78.07 ± 5.9	83.79 ± 4.2	< 0.05	84.1 ± 7.3	87.9 ± 6.7	< 0.05
6	**MCH (pg)**	27.02 ± 3.1	29.2 ± 1.8	< 0.05	27.7 ± 3.1	30.4± 2.3	< 0.05
7	**MCHC (g/dl)**	30.30 ± 2.1	32.9 ± 1.2	< 0.05	32.7 ± 1.8	34.4 ± 1.1	< 0.05
8	**PLT x 10 3 cells/μl**	182.2 ±107.6	257.7 ± 82.7	< 0.05	319 ±171.4	246.4 ± 50.1	< 0.05
9	**Lymphocytes (%)**	32.70 ±12.88	30.50 ± 7.20	< 0.05	31.80 ± 7.7	25.7 ± 13.0	< 0.05
10	**ESR (mm/hour)**	40.70 ±35.61	15.23 ± 4.20	< 0.05	40.5± 29.2	8.6 ± 4.4	< 0.05

Table 3: Comparison of haematological parameters in various studies

Haematological Parameters	Rohini K et al [1]	Shafee M et al [2]	Atomsa D et al [4]	Kurup R et al [5]	Our study
WBC X 10 3 cells/μl	Increased	Variable*	Increased	Normal	Increased
RBC X 10 6 cells/μl	Decreased	-	Decreased	-	Decreased
Hb (g/dl)	Decreased	Decreased	Decreased	Decreased	Decreased
PCV (%)	-	Decreased	-	-	Decreased
MCV (fl)	-	-	Decreased	-	Decreased
MCH (pg)	-	-	Decreased	-	Decreased
MCHC (g/dl)	-	-	-	-	Decreased
PLT x 10 3 cells/μl	Decreased	Variable*	Increased	Increased	Decreased
ESR (mm/hour)	Increased	Increased	-	-	Increased

***** increased in some patients and decreased in others.

Although several studies have documented leucocytosis, there are certain studies that have documented leucopenia among tuberculosis patients.[2]

Elevated ESR is an indication of inflammation and it is elevated consistently in all studies including ours. Platelet count was variable in different studies some showed thrombocytosis and others thrombocytopenia. In our study, although platelet count was with in normal range in majority of cases, the count is decreased compared to normal controls. Comparison of haematological findings in various studies including ours is shown in Table 3.

6. Conclusion

Among haematological parameters haemoglobin, PCV, RBC count, MCV, MCH, MCHC and platelet count were decreased and WBC count, ESR values were increased compared to healthy controls. Since majority of our study participants belonged to lower socioeconomic status, the presence of inherent risk factors like nutritional status could

also have influenced the results of our study. Moreover, social risk factors including smoking and alcohol were higher among the cases. The biological plausibility of an association between these risk factors and the hematological profiles could give deeper insights into the clinical prevention and management of the hematological risk factors. Our study calls for a prospective analysis of the hematological profiles with respect to the management of tuberculosis in order to derive candid guidelines for clinical case management.

7. Conflict of interest

Nil.

8. Funding

Nil.

9. Ethical approval

O btained

References

1. Rohini K, Surekha M, Srikumar PS, Kumar AM. Assessment of Hematological Parameters in Pulmonary Tuberculosis Patients. *Indian J Clin Biochem*. 2016;31(3):332–335.
2. Shafee M, Abbas F, Ashraf M, Alammengal M, Kakar N, et al. Hematological profile and risk factors associated with pulmonary tuberculosispatients in Quetta, Pakistan. *Pak J Med Sci*. 2014;30(1):36–40.
3. Hussain R, Hasan R, Khurshid M, Sturm AW, Ellner JJ, Dawood G. Pulmonary tuberculosis in a BCG vaccinated area: relationship of disease severity with immunological and hematological parameters and drug resistance patterns. *Southeast Asian J Trop Med Public Health*. 1996;27(2):257–262.
4. Atomsa D, Abede G, Sewunet T. Immunological markers and hemotological parameters among newly diagnosed tuberculosis patients at Jimma University Specialized Hospital. *Ethiop J Health Sci*. 2014;24(4):311–318.
5. Kurup R, Flemming K, Daniram S, James SM, Martin RR. Hemotological and Biochemistry profile and Risk Factors Associated with Pulmonary Tuberculosis Patients in Guyana. *Tuberc Res Treat*. 2016;p. 6983747.
6. Duarte R, Lonnroth K, Carvalho C, Lima F, Carvalho A, et al. Tuberculosis, social determinants and co-morbidities(including HIV). *Rev Port Pneumol*. 2018;24(2):115–119.
7. Araujo Z, Larrea CFD, Lopez D, Fandino C, Chirinos M, et al. Hematologic values among Waraoindians with tuberculosis from the Orinoco Delta of Venezuela. *Acta Cient Venez*. 2003;54(4):247–253.

Author biography

H Rajesh Assistant Professor

B S Sangeetha Assistant Professor

S Indhu MBBS Student

Manimaran Professor

M Nishanth Junior Resident

Cite this article: Rajesh H, S Sangeetha B, Indhu S, Manimaran , Nishanth M. Evaluation of hematological profile in pulmonary tuberculosis. *Indian J Pathol Oncol* 2020;7(1):39-42.