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ORIGINAL ARTICLE

Risk Factors of Pulmonary Tubercuosis and its Hematological Parameters

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ABSTRACT

Objective: The purpose of this study is to determine the different peripheral blood parameters and risk factors in pulmonary tuberculosis patients.

Study Design: Case Control study

Place and Duration: Mayo Hospital Lahore. Feb 2021-Aug-2021

Methods: There were 70 patients of both genders were presented in this study. Age of the patients was between 20-70 years. After obtaining informed written agreement, the demographics of enrolled patients were recorded, including age, sex, physique mass index, socioeconomic status, residence, and employment. All the patients had confirmed tuberculosis. As a precaution, a little amount of venous blood was drawn. Sysmex KX 21 haematology analyzer and a peripheral smear were used to analyse around 2 ml of blood in an EDTA tube. Only 2 cc of the patient's blood were utilised to calculate ESR using the Westergren tube technique. Patients filled out a questionnaire that asked them about their symptoms, and the information was then entered into a database. SPSS 21.0 was used to analyze complete data.

Results: Among 70 cases, 38 (54.3%) were males and 32 (45.7%) were female patients with mean age 42.61 ±11.43 years. Majority of the patients 52 (75.7%) had lower socio-economic status and 50 (71.4%) patients were from rural areas. 45 (64.3%) patients were jobless. Smoking and alcohol abuse was the most common cause among all cases. There were significant differences between the sexes patients and normal level in the hematocrit (Hb), PCV, RBC count, MCV, MCH values (p-value 0.05). Cases had a considerably lower platelet count. Patients had considerably higher total leukocyte, ESR readings compared to normal level (p-value 0.05), and the difference was statistically significant.ad considerably higher total leukocyte, ESR readings compared to normal level (p-value 0.05), and the difference was statistically significant.

Conclusion: We concluded that ESR, platelets, and leukocytes are all haematological markers that may be used to identify patients at an early stage of the illness. Common risk factors for TB transmission in the target group were malnutrition, cigarette use, living in crowded conditions, illiteracy, and poverty.

Keywords: Tuberculosis , Hemoglobin, Hematology, ESR, Risk factors

INTRODUCTION

TB, caused by mycobacterium tuberculosis, is one of the world's most dangerous diseases. [1] The number of persons affected by tuberculosis (TB) is alarmingly large, at over 2 billion. As many as 1.8 million people die each year from TB, making it the world's fourth-leading cause of mortality. TB kills 48% of the world's population, mostly in densely populated nations like India (including Pakistan), China (including Hong Kong), Bangladesh (including Bangladesh), and Indonesia. [2] There are considerable haematological abnormalities in individuals with tuberculosis, including anaemia (93.8%), leucoytosis (22.3%), neutrophilia (45.2%), lymphopenia (4.8 percent), reduced platelet count, and raised ESR in addition to the infection of the lungs and bone marrow by tuberculosis (TB) Human immunodeficiency virus (HIV), diabetes, tobacco and alcohol use are the most prevalent risk factors for TB. Other risk factors include a poor socioeconomic position, malnutrition, and illiteracy. [3-5] A successful TB control programme cannot be implemented without first identifying and reducing potential risk factors.

Hematopoiesis is severely compromised in patients with tuberculosis infection. [6] This affects cell lines and plasma components from both myeloid and lymphoid origins. Many haematological abnormalities are prevalent and helpful in the diagnosis of pulmonary TB [7]. These anomalies may help with the diagnosis, prognosis, and indications of infection complications and treatment response [8].

Aside from anaemia, leukocytosis, thrombocytosis and lymphocytosis are the most frequently documented abnormalities in patients with concomitant TB and HIV infections [9–10]. Inflammatory reactions may have triggered a systemic response in this patient. When AIDS is in its late stages and viremia levels are high, significant haematological abnormalities related with HIV might be seen. Concomitant TB infection, which may affect any blood cell lineage, makes this worse [11-13]. Cytopenias, anaemia, and neutropenia, all of which are caused by insufficient production of cells in the bone marrow as a result of HIV infection, might be difficult to treat when they occur as a result of both aberrant cytokine expression and changes to the bone marrow microenvironment [14,15].

The purpose of this research was to look at the haematological alterations and risk variables in patients with smear-positive pulmonary TB.

MATERIAL AND METHODS

This prospective case study was conducted at Mayo Hospital Lahore and comprised of 70 patients had pulmonary tuberculosis. After obtaining informed written agreement, the demographics of enrolled patients were recorded, including age, sex, physique mass index, socioeconomic status, residence, and employment. All pregnant women, children under the age of 20, and those who did not have a confirmed TB diagnosis were excluded.

Age of the patients was between 20-70 years. A sterile syringe was used to draw 3-4 ml of peripheral venous blood aseptically. Hematology Analyzer (Sysmex, KX-21) Hematology Analyzer (Sysmex, KX-21) was used to evaluate two ml of EDTA solution and other blood parameters in the Hematology Analyzer. Erythrocytic sedimentation rate (ESR) was determined with the remaining 2 ml of blood. In a Westergen tube, around 2 ml of the anticoagulant infused blood was drained to the mark. Readings were taken for an hour while the tube was put in a stand vertically. Data were analysed using SPSS 21.0.

The Chi square test was used to do statistical analysis on the given data. Several risk variables, including marital status, ethnicity, illiteracy and work status were shown to have a significant correlation (P 0.05) with age, gender, and other risk factors.

RESULTS

Among 70 cases, 38 (54.3%) were males and 32 (45.7%) were female patients with mean age 42.61 ±11.43 years. Majority of the patients 52 (75.7%) had lower socio-economic status and 50 (71.4%) patients were from rural areas. 45 (64.3%) patients were jobless.(table 1)

Table 1: Gender and demographic details of enrolled cases

Variables	Frequency	Percentage
Mean age (years)	42.61 ±11.43	
Gender		
Male	38	54.3
Female	32	45.7
Socio-economic status		
Poor	52	75.7
Middle	18	24.3
Residency		
Rural	50	71.4
Urban	20	28.6
Education status		
Educated	22	31.4
Un-educated	48	68.6
Employment		
Yes	25	35.7
No	45	64.3

We found that smoking was the most common cause in 35 (50%) patients, alcohol abuse in 25 (35.7%) and drugs in 10 (14.3%) among all cases.(fig 1)

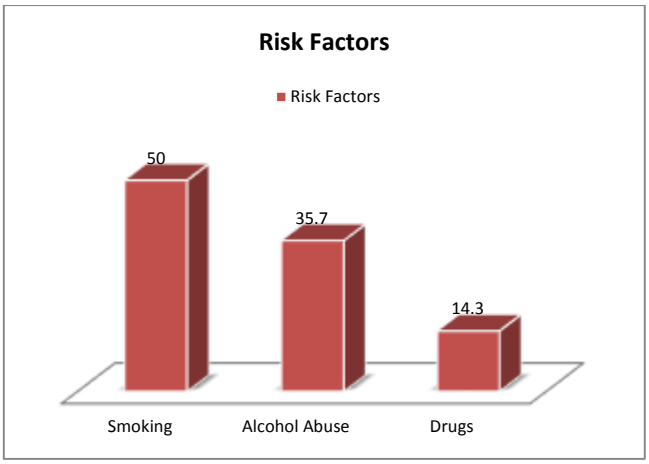

Figure 1: Association of risk factors among all cases

Blood haemoglobin, RBC count, MCV and MCH levels were considerably lower in patients compared to healthy controls (pvalue 0.05). Compared to normal level, the platelet count was considerably lower in the cases, even though the count was within the normal range. It is clear that patients had a greater total leukocyte count and ESR count than the normal level (p-value 0.05). As expected, TB patients had a larger proportion of lymphocytes than healthy individuals.(table 2)

Table 2: Comparison of hematological values of tuberculosis patients with normal level

Variables	Study Patients	Normal Level
Hematological Parameters		
ESR (mm/hour)	38.6±14.45	12.11±31.66
Lymphocytes (%	30.6±13.44	24.16±15.73
PLT x 10 3 cells/µl	184.6±115.9	302.6±67.55
MCHC (g/dl)	31.5±43.7	29.8±23.63
MCH (pg)	27.5±21.9	32.4±31.8
MCV (fl)	77.7±8.42	88.13±4.26
PCV (%)	36.9±9.15	47.10±8.48
Hb(g/dl)	10.11±4.16	14.7±4.1
RBC X 10 6 cells/µ	5.9±1.91	6.3±7.31
WBC X 10 3 cells/µl	12.15±15.41	10.34±7.93

DISCUSSION

Tuberculosis is a serious public health concern in the poor nations, since it is the leading cause of mortality in the globe from a single infectious illness. d tuberculosis is a worldwide emergency in 1993. Various haematological symptoms have been documented in conjunction with TB. There is scarcity of research concerning the hematologic abnormalities in pulmonary TB patients from Pakistan population. In the current research an effort has been made to analyze a full haematological profile in pulmonary TB.

In current study 70 patients of both genders were presented. Among 70 cases, 38 (54.3%) were males and 32 (45.7%) were female patients with mean age 42.61 ±11.43 years. Majority of the patients 52 (75.7%) had lower socio-economic status and 50 (71.4%) patients were from rural areas. 45 (64.3%) patients were jobless. Findings of our research were comparable to the previous studies.[16,17] We found that smoking was the most common cause in 35 (50%) patients, alcohol abuse in 25 (35.7%) and drugs in 10 (14.3%) among all cases.[16] Haemoglobin levels, RBC count, PCV, MCV, MCH, and MCHC were all decreased as a result of anemia's existence. Because of the persistent inflammation and diminished erythropoietin production, it is possible that TB patients have significant anaemia.[1,2]

Several studies have demonstrated a high frequency of anaemia in pulmonary TB patients with and without HIV co-infection, confirming the high occurrence of anaemia in the population. Most investigations have revealed hematopoietic progenitor cells, therapeutic effects on erythropoiesis and folate activity, dietary inadequacies and malabsorption, the absence or depletion of bone marrow iron as the most probable culprits in the development of TB-HIV anaemia. [18,19]. This rise in WBC counts was also seen in our investigation among the patients. However, it was discovered that the lymphocyte percentage was much higher than usual, yet being within the normal range. Neutropenia was also found in nine instances. Some studies have confirmed leucocytosis in TB patients, whereas others have observed leucopenia. [2]

There has been increased ESR in all trials, including ours, which is indicative of inflammation. According to multiple research, the platelet count was either high or low depending on the kind of study. Platelet count was within normal range in the majority of patients in our research, however when compared to normal controls, the count was significantly lower than expected. In Iraq [20,21], as well as in Pakistan[22], research from the province of Babylon and the city of Kirkuk supports this conclusion. Different thrombopoietic factors, such as IL-6, released by inflamed cells during an inflammatory response may explain these discrepancies, including reactive thrombocytosis, which has been observed in several clinical situations, including infectious diseases such as tuberculosis of the lungs [23,24]. IL-6 secretion in PTB patients will increase the synthesis of platelets. PTB-HIV infection is associated with a somewhat reduced platelet count, which has been attributed by some researchers [25-27].

The majority of the patients in our research also had thrombocytopenia and thrombocytosis, as has been previously documented by Hungund et al and Olaniyi and Akeuova. [28,29] When there is an increased production of these thrombopoietic factors, it is thought that this is the cause of the thrombocytosis. There are a number of processes that have been proposed as plausible causes for thrombocytopenia, including drug immunological mechanisms, bone marrow fibrosis, and hypersplenism, among others. Inflamed cells emit interleukin-6, which has been considered a significant thrombotic agent in the past.

CONCLUSION

We concluded that ESR, platelets, and leukocytes are all haematological markers that may be used to identify patients at an early stage of the illness. Common risk factors for TB transmission in the target group were malnutrition, cigarette use, living in crowded conditions, illiteracy, and poverty.

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