

Research Article

PLATELET COUNT, PLATELET INDICES, ERYTHROCYTE SEDIMENTATION RATE AND C-REACTIVE PROTEIN IN PULMONARY TUBERCULOSIS PATIENTS IN ABU-ANJA HOSPITAL

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Received 17 October 2015; Accepted 14 November 2015

ABSTRACT

Background: Tuberculosis (TB) is a major public health problem in Sudan. The pulmonary type is the most important form of tuberculosis, continues to be one of the most wide spread infectious diseases. The differential diagnosis of tuberculosis should be entertained in patients with some abnormal hematological findings. Moreover, hematological parameters are useful indicators of severity in TB infection.

We aimed to investigate the relation between some platelets parameters, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) in patients with pulmonary tuberculosis (PTB).

Methods: 50 patients with PTB and 50 healthy control individuals were included in this analytic study. We investigated the relationship between platelet counts, plateletcrit (PCT), mean platelet volume (MPV), platelet distribution width (PDW), ESR, and CRP and PTB in Sudanese patient in Abu-Anja hospital.

Results: results of this study showed high level of PDW, ESR and CRP in patients with pulmonary tuberculosis when compared with healthy group with t.test ($P.V < 0.05$). But the study showed no significant difference in the values of PLT count, MPV and PCT in patients with pulmonary tuberculosis when compared with healthy group with t.test ($P.V > 0.05$). Thrombocytosis was observed in 14% of patients while thrombocytopenia was observed in 16% of patients. 98% of patient had increased ESR and 38% of patients had ESR value more than 100 mm/h. CRP was elevated in 94% of patients and 6% had a normal CRP.

Conclusions: pulmonary tuberculosis is associated with increase in PDW, CRP and ESR; and may be used as probable indicators for pulmonary tuberculosis.

Key words: Platelets, plateletcrit, the mean platelet volume, platelet distribution width, erythrocyte sedimentation rate, C-reactive protein, pulmonary tuberculosis.

INTRODUCTION

Pulmonary tuberculosis (PTB):

PTB is a widespread, and in many cases fatal, infectious disease caused by various strains of mycobacteria, usually *Mycobacterium tuberculosis*.^[1] Tuberculosis typically attacks the lungs, but can also affect other parts of the body. It is spread through the air when people who have an active TB infection cough, sneeze, or otherwise transmit respiratory fluids through the air.^[2]

More people in the developing world contract tuberculosis because of a poor immune system, largely due to high rates of HIV infection and the corresponding development of AIDS.^[3]

Overcrowding, malnutrition,^[3] Chronic lung disease,^[4] Smoke cigarettes,^[5] Alcoholism,^[3] Diabetes mellitus,^[6] and certain medications such as corticosteroids and infliximab^[3] are other risk factors. Also a genetic susceptibility element exists,^[7] for which the overall importance remains undefined.^[3]

General signs and symptoms include fever, chills, night sweats, loss of appetite, weight loss, and fatigue.^[8] If a tuberculosis infection does become active, it most commonly involves the lungs (in about 90% of cases).^{[3][9]} Symptoms may include chest pain and a prolonged cough producing sputum. About 25% of people may not have any symptoms (i.e. they remain "asymptomatic").^[3]

Occasionally, people may cough up blood in small amounts.^[8]

A chest X-ray and multiple sputum cultures for acid-fast bacilli are typically part of the initial evaluation.^[10] A definitive diagnosis of tuberculosis can only be made by culturing *Mycobacterium tuberculosis* organisms from a specimen taken from the patient (most often sputum, but may also include pus, CSF, biopsied tissue, etc.); cultures should be done for acid-fast bacilli. Other mycobacteria are also acid-fast. If the smear is positive, PCR or gene probe tests can distinguish *M. tuberculosis* from other mycobacteria. Even if sputum smear is negative, tuberculosis must be considered and is only excluded after negative cultures.^[1] Interferon- γ release assay and tuberculin skin tests are of little use in the developing world.^{[11][12]}

Platelets and platelet induces:

Platelets are a component of blood whose function (along with the coagulation factors) is to stop bleeding by clumping and clogging blood vessel injuries.^[13] The normal range (99% of population analyzed) for platelets in healthy Caucasians is 150,000 to 400,000 per cubic millimeter.^[14]

Platelet indices, namely plateletcrit (PCT), mean platelet volume (MPV) and platelet distribution width (PDW). PCT is an expression of a percentage that reflects the volume occupied by platelets in blood.^[15] PCT is directly related to the platelet count and the size of the platelets.^[16] MPV, on the other hand, is a measurement of the average size of the platelet in the blood.^[17] The third index, PDW, reflects the variability in the platelet size.^[18]

ESR:

The erythrocyte sedimentation rate (ESR) is the rate of sedimentation of red blood cells and is used often as a non-specific measure in monitoring disease activity and assisting in the diagnosis of many inflammatory disorders.^[19]

CRP:

C-reactive protein (CRP) is an annular, pentameric protein found in the blood plasma, the levels of which rise in response to inflammation (i.e., C-reactive protein is an acute-phase protein).^[20] Normal concentration in healthy human serum is

usually lower than 10 mg/L, slightly increasing with aging.^[21]

Material and Methods:

Study design:

This was Descriptive observational case control study about platelet count, MPV, PDW, PCT, ESR and CRP in patients with pulmonary tuberculosis in Abu-Anja Hospital.

Sample collection:

100 blood samples were collected. The total number of the confirmed TB patients was fifty. The age of the patients in this study was between 18 and 65 years (mean age 31.52 years). Fifty individuals, age and sex matched, were selected as control group. The control individuals aged between 22 and 59 years (mean age 29.2 years). Of the pulmonary TB patients, 80% were males and 20% were females. In the control group, 48% were males and 52% were females.

Data was collected by using self-administrate questionnaire and analyzed by using SPSS (Statistical Package of Social Science) after having the patient's consent to take and analyze them blood samples.

PTB patients on treatment or any chronic medication and any patients have a chronic disease (e.g. diabetic mellitus, hypertension, rheumatoid arthritis...) excluded from this study. 5 ml venous blood was collected in using aseptic condition. Platelet count and indices were analyzed by automated method by Mindray module BC-2800.

CRP was done by quantitative method by A15 biosystem chemistry analyzer.

ESR was analyzed by manual method.

Results:

In the patient with PTB, the platelet count range from 72×10^3 to 515×10^3 , MPV range from 8.9 to 11.2 fL, PDW range from 14.2 to 15.7 %, PCT range from 0.069 to 0.463 %, ESR range from 8 to 140 mm/h, and CRP range from 2.5 to 148.7 mg/L.

In the control group, the platelet count range from 94×10^3 to 400×10^3 , MPV range from 8.4 to 11.1 fL, PDW range from 14.4 to 17.7 %, PCT range from

0.097 to 0.412 %, ESR range from 3 to 55 mm/h, and CRP range from 1.9 to 10.6 mg/L.

The means of PLT count, MPV, PDW and PCT in PTB patients were (274.44 x103), (9.73 fL), (15.06 %) and (0.265 %); the means of control group were (256.18 x103), (9.76 fL), (14.8 %) and (0.246 %) when compared with t-test showed (P.V:0.355), (P.V:0.801), (P.V:0.01) and (P.V:0.283) respectively. Table (1), chart (1).

The means of ESR and CRP in PTB patients were (87.2 mm/h) and (94.83 mg/L); the means of control group were (17.42 mm/h), (4.256 mg/L)

when compared with t-test showed (P.V:0.00) respectively. Table (1), chart (2) and (3)

In this study Thrombocytosis was observed in 7 (14%) patients while thrombocytopenia was observed in 8 (16 %) patients, Other 35 patients (70 %) had a normal platelet count. Chart (4)

98% of patient had increased ESR, only one patient had a normal ESR, 30 (60%) patients had ESR ranging from 25 to 99 mm/h and 19 (38%) patients had ESR value more than 100 mm/h. chart (5)

CRP was elevated in 94% of patients and 6% had a normal CRP. Chart (6)

Table 1: T-Test of Patient and control

Parameters	GROUPS	Mean	Std. Deviation	Std. Error Mean(±)	P- value
PLT	Patient	274440	122.07	17.26	0.355**
	Control	256180	66.04	9.340	
MPV	Patient	9.730	0.53	0.075	0.801**
	Control	9.760	0.64	0.091	
PDW	Patient	15.06	0.364	0.051	0.01*
	Control	14.80	0.478	0.067	
PCT	Patient	0.265	0.109	.0155	0.283**
	Control	0.246	0.061	.008	
ESR	Patient	87.20	26.974	3.815	0.00*
	Control	17.42	13.473	1.905	
CRP	Patient	94.83	50.45	7.13	0.00*
	Control	4.256	2.048	0.289	

**Not significant at level more 0.05.

* Significant at level less 0.05.

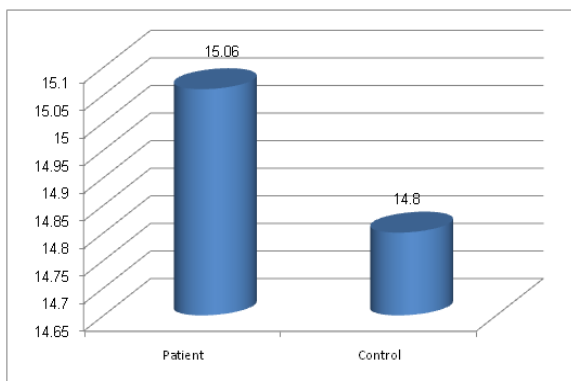


Chart 1: The Mean of PDW in the Croups (Patient and control)

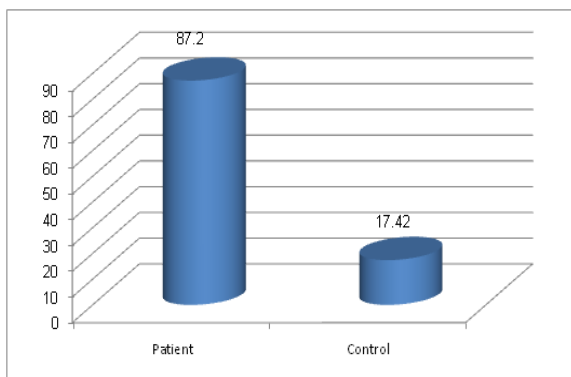


Chart 2: The Mean of ESR in the Croups (Patient and control)

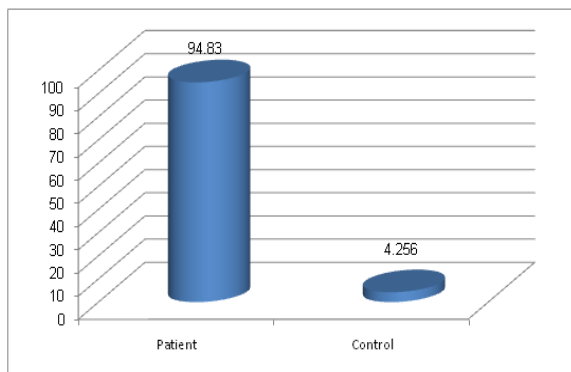


Chart 3: The Mean of CRP in the Croups (Patient and control)

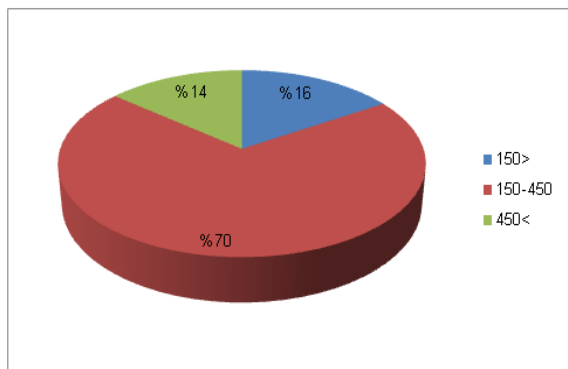


Chart 4: Platelets count among the patients

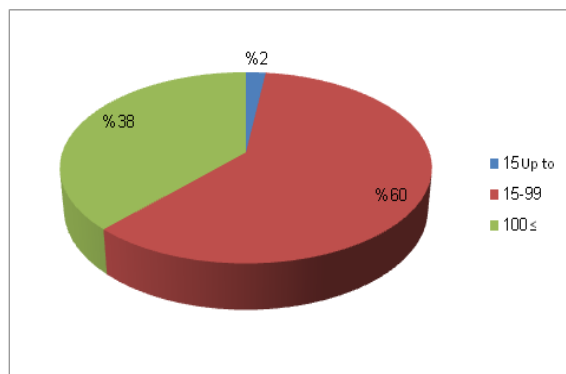


Chart 5: The ESR level among the patients

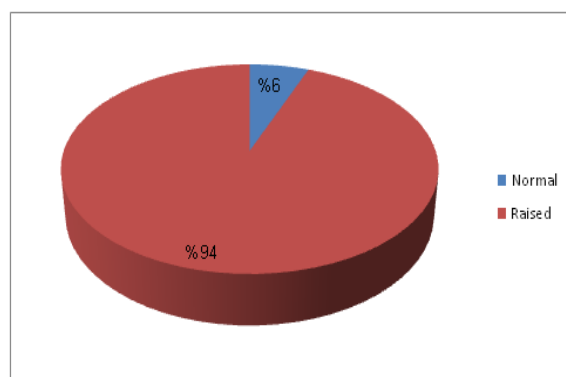


Chart 6: CRP among the patients

Discussion:

In this study, PDW, ESR and CRP values were higher in PTB than in healthy controls, while No significant differences were found in levels of PLT count, MPV and PCT in PTB patients when compared to healthy controls.

Bashir et al. the differences between the patient group and the control group in platelets count and ESR were found to be significantly higher in the patient group ($P < 0.000$)^[22]. My study agreed with him in the presence of high ESR level in PTB patients, but not in platelet count.

Tozkoparan et al. found platelet count and all indices (PDW, MPV and PCT) higher in active PTB than in pneumonia and inactive tuberculosis. They demonstrated that these values decrease to normal levels after the treatment^[23].

Şahin et al. found the increase of the platelet counts in advanced stage PTB was correlated both with the increase in CRP and ESR. Referring to the indices of platelets, PCT was found higher in PTB than in pneumonia and control groups, while PDW was found increased only in PTB, not in healthy

controls^[24]. My study agreed with him in the presence of high PDW, ESR, and CRP levels in PTB patients.

In this study, thrombocytosis was noted in 14% of patients. In contrast, Thatoi et al.^[25], Bashir et al.^[22], Olaniyi et al.^[26] and Akintude et al.^[27] reported that thrombocytosis occurred in 24, 20, 12.9 and 18% of patients, respectively.

Thrombocytopenia was noted in 16 % of patients and 70% of patients had a normal platelet count. Thatoi et al. found thrombocytopenia was observed in 9% of patients and 67% of patients had a normal platelet count.

In this study, ESR was elevated in PTB patients who were similar to results stated by Chakrabarti et al.^[28], Nwankwo et al.^[29], Morris^[30], Awodu OA et al.^[31], Olaniyi et al.^[26], Akintude et al.^[27].

ESR was elevated in 98% of patients and 38% of patient had ESR value more than 100 mm/h. Thatoi et al. found 99% of patient had increased ESR and 11% of patients had ESR value more than 100 mm/h^[25]. Bashir et al. found ESR was elevated in all patients^[22].

In this study, CRP was raised in patients with pulmonary TB which are consistent with the studies by Maasilta and Kostiala^[32] and Choi et al.^[33]

In this study, CRP was elevated in 94% of patients. In contrast, Muhammed et al. found CRP was raised in 86 (67.7%) patients^[34].

Conclusions:

- PDW, ESR and CRP values were higher in PTB patients than in healthy controls (P.V <0.05).
- No significant differences were found in levels of PLT count, MPV and PCT in PTB patients compared to healthy controls.

Recommendation:

- I recommend increasing the sample size.
- Malaria should be excluded in similar studies.

Acknowledgment:

My offer special thanks to all PTB patients who contributed in this study, and special thanks to Abu-Anja hospital and AL Neelain University; Faculty of Medical Laboratory Science.

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