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HEMATOLOGICAL AND BIOCHEMICAL ABNORMALITIES IN CASE OF PULMONARY TUBERCULOSIS PATIENTS IN MALWA REGION (INDORE)

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ABSTRACT

Malwa is a natural region in west-central northern India occupying a plateau of volcanic origin. Tuberculosis is an epidemiological problem which is associated with changing pattern of RBC indices. At least thousand deaths occur from tuberculosis each year in Indore alone. The Present study was carried out at Shri Aurobindo Institute of Medical Sciences, Manorma Raje Tuberculosis Hospital & from different DOTS Centers of Indore between March 2009 to March 2010. Hematological abnormalities were observed in study group and were significant ($p < 0.001$) when the data were compared to control. The Present study concluded that alteration in RBC indices takes place due to rise in CRP level resulting anemia in PTB Patients.

KEY WORDS

Malwa region, Hematological abnormalities, RBC Indices, pulmonary tuberculosis patients, Anemia.

INTRODUCTION

Malwa is a natural region in west-central northern India occupying a plateau of volcanic origin. Tuberculosis (TB) is the world's second most common cause of death from infectious disease, after HIV/AIDS. Every year, approximately 2 million persons in India develop tuberculosis (TB), accounting for one fourth of the world's new TB cases. Hematological abnormalities have been associated with tuberculosis [1]. Tuberculosis is a chronic infectious disease, so anemia of inflammation may contribute significantly [2, 3, 4]. A number of studies have documented anemia in patients with TB[5,6]. The comprehensive investigations on hematological changes and abnormalities associated to tuberculosis are still lacking[7]. The Present study objective is to assess the changing patterns in biochemical parameters during tuberculosis which leads to abnormalities in RBC indices resulting anemia in such patients.

MATERIAL AND METHOD

The Present study consists of 63 pulmonary tuberculosis (PTB) patients and 35 control subjects having 20 to 58 years age group. All newly diagnosed Pulmonary Tuberculosis Patients falling in DOTS (CAT I) were selected from the Out Patient Department (OPD) of Medicine in Shri Aurobindo Institute of Medical Sciences, Manorma Raje Tuberculosis Hospital & from different DOTS Centers of Indore and control subjects were selected from staff and students of SAIMS Medical College. We excluded patients with any other medical conditions that can cause anemia. Prior to start of study Informed consent was taken from each subject.Blood Samples were collected from each subjects and analyzed for: complete Haemogram (RBC, Hb, PCV, MCV, MCH, MCHC and RDW) values were measured by Automated Cell Counter (Sysmex KX- 21). This was based on principle of Electrical Impedance Counters. Serum C- reactive protein (by solid phase

immunoenzymatic by using kit acquired from USA), serum ferritin by the method of Ronald H et al [8], Serum iron by the method of Siedel J. et al [9] and Serum Total Iron Binding Capacity (TIBC) by the method of Tietz NW [10]. Anemic & Non-anemic Patients were selected as per WHO criteria [11].

Statistical Analysis: Unpaired t- test were used for statistical assessments with SPSS Version 10 to evaluate mean levels of variables in study groups. Values were expressed as Mean ± SD.

OBSERVATION & RESULTS

TABLE 1: Comparison of Hematological Parameters between control Group & PTB Patients

Parameter	Control (n = 35)	PTB Patients (n = 63)	t –value	p-value
RBC (X 10^{12}/ L)	4.78 ± 0.36	4.18 ± 0.37	6.682	< 0.001**
Hb **(g/dL)**	14.46 ± 1.61	11.25 ± 1.12	9.742	< 0.001**
HCT **(%)**	39.37 ± 3.61	32.57 ± 3.66	7.872	< 0.001**
MCV **(fL)**	83.09 ± 1.73	77.18 ± 5.68	5.883	< 0.001**
MCH **(pg)**	28.18 ± 3.59	26.96 ± 2.69	1.621	> 0.05
MCHC **(g/dL)**	36.30 ± 2.08	34.12 ± 2.40	4.069	< 0.001**

Values are in Mean ± SD **highly Significant p < o.oo1 p > 0.05 not significant **DF = 96**

Table 1:A highly significant decrease (p < 0.001) was noted in RBC, Hb, HCT, MCV & MCHC but there was no significant change (p > 0.05) was observed in MCH.

TABLE 2: Comparison of Biochemical Parameters between control Group & PTB Patients

Parameter	Control (n = 35)	PTB Patients (n = 63)	t –value	p-value
Serum Iron (µmol/l)	16.35 ± 3.65	6.43 ± 3.47	18.54	< 0.001**
TIBC **(µg/dL)**	295.21 ± 32.2	188.20 ± 46.05	11.43	< 0.001**
Ferritin **(ng/mL)**	170.25 ± 30.5	325.58 ± 68.23	12.45	< 0.001**
CRP **(µg/mL)**	2.87 ± 2.34	40.55 ± 10.67	23.23	< 0.001**

Values are in Mean ±SD **highly Significant p < o.oo1 p > 0.05 not significant **DF = 96**

Table 2: A highly significant decrease was noted in Serum Iron & TIBC but Ferritin & CRP levels were significant increased (p < 0.001), when these values were compared with control group.

TABLE 3: Percentage changes in levels of biochemical & hematological parameter in PTB Patients in comparison to control subjects

Parameter	Percentage (%) change
Serum Iron (µmol/l)	60.67 % decreased
TIBC **(µg/dL)**	36.24 % decreased
Ferritin **(ng/mL)**	91.23 % increased
CRP **(µg/mL)**	1312.89 % increased up to 1000 fold
Hb **(g/dL)**	22.19 % decreased

Table 3: The above table showed percentage increase in the level of C - reactive protein (CRP), and Ferritin whereas the level of Serum iron, TIBC and Hemoglobin (Hb) were decreased.

CHART

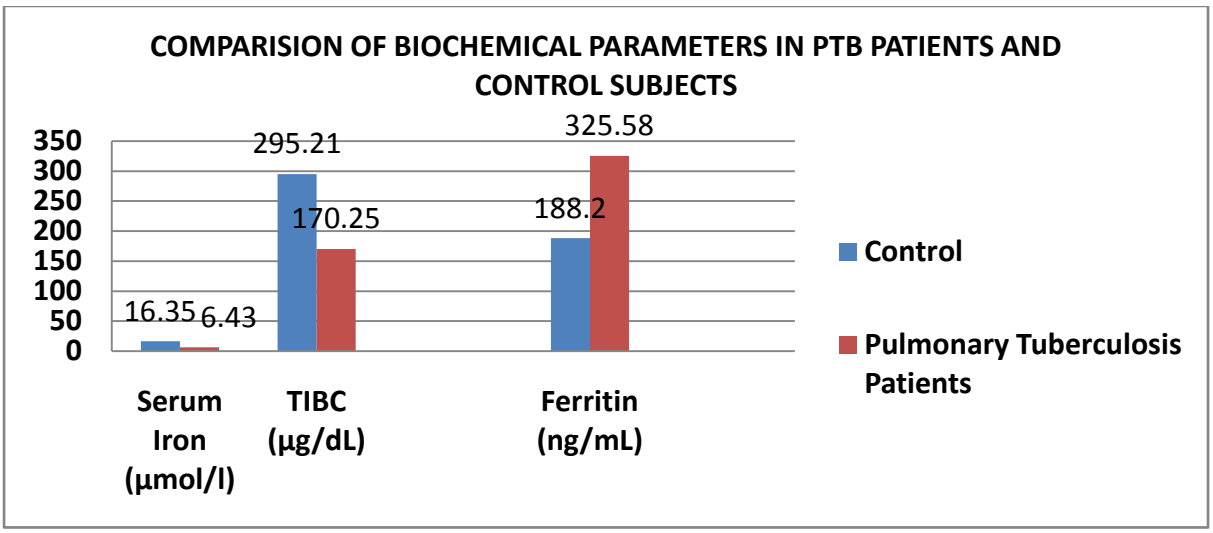

CHART 1. Comparisons of Biochemical parameters in Pulmonary Tuberculosis Patients and control subjects

DISCUSSION

Comparison of Hematological parameters of PTB with control

The mean hematological parameter (RBC, Hb, HCT, MCV, MCH & MCHC) in the study groups were lower and statistically significant ($p < 0.001$) except MCH ($p > 0.05$), as compared to control group **(Table 1).** Most of the study group showed anemic parameters. Anemia is a highly common hematologic complication among TB patients and is a strong risk factor for mortality. The previous report also showed the fall in hemogram levels in PTB Patients [1, 5, 12].

In the present study majority of PTB Patients had normocytic normochromic anemia (86 %) and few cases were of normocytic & hypochromic anemia (14 %). The present study 22.19 % reduction in percentage hemoglobin was observed in PTB Patients **(Table 3).** Normocytic and normochromic pattern in most of the TB patients were observed by others researchers earlier [6, 13].

Comparison of Biochemical parameters of PTB with control

The present study showed that there was a significant decrease in Serum iron, Hemoglobin and Total iron binding protein whereas a significant increase in the level of CRP and Ferritin (Table No. 2 and 3).The reduced level of Hemoglobin is inversely correlated with C - reactive protein in PTB patients The finding concludes that elevated level of CRP is responsible for decline in Hemoglobin level in PTB patients. Significant & positive correlation was found between Hb & Serum iron in PTB Patients. Increased level of CRP was negatively correlated with increased level of FRT in PTB Patients. Previous report suggests that in pulmonary tuberculosis ferritin synthesis is stimulated by the inflammatory process [6, 14, 15]. It is well established that nutritional deficiency is associated with impaired immune functions [16].

In PTB Patients, a highly significant rise was noted in serum levels of C-reactive proteins (CRP), and Ferritin (FRT) as compared to control group. Elevated level of serum C- reactive protein in pulmonary tuberculosis patients has been also reported by previous study [17, 18, 19].Various pathogenesis have been suggested in TB-associated anemia, but most studies have shown suppression of erythropoiesis by inflammatory mediators [20, 21].Anemia due to inflammation as well as that of Iron deficiency has been reported earlier by other scientists [22]. The reason for low serum iron & TIBC in PTB patient was due to the disturbances in iron homeostasis due to alteration in C- Reactive Proteins (Table 2 & 3). The decreased level of TIBC might have been due to acute phase response and also reported low iron in patients of pulmonary tuberculosis [23, 24, 25].

On the basis of previous and present study we conclude that inflammation and the acute phase response interact with iron metabolism at several levels. Since anemia of pulmonary tuberculosis is multifactorial in origin as like anemia of chronic disease which affect iron metabolism directly and indirectly, depending upon the severity of disease condition. In PTB patients, more rise in acute phase protein leads to blunted erythropoietin resistance which is responsible for anemic condition. The subnormal values of hematological parameters were found in PTB patients, which might be associated with the underlying chronic disease condition which slowly progress in the TB patients due to poor nutrition, anorexia, increased acute phase response and severity of the disease that causes blunted erythropoietin response which in turn causes iron deregulation and anemia.

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