To study the clinical, hematological and biochemical profile in patients with pulmonary tuberculosis in a peripheral health institute

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ABSTRACT

Background*:* Tuberculosis has always been one of the most feared diseases of mankind caused by the mycobacterium tuberculosis complex. As far as India is concerned Tuberculosis continues to be a major public health problem. Tuberculosis inflicts a varied spectrum of hematological and biochemical manifestations. Aims: The aim of this stud the various changes in hematological and biochemical profile in patients affected with pulmonary tuberculosis (PTB) **Patients and Methods**: This study was conducted from July 2018 to December 2019 at civil hospital nagrota Bagwan, Kangra, Himachal pradesh. A total of 100 diagnosed PTB patients (59 males and 41 females) were recruited in this study. All patients underwent plain chest X-ray, sputum smear for acid-fast bacilli, and Complete blood count and ESR measurements along with renal function test, liver function test with serum electrolyte level. All the smears were read with fluorescence microscopy. Blood sample were obtained from patient and processed with the help of automated cell counter and semi auto analyser for biochemical results. **Results:** The study was carried out on 100 diagnosed cases of tuberculosis. Majority of cases were in second to fifth decade (55%) of life The commonest hematological findings were anemia 100% (31% having Hb less than 10g/dl),then raised ESR 92%, followed by, leukocytosis 29% , thrombocytopenia 5% and leukopenia 2%. The commonest peripheral smear picture was microcytic hypochromic anemia 73% followed by normocytic normochromic anemia 27% then macrocytic anemia (5%). Hypoalbuminemia (serum albumin < 3.5g/dl) was present in 51 (51%) patients. **Conclusion**: hematological and biochemical profile should be assessed periodically so as to implement the corrective measures in order to achieve faster improvement in patient clinical profile

INTRODUCTION Tuberculosis (TB) is a contagious disease caused by a bacteria complex called Mycobacterium tuberculosis complex". It mainly involves lungs where it is called as Pulmonary TB (PTB). It is thought that currently one-third of the world's population is having tuberculosis. It has been seen that 5-10% of HIV negative people who harbour TB bacilli they either develop full blown disease or become contagious at some course of time during their lifetime. As per the WHO global report on tuberculosis 2019,an estimated 10.0 million (range, 9.0–11.1 million) 2 people fell ill with TB in 2018, a number that has been relatively stable in recent years. Eight countries accounted for two thirds of the global total: India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (6%), Nigeria (4%), Bangladesh (4%) and South Africa (3%). These and 22 other countries in WHO's list of 30 high TB burden countries accounted for 87% of the world's cases. [1]. Almost every organ is affected by tuberculosis and Hematopoietic system is no exception. Similarly biochemical profile is also affected during the course of illness having great impact on the general wellbeing of the patient. These hematological and biochemical changes can help us as a marker for the diagnosis, prognosis and response to therapy [2]. The aim of this study was to look into the

hematological and biochemical parameters in patient with sputum smear positive tuberculosis and to evaluate their diagnostic and prognostic significance during anti-tuberculous therapy.

PATIENTS AND METHODS

Our study was a single centre prospective observational study which was conducted at civil hospital nagrota Bagwan, Kangra, Himachal Pradesh between July 2018 and December 2019. A total of 100 diagnosed PTB (both clinically confirmed as well as microbiologically confirmed) attending the outdoor department were recruited. A written consent was obtained from all the participants before inclusion in the study. For patients less than 18 years of age, a proper written assent and informed consent were obtained from the concerned parents/guardian.

INCLUSION CRITERIA:

1. Age ≥ 14years
2. Willing for follow up and ready to give a written informed consent

EXCLUSION CRITERIA

1. Patient's unwillingness to participate.

2. Patient with MDR TB

3. Others-severe disease, CHD, epilepsy

Method: Once enrolled, the detailed demographic characteristics, history and clinical examination findings were recorded as per the attached performa. In general examination, special attention was paid to the presence of features suggestive of tuberculosis outside the central nervous system, like lymphadenopathy and cold abscesses. In systemic examination, careful search was made for other forms of TB, including pleural effusion and rub for pleural TB, pott's spine and paraspinal abscess for spinal TB, pericardial rub and effusion for pericardial TB, abdominal mass, tenderness for abdominal TB. All the relevant details were noted meticulously. Previous records and blood investigations were documented and further investigations were done where they had not been done before. All the findings were recorded. In case of the new patient diagnosed at our centre after a complete thorough general examination, they were subjected to chest X-ray, sputum smear examination with fluorescent microscopy, and CBNAAT examination. Further 5-7 ml of blood was drawn for carrying out biochemical investigations like renal function tests, liver function tests , blood sugar, Complete blood cell (CBC) count, peripheral blood peripheral blood examination and erthrocytic sedimentation rate (ESR) measurement The statistical analysis was done using statistical package for social sciences 23.0 (SPSS) for windows. The demographic data was tabulated in Microsoft Excel. Measures of central tendency (mean, median) were calculated for all quantitative variables along with measures of dispersion (standard deviation, standard error) are presented as mean, median, range, etc. Comparison between discrete variables will be done by Chi square test, while continuous variables will be compared using Non parametric tests such as Mann Whitney test. The categorical variables were compared by Fisher's exact test. Risk ratio was calculated to denote the risk of various factors. P value of ≤ 0.05 will be considered as statistically significant.

RESULTS Demographic characteristics of studied cases: all 100 patients recruited in the study were either clinically diagnosed or microbiologically confirmed cases. The mean age in the current study group was 37.25 ± 16.487 years (range: 14 -70). Majority of the patients were in the age group of 21-50 years (55%). There were 51 (51%) males and 49 (49%) females. 29 (29%) patients had co morbidities at the time of presentation. Diabetes and acquired immune deficiency syndrome were the commonest comorbidities being seen in seven patients each. 30 patients had evidence of TB elsewhere in the body (lung-20; lymph node-9; spine -1; eye-1, prostate-2, testicles-2, multiple. 31(31%) patients had anemia (Hb< 10 g/dl) at presentation. Leucocytosis (TLC>11000/mm^3) and leucopenia (TLC <4000/mm^3) were seen in 29 (29%) and 2 (2%) patients respectively. 5 (5%) patients had thrombocytopenia at presentation depicted in table1. Hypoalbuminemia (serum albumin < 3.5g/dl) was present in 71 (51%) patients.11 (11%) patients had raised transaminases (>3 times upper limit of normal) related to the antitubercular drug therapy. As regard to type of anemia among PTB patients: Microcytic hypochromic anemia was the most common (73%) of patient followed by normocytic normochromic anemia (27%) and then macrocytic anemia was identified in 2% of cases. The severity of anemia was determined as the result of hemoglobin level mild (10-13 g/dl), moderate (9.9-8.1 g/dl) and severe (<8 g/dl). Mild anemia was found in 67% of cases, moderate anemia was found in 31% and severe anemia was found in 2% of total patients. WBC count: 2% had leukopenia (<4x103/ul), 69% had normal WBC count (4-11x103/ul) and 29% have leukocytosis (>11.0 x103/ul). 6% had lymphocytosis (>3 x103/ul). Platelets count among PTB Patients: 5% had thrombocytopenia (<150 x103/L), Most of the PTB patients (92%) had ESR more than

20 mm/hr (table 3). Hematologic parameters among PTB patients before and after treatment: As regard to differences in hematologic parameters among PTB patients before and after treatment: There were significant improvements in Hb, hematocrit, RBCs, MCV, MCH and MCHC among PTB patients after treatment compared to before treatment with p<0.01.

There were significant decreased in total WBC and absolute lymphocyte count among PTB patients after treatment compared to before treatment with p<0.01.depicted in Table (2)

Table 1: Hematological and biochemical profile at presentation

Parameter	Number of patients (n=100)	%age
Anaemia (Hb < 10g/dl)	31	31%
Leucocytosis(TLC> 11000/mm$^{3)}$	29	29%
Leucopoenia (TLC < 4000/ mm$^{3)}$	2	2 %
Thrombocytopenia (Platelet < 1lakh/mm$^{3)}$	5	5 %
Hypoalbuminemia (with Albumin < 3.5 g%)	51	51%
Transaminitis (> 3X upper limit)	11	11%
ESR (mm/hour) >20mm/1st hour	92	92%

Table (2): Comparison of hematologic Parameters among PTB patients before and after treatment (Total n=100)

Parameters	PTB before treatment	PTB after treatment	P-value
Hb (g/dL)	10.21±1.52	11.8±1.21	<0.001*
MCV (FL)	69.3±7.2	76.07±6.4	<0.001*
Absolute lymphocyte count (x10/ul)	1.86±0.31	1.4±0.42	<0.001*
ESR (mm/hour)	48.92±15.8	23.2±14.8	<0.001*
Serum Albumin (g/dl)	3.2±1.6	5.8±2.3	<0.001*

DISCUSSION

Current study was carried out as a single centre, prospective observational study on 100 patients of TBM (M: F = 51:49).The mean age at presentation was 37.25± 16.49 years (range: 14 -70). Similar results were seen in previous study by Ige and Akindele study where 73.2% of the patients were between the ages of 20 years and 49 years [3] as well as reported by Zedan et al. who found that the mean age in their study was 37.5±16 years [4]. Higher male affection by TB in our study is in accordance to several studies who also reported a higher percentage of men having the disease [5-9]. A number of markers for tuberculosis are available to assess the activity and monitoring of disease process in pulmonary tuberculosis however but specific markers are expensive and cannot be done routinely at peripheral centre where cost is an important factor to consider. So the simple hematological and biochemical parameters like CBC and ESR can provide indirect and alternate way to monitor the course of the disease [10]. In our study (67%) of total patients have mild anemia and, (31%) have moderate anemia and only, (2%) of patients had severe anemia. Microcytic anemia was the most common (73%) of patient and normocytic anemia was next common was identified in 27% while macrocytic anemia was noted in 2 (2.0%). This study in contrast to the study done by Banerjee et al. where normocytic anemia was the most common type (65.16%) followed by microcytic anemia (29.67%) patients [5]. The prevalence of iron deficiency anemia particularly in females in our community can very well explain this deviation,

The commonest WBCs abnormalities in our study were leukocytosis 29%, lymphocytosis 6%, thrombocytopenia 5% and leucopenia 2%. The occurrence of leukocytosis and neutrophilia were similar to other studies and are thought to be the immune responses to tuberculosis [11-13]. Compared to our findings, Banerjee et al. found leukocytosis in 28.63% cases, leucopenia in 2.20% cases, neutrophilia in 66.15% cases, lymphocytosis in 21.53% cases, and eosinophilia in 4.61% cases [5].

Our study noted thrombocytopenia in 3% of PTB. Similar results were seen in study done by Yaranal et al. and Banerjee et al. where they noted thrombocytopenia in 9 and 5% cases respectively [5,9]. The various mechanisms

possible for thrombocytopenia are drugs immune mechanisms, bone marrow fibrosis, and granulomatous involvement of bone marrow and hypersplenism [13].

The ESR though sensitive but not a specific marker of the inflammatory response is routinely done in during the evaluation. An elevated ESR has positive predictive value for the presence of chronic inflammatory process. In our study ESR was elevated in 92% of patients. Similarly Banerjee et al and Yaranal et al noted raised ESR in 99 and 98% of cases respectively [5,9].

51% of the patients had hypoalbuminemia (<3.5g/dl) reflecting the poor nutritional status of the pulmonary TB patients. Similar results were noted in study done by Ganesan et al.[14]. In term of the effect of treatment on hematologic and biochemical parameters among PTB patients before and after treatment: There were significant improvements in Hb, hematocrit, RBCs, MCV, MCH and MCHC among PTB patients after treatment compared to before treatment with p<0.01. Similar results were seen in study carried by Yaranal et al [9,15].

There were significant decreased in total WBC and absolute lymphocyte count among PTB patients after treatment compared to before treatment with p<0.01. These results similar with several studies [12,14]. Also ESR showed reduction after treatment with p<0.001 similar to a study done in Nigeria [16].

CONCLUSION:

This study shows males were more infected than males in more in the age group of 20-50. Most common hematological and the biochemical abnormalities noted were microcytic hypochromic anemia, leucocytosis, lymphocytosis, thrombocytopenia, elevated ESR, hypoalbuminemia. These parameters showed significant improvement after treatment with antitubercular medicines. So the patients with PTB should be monitored periodically for hematological and biochemical parameters. They can serve as cost effective diagnostic and prognostic markers for assessing the clinical profile of the patient during the anti-tuberculous therapy.

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