



To Evaluate the Presence of Anemia in Patients with Pulmonary Tuberculosis at a Tertiary Health Care Centre.

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ABSTRACT

Aim: To evaluate the prevalence of anemia and of its types in hospitalized patients with pulmonary tuberculosis.
Material and Methods:
 A prospective study on sputum positive pulmonary tuberculosis patients who were admitted to the department of pulmonary medicine, Rohilkhand Medical College and Hospital , Bareilly. The enrolled patients were informed and proper consent was taken. We evaluated body mass index (BMI), mean corpuscular volume, and red blood cell distribution width (RDW), hemoglobin.
RESULTS: We included 83 patients, 63 (75.9%) of whom were male. The mean age was 39.0 ± 10.7 years. The prevalence of anemia of chronic disease and iron deficiency anemia were, respectively, 75.9% and 2.4%; and 68.7% had low body weight (mean BMI = 18.21 kg/m² . Anemia was found to be associated with the following: female gender (p <0.05); low weight (p <0.05); low mean corpuscular volume MCV (p <0.05); high RDW (p <0.05). We also found significant differences between anemic and non-anemic patients in terms of BMI (p <0.05).
CONCLUSIONS: In this sample, high proportions of pulmonary tuberculosis patients were classified as underweight and malnourished, and there was a high prevalence of anemia of chronic disease. In addition, anemia was associated with high ESR and malnutrition.

KEYWORDS	Pulmonary Tuberculosis, Anemia, Iron , Malnutrition
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Introduction

Tuberculosis (TB) is the world's second most common cause of death from infectious diseases^(1,2). As per the statistics in 2011, a total of 8.7 million new active TB cases and 1.4 million TB related deaths were estimated worldwide; 70% of these deaths were among HIV uninfected people . According to the World Health Organization, one third of the world population is infected with Mycobacterium tuberculosis. In addition to AIDS, risk factors for tuberculosis include alcoholism, smoking, history of tuberculosis, malnutrition, and low socioeconomic status.⁽³⁾

Sputum Smear positivity is the most important predictor of active TB infectiousness⁽⁴⁾. When smear positive TB patients initiate TB there is a rapid multifold reduction in bacillary load expelled in sputum which minimizes the risk for transmission⁽⁵⁾. The association between tuberculosis infection and malnutrition consists of two interactions: the effect of tuberculosis on the nutritional status and the effect of malnutrition on the clinical manifestations of tuberculosis, as a result of immunological impairment. As per the researches worldwide anemia has been observed in 32-94% of patients with tuberculosis⁽⁶⁻⁸⁾

Amongst the anemia, Iron deficiency is the most common micronutrient deficiency in the world, and numerous studies have evaluated the association between serum iron levels and iron-deficiency anemia^(9, 10) . Among the anemias that are characterized by altered iron metabolism, iron-deficiency anemia and anemia of chronic disease are the most common⁽¹¹⁾

Iron-deficiency anemia is the most common nutritional deficiency in . It occurs as a result of chronic blood loss, urinary losses, poor iron intake/absorption, and increased blood volume. In individuals with iron-deficiency anemia, a decrease in plasma iron levels occurs, limiting erythropoiesis. The risk of

developing iron-deficiency anemia is highest among infants, children under 5 years of age, and women of childbearing age.⁽¹²⁾

Anemia of chronic disease, that is also known as anemia of inflammation, is a clinical syndrome characterized by the development of anemia in patients with (fungal, bacterial, or viral) infectious diseases, such as tuberculosis, inflammatory diseases, autoimmune diseases, and neoplastic diseases. It is characterized by mild to moderate normocytic hypochromic anemia, and hypochromia and microcytosis can occur in 20-30% of cases. It is associated with decreased serum iron levels and total iron binding capacity, as well as with increased ferritin levels.

Methods

It was a prospective study and was carried out in the department of pulmonary medicine at Rohilkhand Medical College and Hospital, Bareilly, which was preapproved by the Ethical Committee of this institution review board. Data from all the cases diagnosed with pleural effusion in the pulmonary medicine department of RMCH from July 2014 to July 2015 were included. All participants gave written informed consent.

Patients under 18 years of age or over 60 years of age were excluded, as were those who had previously undergone tuberculosis treatment or who had been receiving treatment with antituberculosis drugs for more than seven days; those with diabetes mellitus receiving insulin therapy; those with renal failure on peritoneal dialysis or hemodialysis; those who had received blood transfusions in the 3 months preceding study entry; and those who were pregnant or lactating. For data collection, we used a standardized questionnaire and reviewed medical records. In addition, we collected blood samples and performed medical and nutritional assessment up to seven days after the initiation of pharmacological treatment.

Nutritional assessment included measurements of weight, height, and body mass index (BMI), in order to identify patients who were underweight.

In order to classify anemia, we analyzed the following parameters: hemoglobin levels; transferrin levels; ferritin levels; and mean corpuscular volume (MCV). Iron-deficiency anemia was characterized by decreased levels of iron and ferritin, whereas anemia of chronic disease was characterized by decreased levels of iron and increased levels of ferritin. For statistical analysis, Student's t-test, ANNOVA and the chi-square were applied wherever required. Values of $p < 0.05$ were considered statistically significant.

Results

We included 83 patients, 63 (75.9%) of whom were male. The mean age was 39.0 ± 10.7 years. 49 (59%) patients were alcoholic; 59 (71%) of patients were classified as smokers or former smokers or exposed to biomass. Of the 83 patients, 9 (11%) had no anemia and 74 (89.1%) had anemia. Of those, 20 (24%) had iron-deficiency anemia and 63 (75.9%) had anemia of chronic disease. low hemoglobin levels (mean, 10.86 ± 2.04 g/dL) in 89.2% of patients and low MCV (mean, 82.00 ± 7.77 fL) in 39.7%. In addition, high ferritin levels (mean, 520.68 ± 284.26 ng/mL) in 52.7% of patients; high RDW (mean, $16.36 \pm 3.47\%$) in 55.4%.

On the basis of the BMI, 44 (53%) patients were underweight (mean, 18.21 ± 2.93 kg/m²).

On further evaluation on the basis of history and demography along with the socio economic status of the patient, we saw an association of anemia with the female gender ($p < 0.05$) and a trend toward an association of anemia with being a smoker or former smoker ($p = 0.05$); Anemia was found to be associated with the following: BMI ($p < 0.005$); MCV ($p < 0.005$); ferritin ($p < 0.005$); RDW ($p = 0.0003$).

Discussion

In the present study, pulmonary tuberculosis was found to be more common in young adults, males, alcoholics, smokers; this finding is similar to those reported in studies evaluating pulmonary tuberculosis worldwide.

In the present study, the proportion of patients with anemia of chronic disease was higher than was that of those with iron-deficiency anemia (75.9% vs. 2.4%), a finding that was similar to those reported in other studies but different from those reported in another study.

In the bivariate analysis, anemia was found to be more common in females than in males, a finding that is consistent with the literature.

On the basis of the BMI, 53% of patients were found to be underweight, a proportion that is higher than that reported in a study conducted in Peru (21%) and similar to those reported in studies conducted in Malawi⁽¹³⁾ and England⁽¹⁴⁾. This is probably due to the fact that those studies included high proportions of HIV-positive inpatients. In our study, we found high concentrations of ferritin, a finding that is similar to those reported by other groups of authors.^(6,7,15,16) In tuberculosis patients, determination of ferritin levels should be used with caution because ferritin levels do not accurately express the amount of iron in such patients. Therefore, patients can have iron deficiency even when they have normal or increased ferritin levels.

Given that microcytosis was observed in most of the patients in the present study, increased RDW might be useful to demonstrate iron deficiency⁽¹⁶⁾ although its role remains controversial.

When we compared the groups of patients with and without anemia in terms of their nutritional status, we found that malnutrition was more severe in the former, who had low serum

concentrations of transferrin and high serum concentrations of ferritin, as reported in one study.⁽²⁾

In conclusion, high proportions of pulmonary tuberculosis patients were classified as underweight and malnourished on the basis of different parameters (BMI), and there was a high prevalence of anemia of chronic disease. In addition, the degree of malnutrition was higher in the patients with anemia than in those without.

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