

Frequency of Anaemia in Patients of Pulmonary Tuberculosis

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Abstract: Chronic pulmonary tuberculosis caused by the bacillus *Mycobacterium tuberculosis* (*M. Tuberculosis*) which is a major cause of global health problems in developing countries. Co-infection with several *Mycobacterium* strains or species has, however, also been documented. *M. tuberculosis* is an aerobic, acid-fast, non-spore-forming, non-motile bacillus. One of the most prevalent symptoms of TB patients is anaemia, which is thought to be the cause of its poor prognosis. The most prevalent type of anaemia is iron deficiency anaemia, which lowers the host's capacity to defend against foreign antigens and results in an impaired immune response. The purpose of this study was to investigate the frequency of anaemia among patients with pulmonary tuberculosis in the Medical Department at Ayub Teaching Hospital Abbottabad. The study was carried out at Ayub Teaching Hospital Abbottabad's Department of General Medicine from January to June 2022. it was a cross Sectional (Descriptive) Study. Suspected cases of pulmonary tuberculosis (TB) from the Hazara division visiting Medical units of Ayub Teaching Hospital Abbottabad, ranging in age from 20 to 60 years, were selected as participants. Their sputum for acid fast bacilli (AFB) was collected in a bottle. Blood was collected in an EDTA (ethylenediaminetetraacetic acid) tube and was examined in the laboratory. The patients had a mean age of 38.76 ± 15.16 years (range: 20-60) and a mean haemoglobin level of 11.477 ± 2.173 . Male patients had a mean haemoglobin level of 11.961 ± 2.333 , while female patients had a mean level of 10.794 ± 1.720 . Of the patients, 64.3% (110) were anaemic and 35.7% (61) were non-anaemic. In conclusion, Tuberculosis is a common disease in a developing country like Pakistan. Anemia related to tuberculosis is prevalent in most cases and needs further evaluation to decrease the morbidity and mortality ratio.

Key words: Anemia, Pulmonary Tuberculosis, Acid Fast Bacilli (AFB), Sputum

I. INTRODUCTION

Chronic pulmonary tuberculosis (TB) is a worldwide public health crisis caused primarily by the bacillus *Mycobacterium Tuberculosis* (*M. Tuberculosis*). However, reports have also indicated co-infection with different *Mycobacterium* strains or species. *Mycobacterium Bovis* is mostly an animal pathogen, it is non- pathogenic for humans¹. According to the WHO, approximately 10.6 million people had been ill with tuberculosis in the world in 2021, with the incidence rate of 3.6% in 2020 to 2021 and prevalence rates 125 and 170 cases per 100,000 people, respectively ². With an estimated 510 000 new cases of tuberculosis occurring annually, Pakistan ranks sixth among nations with high tuberculosis burdens. Roughly 15,000 instances of drug resistant TB are reported annually^{3,4}. In 1993, the WHO declared tuberculosis a global health emergency. Between 2006 and 2015, the Stop TB Partnership saved 14 million people through the development of a global plan to combat tuberculosis⁵. TB is among the leading causes of death caused by a single infectious agent. It ranks among the top ten causes of mortality worldwide⁶. Pulmonary TB is the most common type of tuberculosis affecting the lungs. Extra-pulmonary TB affects other parts of the body but may co-exist with pulmonary TB. The patients commonly present with fever, chills, anorexia, night sweats, weight loss, anemia, and fatigue⁷. Pulmonary tuberculosis is a chronic disease. There is always inflammation and resultant anaemia in chronic diseases. This is due to increased levels of hepcidin, which produces serum hypoferrremia and tissue hyperferritinemia. Chronic inflammation also reduces the level of erythropoietin, due to the over production of interleukin 6, which is essential for the formation of red blood cells⁸.

Anemia is the most prevalent disease, affecting developing nations worldwide. It is a common complication of tuberculosis, presenting more in tuberculosis patients than in control groups⁹. Anemia can be divided into mild, moderate, and severe. The prevalence of anemia among tuberculous patients is 61.53%¹⁰. The anemia in TB is also correlated to malnutrition. TB makes malnutrition worse, and malnutrition lowers immunity, which increases the likelihood that latent TB may become an active illness. Several factors contribute to this phenomenon which include hemoptysis, decreased red blood cell production due to bone marrow involvement, decreased appetite resulting in malnutrition and chronic inflammation¹¹. Patients suffering from anemia have a low quality of life. Anemia also increases the morbidity and mortality rates in patients suffering from chronic diseases. Each year, 13.7 million people

contract tuberculosis, with 1.5 million dying as a result. Tuberculosis, malnutrition, and anemia are interconnected, with TB causing severe malnutrition and anemia and vice versa¹². The evaluation of potentially amendable risk factors, like anemia, is critical for developing TB control policies.²

In Pakistan, the main issue faced by majority of population is poor socioeconomic status. This results in lack of access to balanced nutrition, resulting in anemia. The lack of vital nutrients like iron, vitamin B12 and Folate, along with a weakened immune system result in tuberculosis and, consequently anemia. The multifactorial effects of tuberculosis, along with co-infections and weakened health, poses high socioeconomic and health care issues. Addressing this problem will not only help in TB control and prevention but also in improving the overall health of people.

II. MATERIALS AND METHODS

This descriptive cross-sectional study was conducted in the department of medicine, Ayub Teaching Hospital, Abbottabad. After receiving ethical approval from the CPSP and the ethical committee of the Ayub Teaching Hospital, the study was conducted from January to June 2022. The sample size was calculated using W.H.O. criteria as 171, with 32% prevalence, a 7% margin of error, and a 95% confidence interval. The patients were selected using a consecutive non-probability sampling technique. Suspected cases of pulmonary TB of either gender, aged 20–60 years, were included in this study. Pregnancy, lactation, and haemolytic anaemia were all excluded, also elderly patients, and renal failure patients on peritoneal dialysis or haemodialysis who had received blood transfusions during the previous three months of study commencement.

The patients and/or their relatives were informed about the use of data for study and publication, and their consent was obtained. The sputum for AFB was collected in a bottle. AFB were detected in aputum by using Immununochromatographic test (ICT). A specimen of 2–3 ml of blood was collected from sputum AFB positive subjects in a 3 ml disposable syringe (gauge 23 G of BD Company) by venipuncture with aseptic measures. This sample was transferred to an EDTA bottle. The sample was examined in the pathology laboratory of the Ayub Teaching Hospital, Abbottabad. The data was analysed using SPSS 20.0. Quantitative variables like age and haemoglobin in g/dl were described as Mean \pm Standard Deviation. Categorical variables like gender and the presence of anaemia were described as having

frequencies and percentages. A stratification chi-square test was applied at a 5% level of significance.

III. RESULTS

We took a total of 300 patients out of which 171 patients who were AFB positive were considered for further study. Anaemia was found in 110 patients (both males and females), whereas 61 patients had normal haemoglobin values (table 1). Of the total patients, 100 were male and 71 were female (table 1). According to demographics, 79 (46.2%) patients were below the age of 30 years, and 92 (53.8%) patients were between the ages of 31 and 60 years (table 1). The age range for anaemia among patients is 20–60 years, with a mean of 38.75 ± 15.158 . The haemoglobin ranged from as low as 5.7 g/dl to 15.4 g/dl, with a mean of 11.4 ± 2.1728 (table 2). Out of a total of 171 patients, the mean haemoglobin level of the male patients was 11.961 ± 2.3334 , ranging from 5.7 to 15.4 g/dl, and the mean haemoglobin level of the female patients was 10.794 ± 1.7198 , ranging from 8.0 to 13.2 g/dl (table 3).

Stratification of anaemia based on gender and age is demonstrated in table 4. Out of a total of 171 patients, 65 (65.0%) male patients were found to have anaemia, 45 (63.4%) female patients were found to have anaemia and 61 (35.7%) were found to have no anaemia. In the frequency distribution of anaemia by age group among both genders, anaemic patients under 30 years were 32(88.9%) and those between 31 and 60 years were 33(51.6%). This discovery was statistically significant at $p=0.000$. Females made up 31.1% of anaemic patients aged under 30 and 14.0% of those aged 31 to 60.

Table 1: Demographics of patients suffering from Tuberculosis

Variable		Frequency	Percentage
Gender	Male	100	58.5%
	Female	71	41.5%
Total		171	
Age	Below 30 years	79	46.2%
	31- 60 years	92	53.8%
Total		171	
Anaemia	Present	110	64.3%

	Absent	61	35.7%
Total		171	

Table 2: Descriptive statistics of age and gender

	n	Minimum	Maximum	Mean	Standard Deviation
Age	171	20	60	38.75	15.158
Haemoglobin	171	5.7	15.4	11.4	2.1728

Table 3: Distribution of haemoglobin levels between the genders

Gender	n	Minimum	Maximum	Mean	Standard Deviation
Male	100	5.7	15.4	11.961	2.3334
Female	71	8.0	13.2	10.794	1.7198
Total	171			11.477	2.1728

Table 4: stratification of anaemia on gender and age group

Gender	Age Group	Anaemia		Total	p-value
		Present	Absent		0.828
Male		65	35	100	
Female		45	26	71	
Total				171	
Male	Below 30 years	32	4	36	0.000
	31 – 60 years	33	31	64	

Female	Below 30 years	31	12	43	0.059
	31 – 60 years	14	14	28	
Total	Below 30 years	63	16	79	0.000
	31 – 60 years	47	45	92	
TOTAL		110	61	171	

IV. DISCUSSION

The results of our study show that anemia is common among patients suffering from tuberculosis. Our patients were predominantly male (100), with 71 female patients suffering from tuberculosis. Schurz et al. reported that, according to the WHO, in 2017, 65% of males suffered from tuberculosis of the 0.4 million known cases of the disease¹³. A study conducted by Mukerjee et al. in India showed that anaemia is common in males and in people over 50 years of age¹⁴. Our study had a similar result, with 92 (53.8%) patients between the ages of 30 and 60. A similar study was conducted by Chhabra et al., who discovered that anaemia is common in men over the age of 40¹⁵. In our study, 110 (64.3%) people had low haematocrit values and 61 had normal haematocrit values. Batool et al. discovered similar results when they conducted a study at Nishtar Medical College and discovered that anemia was present in 82.6% of their patients. Similar to the fact that the patients were 34.36 ± 6.41 years old, which was the same as our study (38.75 ± 15.158), they also had more male patients than female patients¹⁶. In our study, we discovered that haemoglobin levels ranged from 5.7 g/dl at the lowest to 15.4 g/dl at the highest, with a mean of 11.4 ± 2.1728 . In their study, Yu et al. also discovered that 71.9% of participants had moderate anaemia, while 6.4% had severe anemia¹⁷. According to further stratification of our data, anaemia ranged from 5.7 to 15.4 g/dl in male patients, while it ranged from 8.0 to 13.2 g/dl in female patients. Anaemia was also discovered by Firdaus et al. to be more prevalent in men (78.7%) than in women (73.6%). Their patients' haemoglobin levels ranged from 2.2 g/dl at the lowest to 15.6 g/dl at the highest¹⁸. In our study, out of a total of 171 patients, anaemia was discovered in 65 (65.0%) male patients and 45 (63.4%) female patients. Gil-Santana et al. found comparable results with a large male population as their

subjects¹⁹. A similar study conducted by Holden et al. for a period of 5 years in Denmark also demonstrated males to be at a higher risk of developing anemia²⁰.

Our research reveals the importance of comorbidity associated with tuberculosis. The need to make sufficient and achievable plans to control tuberculosis and manage its causes and effects on the healthcare system should be among the top priorities.

V. CONCLUSION

This study concluded that the frequency of anaemia in tuberculous patients was 64.3%, which is quite high. However, other factors like low socioeconomic status, the duration of tuberculosis, and other causes of iron deficiency anaemia are also prevalent in Pakistan, which is a developing country, may be involved and need to be further evaluated.

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