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Prevalence of Anemia among the Patients with Pulmonary Tuberculosis and Diabetes – In and Around Ongole -India

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ABSTRACT

The infectious disease pulmonary tuberculosis (PTB) and the non-infectious disease diabetes mellitus (DM) constitutes major health problem in the society. Many research studies acknowledging the negative health impacts of DM on patients with PTB. In this study 500 PTB patients with DM had been subjected to screen for anemia. Hb % had been studied to evaluate their anemic status. The study results had been strongly proving about of the PTB patients were found to be affected by anemia. From this study results, it has been concluded that the patients with DM and PTB had been documented with mild to severe type of anemia . These patients require special care to treat anemia which in turn helps in the management of PTB and DM.

Introduction

The term anemia is defined as low blood hemoglobin (HB) concentration. Anemia is a world wide public health issue. A considerable percentage of the human population around the world (both developing and developed countries) was found to be affected by the disease anemia. Anemia occurs at all age groups and all stages of the human life cycle. Young children and pregnant women are predominantly affected (Steven et al 2013 and WHO-2020). About 24.8% of the global population had been affected by the disease anemia (De Benoist et al 2008), among which the highest percentage (43%) of the pre-school-aged children was affected (Steven et al 2013 and WHO-2020). Though many factors such as acute and chronic infections which include malaria, cancers, HIV are the cause of anemia, about 50% of the anemia occurs because of iron deficiency (De Benoist et al 1993-2005).

Pulmonary tuberculosis is a type of airborne infection caused by Mycobacterium tuberculosis. Among all chronic infectious diseases, pulmonary tuberculosis is the second most common infection for the cause of death. According to the report of the authors (Nagu et al 2014, Devi et al 2003, Umakahan 2017) it had been recorded that about 8.7 million new active TB patients and 1.4 million deaths due to TB were recorded worldwide.

According to the severity of anemia, it may be classified into three main categories as mild, moderate, and severe anemia (De Benoist et al 1993-2005). When the level of hemoglobin among the children below the five years age group and for pregnant women and incase of non-pregnant 10.0-11.9g/dl is indicative of mild anemia, and the moderate anemia constitutes when the hemoglobin concentration value found as 7.0-9.9 g/dl, in all individuals. Whereas the hemoglobin concentration level is less than 7.0g/dl, it is noted as severe anemia. Anemia brings down the health associate quality of life**.** Anemia increases the morbidity as well the mortality of the already diseased chronic patients. Anemia is also considered as one of the predisposing factors for some infectious diseases including tuberculosis (Cote et al 2007).

Many research authors noted that the prevalence (44-89.1%) of anemia among TB patients (Barzegari et al 2019, Nagu et al 2014, Hella et al 2018, Bashir et al 2013 and Oliverira et al 2014). It has been also recorded that patients with anemia are found to have a higher proportion of TB while compare to non-anemic patients, and the highest TB burden is in patients with severe anemia (Bashir et al 2019 and Kerkhoff et al 2014). This could be due to the suppressed status of the immune system of the anemic patient's aid to the susceptibility to the remarkably decreased cell-mediated immunity and reduced bactericidal function of the leucocytes is the usual reason why the anemic individuals are more prone to get infectious diseases including TB while comparing with non-anemic individuals (Erkurt et al 2008 and Ekiz et al 2005).

Many authors performed studies on the TB clinic attendees with DM and PTB. They had been well analyzed and studied the relationship and the comorbidity of DM in PTB. The correlation between PTB and the comorbidity of DM and anemia are not yet been well studied. Hence the research in this field of specialization is still needs to be established (Yemataw et al 2021).

The related research to this particular patients group seems to be too less from south India and the existing research information is inadequate. Hence it is felt essential to screen anemia among the TB clinic attendees by which the early diagnosis of anemia could be possible among the TB positive as well as the TB negative patients attending TB clinics. This will aid the PTB-positive patients with or without DM to get treatment for anemia which may reduce the burden of tuberculosis and also will help to reduce the comorbidity of DM, anemia, and PTB.

Materials and Methods

Source of the Study population and Period of study

Totally 500 pulmonary TB patients with diabetes mellitus were selectively included in this study. All the patients included in this study were the TB clinic/ chest clinic attendees, referred by the divisions of medicine, surgery, medical college, RNTCP, Ongole. Andhra Pradesh, India. The present study was conducted in the year 2018 January to December 2018 for 12 months period.

Ethical clearance and Patient's Consent

Prior to conducting the present study, the proposed study plan was submitted to the institutional ethical committee and permission was obtained to perform the research. The study plan was thoroughly explained to the patients before specimen collection and written consent was obtained from each patient, with their consent specimens were collected from them.

Blood samples and tests performed to Screen anemia

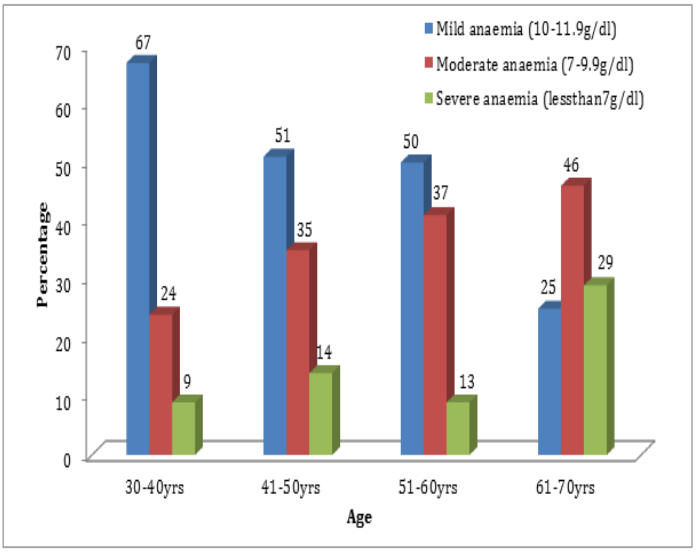
The blood sample was collected from the study population by two different methods and two different techniques were used to screen anemia. The Peripheral Blood Sample was collected by finger prick and strip method was used to screen the level of hemoglobin concentration in the patient's blood. From the same patient, another blood sample was collected by vein puncture and tested for Hb% by a fully automated analyzer (cell counter analyzer – BECKMAN – company). The Hb% results of each patient by two different methods were recorded for further analysis.

Results and Discussion

The world health organization (WHO) approved and established guidelines for the high risky population to be systematized for the TB screening than the other general population (Gurvits2014). As per the instructions given by WHO, all TB patients should check for their DM status and HIV. All Government health care institutes and private health care centers are bound to follow the guidelines of WHO. Though the health care centers strictly followed the rules of WHO, the patients who attended the TB clinic were unaware of the negative impacts of the co-risk factors. It is our experience that considerable numbers of these patients failed to render their cooperation to test and screen the other co-risk factors (physiological parameters like Hb%, HbA1c). Assessing the probable risk factors associated with TB is surely helpful and useful for the evolution of TB control policies (Chu et al 2019). So in this study, it was planned to assess the hematological parameters especially anemia, by evaluating the Hb% of the TB clinic attendees with appropriate control groups.

According to the WHO - 2011, The prevalence of anemia in populations was estimated as severe anemia as 40% or higher and the moderate and the mild anemia and its prevalence rate were identified as 20.0 -39.9% and 5.0-19.9% respectively while the normal condition of the blood level hemoglobin was recorded as 4.9% or lower (WHO-2011-http.www.who.int). In this study all (500) the patients (with PTB and DM) were found to be recorded with either of the following categories of anemia. Out of 500 patients with PTB and DM, 49%, 35 %, and 16 % of them had mild, moderate, and severe anemia respectively. There is not much difference in the data presented by WHO and with our study results. However the WHO pointed out the prevalence of anemia among the general human population at the global level (large population), but our study report is related to the patients (PTB and DM) with a limited population (500).

All these 500 patients with PTB and DM fall in the age group range between 30 and 70 years. About 25%, of the study population, falls in the age group 30- 40 years and they were predominantly affected by mild anemia (67%). Out of 500 study population, about 21% of the patients were recorded from the age groups 41-50 years among them 51% were affected by mild anemia. Whereas only 32% of the patients belong to the age group between 51-60 years and they were predominantly (50%) affected by mild anemia. When compared to all the age groups, the patients belonging to the age group 61-70 years were affected by severe anemia with an increased percentage (29%). Comparatively less percentage of severe anemia was recorded with the other age groups (Table .1 & fig.1).



Statistical analysis

The statistical analysis had been performed by using the Pearson Chi-Square method and the P-value was recorded as less than .001, and it is found as statistically significant.

In this study, all (100%) of the study population (PTB patients with DM) were found to have anemia with different degree. On inquiry, all these patients were noted as vegetarian food consumers and they all were from a suburban area. Out of 500 PTB patients with DM, 188 were females and 312 were males. All 188 female patients belong to the age group 30 to 60 years while the male patients fall in the age group 30 to 70 years.

The case history of these patents attracted our attention and the collected information help us to correlate with the other results of this study. Out of 188 female patients with pulmonary tuberculosis and diabetes mellitus, 68% and 23% of them had mild and moderate anemia respectively, only 9% of the female patients were shown to have severe anemia. On inquiry of the female patients with PTB and DM, those who

Table 1. Prevalence of anemia among pulmonary tuberculosis patients with diabetes mellitus specific to age groups

Anaemia	Patients and Age groups n=500				Total
	30-40yrs	41-50yrs	51-60yrs	61-70yrs	
Mild anaemia (10-11.9g/dl)	84 (67%)	56 (51%)	79 (50%)	27 (25%)	246(49%)
Moderate anaemia (7-9.9g/dl)	30 (24%)	39 (35)	58 (37)	49 (46 %)	176 (35%)
Severe anaemia (lessthan7g/dl)	11 (9%)	15 (14%)	21(13%)	31 (29 %)	78 (16%)
Total	125 (25%)	110 (22%)	158(32%)	107 (21%)	500 (100%)

had severe anemia, are found to have the habit of chewing tobacco as well as not taking any kind of treatment to cure DM and they all seems to be unaware of anemia. They all checked for anemia first time in their lifetime (during this study time). Moreover, these patients had increased level of blood glucose levels (ranging from 150 – 300 random sugar). The chronically increased blood sugar level may be affected the RBCs and this could be the reason for the severe anemia in these patients.

Further, they were counseled to obtain the physician's opinion for further DM treatment. Likewise, the female patients with PTB and DM who had been recorded with mild and moderate anemia were found to be received irregular treatment for DM. These groups of people well aware of the negative health impacts of DM, somehow, they were all failed to maintain health care guidelines.

From the details collected from the patient's history, it came to know that all these patients who had severe anemia, had been related to any one or more of the following factors, they are as follows, strictly eating vegetarian food, belongs to the poor socio-economic category, not treated for the worm infestation. So, further study is essential to correlate all these factors and their association with anemia. Usually, the poor people who reside in and around the study area (Ongole, Andhrapradesh, India) never consume iron-rich food and their main food is rice-based which is rich in carbohydrates. It came to know that some of them those who had been strictly consumed vegetarian food, did not consume iron-rich food such as spinach, ragi, dates as their routine food. Special care was not taken to improve their Hb level since they are unaware of the negative impacts of anemia. Certain factors such as diabetes mellitus, and chronic kindly diseases, and habitual characters like tobacco smoking, alcoholism are playing a major role among TB patients (Chu et al 2019 and WHO-2013), the present study results also acknowledge these authors' statements.

The world health organization (WHO) approved and established guidelines for the high risky population to be systematized for the TB screening than the other general population (Gurvits2014). As per the instructions given by WHO, all TB patients should check for their DM status and HIV and all Government health care institutes and private health care centers are bound to follow the guidelines of WHO. TB clinic attendees those who have completed all the tests which were fixed in between DM and TB had been well analyzed and Studied but the relationship, as well as the correlation between TB and anemia, has not yet been well studied and the research in this field of specialization is still needs to be established.

The different types of anemia such as Aplastic anemia, Thalassemia, and vitamin deficiency anemia have been recognized as the cause of anemia associated with bone marrow diseases and anemia of inflammation can also be the type of anemia. Further study in this field of Specialization in suggested and welcome.

The available research information conveys that anemia is one of the risk factors for TB (Enjn et al 2015) Alemu et al 2016 and Phyo et al 2019), and few authors pointed out that anemia is not a provable factor in the development of TB (Kerkhoff et al 2015, and Iroezindu et al 2016). These types of contradictory reporting reveal the inadequacy of systemic review in the particular field of specialization. Yematawgelaw et al 2021, performed a systematic review and meta-analysis on the risk of TB. These authors concluded that the anemia condition of the individual aid for contracting TB and the risk of contracting and development of seems to be increased with anemia severity.

The author Uma Kanth 2017, from Srilanka, pointed out that there are many causes for anemia in patients with tuberculosis, but two major reasons were observed from the TB patients who attended teaching hospital Batticaloa, Srilanka. TB-related inflammation in which TB itself is the cause for the anemia and it found this condition does not respond to iron treatment and the of the cause for anemia among TB patients is iron deficiency, that will respond to iron therapy.

It has been concluded that the women with pulmonary tuberculosis were found to have the disease anemia (Saeed et al., 2019). Tuberculosis is caused by the mycobacterium tuberculosis and is considered a major public health problem mainly affecting the people of poor socioeconomic category. Tuberculosis causes a double burden with anemic patients. It has been studied and documented that anemic individuals are the more susceptible persons to infectious diseases, which include TB, due to their low immunity level (Yemataw et al 2021).

From all the above mentioned details it came to know that the need for special attention towards not only the patients with PTB and DM together but also require equal attention towards all the patients who are attending health care centers. As well as still, more focus is essential for the poor socio-economic and illiterate categories since they are unaware of the disease anemia and its negative health impacts. Moreover, it is suggested to the health authorities and policymakers to consider all these issues and to bring out an effective solution to eradicate anemia from the society by implementing certain guidelines and to screen anemia all the patients attending health care centers institutes and to conduct health camps in the villages during which the provision of Hb% checkup by cord test at least.

It has been concluded that the women with pulmonary tuberculosis were found to have the disease anemia (Saeed et al 2019). Tuberculosis is caused by mycobacterium tuberculosis and is considered a major public health problem mainly affecting people of poor socioeconomic category. Tuberculosis causes a double burden with anemic patients. It has been studied and documented that anemic individuals are the more susceptible persons to infectious diseases. It is suggested that the diagnosis of anemia by measuring Hb is cheap and easy to perform within the clinical setup or elsewhere, hence it can be used to screen anemia for the TB clinic attendees, in order to take proper health care treatment to overcome the anemia condition of the patients.

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