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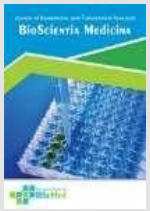

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Successful Management of Miliary Tuberculosis with Concomitant Anemia: A Case Report

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A B S T R A C T

Background: Miliary tuberculosis (TB) is a disseminated and potentially fatal form of TB characterized by the hematogenous spread of *Mycobacterium tuberculosis*, often complicated by anemia of chronic disease. The diagnosis and management of miliary TB, particularly in conjunction with anemia, can be challenging, especially in resource-limited settings. **Case presentation:** We report the case of a 20-year-old male from a remote region in Eastern Halmahera, Indonesia, who presented with progressive shortness of breath, productive cough, night sweats, unintentional weight loss, and generalized weakness. Clinical examination revealed signs of anemia and respiratory distress. Laboratory investigations confirmed microcytic hypochromic anemia and a positive GeneXpert MTB/RIF test. Chest radiography demonstrated diffuse miliary nodules, consolidation, and cavitation, establishing the diagnosis of miliary TB with concomitant anemia. The patient received a standard six-month anti-tuberculosis therapy regimen, along with supportive care and targeted treatment for anemia and associated symptoms. The patient demonstrated significant clinical and hematological improvement, leading to discharge after 11 days of hospitalization. Follow-up assessments confirmed continued progress and the absence of complications. **Conclusion:** This case underscores the critical importance of maintaining a high index of suspicion for miliary TB in patients presenting with respiratory and constitutional symptoms, even in the absence of traditional risk factors. The presence of anemia can further complicate the clinical picture. Prompt diagnosis through a combination of clinical assessment, laboratory investigations, and imaging studies, followed by the immediate initiation of appropriate treatment, including the management of anemia, is paramount for achieving favorable outcomes in patients with miliary TB. The case also emphasizes the necessity for comprehensive care and follow-up to ensure sustained recovery and prevent relapse.

1. Introduction

Miliary tuberculosis (TB), a disseminated and often fatal manifestation of tuberculosis, arises from the hematogenous spread of *Mycobacterium tuberculosis* bacilli throughout the body. The term "miliary" is derived from the characteristic millet-seed-sized granulomas that develop in various organs, predominantly the lungs, liver, spleen, and bone marrow.[1] The pathogenesis of miliary TB involves the rupture of a caseous focus into the bloodstream, leading to the widespread dissemination of bacilli and subsequent granuloma formation.[2] The clinical presentation of miliary TB is often insidious and non-specific, with symptoms such as fever, weight loss, fatigue, cough, and dyspnea.[3] The diverse range of symptoms can mimic

other diseases, making the diagnosis challenging, particularly in the early stages.[4] The mortality rate associated with miliary TB remains significant, ranging from 15% to 40%, even with appropriate treatment.[5] The high mortality is attributed to factors such as delayed diagnosis, extensive organ involvement, and comorbidities, particularly in immunocompromised individuals.[6] Miliary TB accounts for approximately 1-2% of all TB cases and is more prevalent in individuals with weakened immune systems, such as those with HIV/AIDS, malnutrition, or undergoing immunosuppressive therapy.[7] The global burden of miliary TB is substantial, with an estimated incidence of 1.1 million cases and 170,000 deaths annually.[8] The incidence of miliary TB is particularly high in regions with a high prevalence of TB, such as sub-Saharan Africa and Southeast Asia.[9]

HIV/AIDS is the most significant risk factor for miliary TB, with HIV-infected individuals being 30 times more likely to develop miliary TB than those without HIV. Other immunosuppressive conditions, such as malignancies, organ transplantation, and chronic corticosteroid use, also increase the risk.[1] Young children and the elderly are at a higher risk due to their immature or waning immune systems.[2] Malnutrition impairs immune function and increases susceptibility to TB infection and progression to miliary TB.[3] Intravenous drug use and alcoholism are associated with an increased risk of TB and its complications, including miliary TB.[4] Exposure to individuals with active TB, particularly those with pulmonary TB, increases the risk of acquiring TB infection and developing miliary TB.[5] The diagnosis of miliary TB requires a comprehensive approach that includes a thorough clinical assessment, laboratory investigations, and imaging studies. A detailed history and physical examination are essential for identifying suggestive symptoms and signs of miliary TB. Common symptoms include fever, weight loss, fatigue, cough, and dyspnea. Physical examination findings may include pallor, lymphadenopathy, hepatosplenomegaly, and signs of respiratory distress.[6] Complete blood count often reveals anemia, leukocytosis, or leukopenia. Liver function tests may show elevated transaminases and renal function tests may be abnormal in cases with renal involvement.[7] Sputum smear microscopy, culture, or NAATs are crucial for microbiological confirmation of TB.[8] In cases where sputum is unavailable or negative, other diagnostic modalities such as bronchoalveolar lavage, tissue biopsy, or blood culture may be necessary.[9] Interferon-gamma release assays (IGRAs) and tuberculin skin tests (TSTs) can aid in diagnosing TB infection but are less specific for miliary TB.[10] Chest radiography is the initial imaging modality of choice, and the classic finding is the presence of diffuse, millet-seed-sized nodules throughout both lung fields.[1] However, in some cases, the chest radiograph may be normal or show non-specific findings, necessitating further imaging with a CT scan.[2] CT scan offers superior sensitivity and specificity for detecting miliary TB and can also identify extrapulmonary involvement.[3] Other imaging modalities such as ultrasound, magnetic resonance imaging (MRI), and positron emission tomography (PET) scan may be helpful in evaluating specific organ involvement or complications.[4]

The treatment of miliary TB involves a standard six-month regimen of ATT consisting of isoniazid, rifampicin, pyrazinamide, and ethambutol for the initial two months, followed by isoniazid and rifampicin for the remaining four months.[5] The duration of treatment may be extended in cases with extrapulmonary involvement or complications.[6] Adherence to ATT is crucial for successful treatment and preventing relapse.[7] Directly observed therapy (DOT) is recommended to ensure adherence, particularly in vulnerable populations.[8] Anemia is a frequent complication of miliary TB, contributing to morbidity and mortality.[3] The anemia associated with TB is typically normocytic normochromic or microcytic hypochromic and is often attributed to chronic inflammation, iron deficiency, or a combination of both.[4] Chronic inflammation leads to the release of cytokines that impair iron absorption

and utilization, leading to functional iron deficiency.[5] Iron deficiency may also occur due to decreased dietary intake or blood loss.[6] The management of anemia in miliary TB involves identifying and addressing the underlying cause. Iron supplementation is recommended in cases of iron deficiency, while erythropoiesis-stimulating agents or blood transfusions may be necessary in severe cases or when a rapid increase in hemoglobin is required.[7] The diagnosis and management of miliary TB, especially in the presence of anemia, can be particularly challenging in resource-limited settings. Limited access to diagnostic facilities, such as CT scans and NAATs, can delay diagnosis and initiation of treatment.[8] Additionally, the availability of medications and supportive care may be limited, impacting treatment outcomes.[9] In these settings, a high index of suspicion, prompt empirical treatment based on clinical suspicion, and close monitoring are crucial for managing miliary TB.[10] Community-based interventions, such as active case finding and contact tracing, are also essential for early detection and prevention of transmission.[1]

Miliary TB is a severe and often fatal form of TB that requires prompt diagnosis and aggressive treatment. Anemia is a common complication that can further exacerbate the morbidity and mortality associated with miliary TB. A multidisciplinary approach involving ATT, supportive care, and management of anemia is essential for achieving successful outcomes. In resource-limited settings, a high index of suspicion, early empirical treatment, and close monitoring are crucial for managing this challenging condition. Further research is needed to develop improved diagnostic tools and treatment strategies for miliary TB, particularly in vulnerable populations. This case report aims to contribute to the existing literature by presenting a case of successful management of miliary TB with concomitant anemia in a young adult from a remote area.

2. Case Presentation

A 20-year-old male sought medical attention at the Emergency Department of Maba City General Hospital in North Maluku, Indonesia, due to a chief complaint of worsening shortness of breath over the preceding week. The dyspnea was present even at rest and exacerbated by exertion. The patient also reported a one-month history of productive cough with white sputum, accompanied by epigastric pain, night sweats, unintentional weight loss, and generalized weakness. He specifically noted feeling dizzy and unsteady on his feet. The patient denied any history of contact with individuals with TB, previous TB treatment, or similar past episodes. He also denied experiencing fever, chest pain, nausea, vomiting, edema, jaundice, or any other significant symptoms. Upon physical examination, the patient appeared to be in moderate distress but was alert and oriented. Vital signs revealed a temperature of 36.5°C, blood pressure of 100/70 mmHg, heart rate of 130 beats per minute, and respiratory rate of 38 breaths per minute. Conjunctival pallor was observed, suggestive of anemia, but no scleral icterus or lymphadenopathy was noted. Lung auscultation revealed bronchial breath sounds and coarse crackles bilaterally. Cardiovascular and abdominal examinations were unremarkable, except for tenderness in the epigastric region. There was no evidence of organomegaly, ascites, or peripheral edema.

Laboratory investigations (Table 1) were conducted to further evaluate the patient's condition. The complete blood count demonstrated microcytic hypochromic anemia, with a hemoglobin level of 10.3 g/dL, mean corpuscular volume (MCV) of 76.5 fL, mean corpuscular hemoglobin (MCH) of 22.9 pg, and mean corpuscular hemoglobin concentration (MCHC) of 29.9 g/dL. Leukocytosis was also present, with a white blood cell count of 24.47 x 10^3/µL, predominantly neutrophils. Liver function tests, renal function tests, and blood glucose levels were within normal limits. An HIV test was non-reactive. A rapid molecular test for TB (GeneXpert MTB/RIF) yielded a

positive result for *Mycobacterium tuberculosis* with a "very low" bacterial load. Chest radiography (Figure 1) revealed diffuse, millet-seed-sized nodules throughout both lung fields, a hallmark of miliary TB. Additionally, consolidation and cavitation were observed in the right upper lobe. An electrocardiogram (ECG) showed sinus tachycardia.

Table 1. Laboratory findings.

Test	Result	Units	Normal range
Hematology			
Complete blood count			
Hemoglobin	10.3	g/dL	11.0-15.0
Hematocrit	34.4	%	35.0-50.0
Platelets	456	x 10^3/µL	150-450
Leukocytes	24.47	x 10^3/µL	4.0-10.0
Erythrocytes	4.5	x 10^6/µL	3.50-5.0
MCV	76.5	fL	80.0-100.0
MCH	22.9	pg	27.0-34.0
MCHC	29.9	g/dL	32.0-36.0
Differential			
Neutrophils	92.9	%	30-90
Lymphocytes	2.7	%	14-53
Neutrophil-lymphocyte ratio	34.4		< 3.13
Mixed cell count	4.4	%	3-16
Clinical chemistry			
SGOT/AST	22	U/L	< 35
SGPT/ALT	22	U/L	< 41
Urea	32	mg/dL	15-45
Creatinine	0.7	mg/dL	0.7-1.2
Random blood glucose	109	mg/dL	< 200
HIV test	Non-reactive		Non-reactive

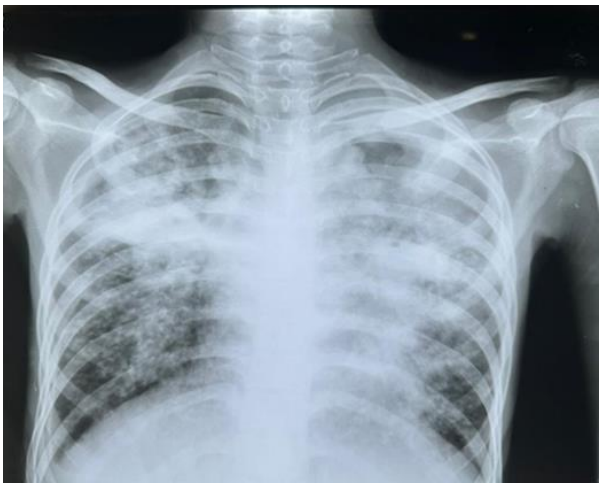

Figure 1. Chest radiography.

Based on the collective clinical, laboratory, and imaging findings, a diagnosis of miliary tuberculosis with concomitant microcytic hypochromic anemia was established. The patient was promptly admitted to the high-care unit under isolation precautions to initiate appropriate treatment and prevent further transmission. The therapeutic approach encompassed both pharmacological and non-pharmacological interventions. Non-pharmacological measures included oxygen supplementation via nasal cannula at 3 LPM, intravenous hydration with Ringer's lactate solution, adequate rest, and a diet rich in calories and protein. Pharmacological management consisted of a standard six-month anti-tuberculosis therapy (ATT) regimen, comprising four fixed-dose combination (FDC) tablets daily. Adjunctive medications were administered to address specific symptoms and potential complications: N-acetylcysteine for productive cough, ceftriaxone for suspected secondary bacterial infection, ranitidine for dyspepsia, and inhaled ipratropium bromide with salbutamol sulfate for bronchodilation. Paracetamol was prescribed for fever if necessary.

The patient's condition progressively improved during his 11-day hospitalization. Respiratory distress subsided, cough and constitutional symptoms resolved, and repeat blood tests showed an increase in hemoglobin levels. Upon discharge, the patient was instructed to continue ATT and adhere to follow-up appointments at the outpatient clinic. One week post-discharge, the patient remained asymptomatic and exhibited no complications. He was advised to continue treatment and follow-up care at the local health center.

3. Discussion

The case presented serves as a stark reminder of the intricate challenges inherent in diagnosing miliary tuberculosis (TB), particularly when it is further complicated by the presence of anemia. The initial clinical presentation of the patient was marked by a constellation of non-specific respiratory and constitutional symptoms, including shortness of breath, cough, fatigue, and weight loss. These symptoms, while suggestive of an underlying pathology, lacked the specificity required to pinpoint miliary TB as the culprit. The co-existing anemia further muddied the diagnostic waters, as its symptoms often overlap with those of TB, creating a clinical picture that could readily be attributed to a myriad of other conditions. The insidious onset and non-specific nature of these symptoms, coupled with the confounding effects of anemia, underscore the formidable challenges faced in the early identification of miliary TB. The eventual diagnosis of miliary TB in this patient was achieved through a synergistic approach that integrated clinical acumen, laboratory investigations, and imaging modalities. The astute clinician, recognizing the potential for TB despite the absence of classic risk factors, initiated a series of diagnostic tests that ultimately led to the definitive diagnosis. The positive GeneXpert MTB/RIF test, a rapid and sensitive molecular diagnostic tool, played a pivotal role in providing swift and unequivocal microbiological confirmation of *Mycobacterium tuberculosis* infection. The characteristic finding of diffuse, millet-seed-sized nodules on chest radiography, a pathognomonic hallmark of miliary TB, further corroborated the diagnosis.

However, it is imperative to acknowledge that the diagnostic journey in miliary TB is not always this straightforward. The reliance on chest radiography as an initial screening tool can be fraught with challenges, as the radiographic manifestations of miliary TB can be subtle, non-specific, or even absent in some cases, particularly in the early stages of the disease.[11] The sensitivity of chest radiography for detecting miliary TB is estimated to be around 50-80%, implying that a significant proportion of cases may be missed on initial imaging.[12] In such scenarios, further imaging with computed tomography (CT) scans becomes indispensable for definitive diagnosis. CT scans offer superior sensitivity and specificity for detecting miliary TB, enabling the visualization of even minute granulomas that may be elusive on chest radiography.[13] However,

the availability and accessibility of CT scans can be limited in resource-constrained settings, potentially leading to delays in diagnosis and initiation of treatment, with dire consequences for the patient. The clinical presentation of miliary TB further compounds the diagnostic challenges. The disease can manifest in a spectrum of ways, ranging from an acute and fulminant illness with rapid deterioration to a chronic and indolent process with subtle and non-specific symptoms.[14] This heterogeneity in the presentation can confound even the most experienced clinicians, as the symptoms of miliary TB often mimic those of other infectious and non-infectious diseases, such as pneumonia, sepsis, malignancies, and autoimmune disorders. The absence of classic risk factors, such as HIV infection or immunosuppression, can further lower the index of suspicion for miliary TB, leading to diagnostic delays and missed opportunities for early intervention.

In light of these challenges, a high index of suspicion is paramount in the evaluation of patients presenting with respiratory and constitutional symptoms, particularly in endemic areas or in individuals with potential risk factors for TB. A thorough clinical assessment, coupled with judicious use of laboratory and imaging investigations, is crucial for timely diagnosis and initiation of appropriate treatment. The advent of rapid molecular diagnostic tests, such as GeneXpert MTB/RIF, has revolutionized the diagnosis of TB, enabling rapid and accurate identification of *Mycobacterium tuberculosis* infection.[15] However, these tests may not always be readily available in resource-limited settings, underscoring the need for continued investment in diagnostic infrastructure and capacity building. The diagnosis of miliary TB remains a formidable challenge, particularly in the presence of anemia and non-specific clinical presentations. A high index of suspicion, coupled with a comprehensive diagnostic approach that integrates clinical, laboratory, and imaging modalities, is essential for the timely identification and management of this potentially devastating disease. The case presented in this report serves as a poignant reminder of the complexities inherent in diagnosing miliary TB and underscores the critical importance of maintaining vigilance and pursuing a thorough diagnostic evaluation in patients with suggestive symptoms.

The presence of anemia in the context of miliary tuberculosis (TB) introduces a significant layer of complexity to the clinical picture. The diagnosis of microcytic hypochromic anemia in this patient, characterized by small, pale red blood cells, initially suggests iron deficiency as a potential culprit. However, the etiology of anemia in TB is rarely straightforward, often involving a complex interplay of factors that extend beyond simple iron deficiency. The development of anemia in TB is frequently multifactorial, with chronic inflammation, iron deficiency, and other mechanisms playing contributing roles. The chronic inflammatory state that characterizes TB triggers the release of pro-inflammatory cytokines, such as interleukin-6 and hepcidin. These cytokines disrupt iron metabolism by inhibiting iron absorption in the gut, promoting iron sequestration in macrophages, and suppressing erythropoiesis, the process of red blood cell production.[11] This phenomenon, known as functional iron deficiency, can lead to anemia even when iron stores are adequate.[12] While functional iron deficiency is a central mechanism in anemia of chronic disease, true iron deficiency can also coexist or occur independently in TB patients. Decreased dietary iron intake, malabsorption due to gastrointestinal TB or other factors, and blood loss from hemoptysis or other sources can all contribute to iron deficiency.[13] The distinction between functional iron deficiency and true iron deficiency is crucial for guiding appropriate management strategies.

Mycobacterium tuberculosis can directly infect the bone marrow, leading to decreased production of red blood cells and other blood cell lineages.[14] In some cases, TB can trigger immune-mediated hemolysis, resulting in the premature destruction of red blood

cells.[15] TB can affect the kidneys, leading to decreased production of erythropoietin, a hormone that stimulates red blood cell production.[16] Certain anti-TB drugs, such as rifampicin and isoniazid, can cause hemolysis or interfere with vitamin B12 and folate metabolism, potentially contributing to anemia.[17] Distinguishing between the various mechanisms underlying anemia in TB can be particularly challenging in resource-limited settings. Access to specialized laboratory tests, such as serum iron, ferritin, transferrin saturation, and soluble transferrin receptor, may be limited or unavailable. These tests are crucial for differentiating between functional iron deficiency and true iron deficiency and for identifying other potential causes of anemia. In such settings, clinicians often rely on a combination of clinical assessment, basic laboratory tests (such as complete blood count and peripheral blood smear), and response to empirical treatment to guide the management of anemia in TB patients. However, this approach may not always be definitive, and misdiagnosis or undertreatment of anemia can have detrimental consequences for patient outcomes.

The management of anemia in miliary TB necessitates a comprehensive and individualized approach that addresses both the underlying TB infection and the contributing factors to anemia. The primary goal is to improve oxygen-carrying capacity and alleviate symptoms associated with anemia, thereby enhancing the patient's quality of life and facilitating recovery from TB. Oral or intravenous iron supplementation is indicated in cases of true iron deficiency. The choice of route and dosage depends on the severity of the deficiency and the patient's tolerance.[18] Erythropoiesis-stimulating agents (ESAs) such as epoetin alfa or darbepoetin alfa, can be considered in patients with anemia of chronic disease who do not respond to iron supplementation or in cases where a rapid increase in hemoglobin levels is required.[9] Blood transfusions may be necessary in severe cases of anemia or when patients are symptomatic or hemodynamically unstable.[10] Effective anti-TB therapy is essential for addressing the chronic inflammation that contributes to anemia of chronic disease. As the TB infection is controlled, the inflammatory response subsides, leading to improved iron utilization and erythropoiesis.[11] Addressing comorbidities that may contribute to anemia, such as renal insufficiency or malabsorption, is crucial for optimizing the management of anemia in TB patients. The choice of treatment modality should be individualized based on the patient's clinical presentation, severity of anemia, underlying cause, and available resources. Close monitoring of hemoglobin levels and response to treatment is essential for adjusting therapy as needed. The presence of anemia in miliary TB adds a layer of complexity to an already challenging disease. Understanding the multifaceted nature of anemia in TB and employing a comprehensive approach to its management are crucial for improving patient outcomes. In resource-limited settings, where access to specialized diagnostic tests may be limited, a high index of suspicion and empirical treatment based on clinical judgment are essential. Further research is needed to develop more effective and accessible diagnostic and therapeutic strategies for managing anemia in TB, particularly in vulnerable populations.

The successful management of the patient diagnosed with miliary tuberculosis and concurrent anemia in this case report serves as a testament to the efficacy of a multifaceted therapeutic strategy. The cornerstone of this strategy was the implementation of the standard six-month anti-tuberculosis therapy (ATT) regimen, a well-established and evidence-based approach for combating the underlying *Mycobacterium tuberculosis* infection. The ATT regimen, consisting of a combination of potent anti-tubercular drugs, acts synergistically to eradicate the bacilli and halt the progression of the disease. The effectiveness of ATT in this case was evident in the resolution of the patient's respiratory distress, cough, and other constitutional symptoms, signifying a successful containment of the infection. However, the management of miliary TB extends beyond merely addressing the infectious

agent. The presence of concomitant anemia in this patient necessitated a holistic approach that encompassed not only the eradication of the pathogen but also the amelioration of the associated complications. The anemia, likely multifactorial in origin, stemmed from a combination of chronic inflammation induced by the TB infection, potential iron deficiency, and possibly other contributing factors. The microcytic hypochromic morphology of the red blood cells observed in the patient's blood smear hinted at iron deficiency, although further investigations were constrained by the limitations of the healthcare setting. The therapeutic strategy, therefore, incorporated adjunctive therapies aimed at alleviating specific symptoms and addressing potential complications. N-acetylcysteine was administered to manage the patient's productive cough, facilitating the clearance of mucus and improving respiratory function. Ceftriaxone, a broad-spectrum antibiotic, was prescribed to combat suspected secondary bacterial infection, a common complication in patients with compromised immune systems due to TB. Ranitidine, a histamine H2 receptor antagonist, was utilized to manage dyspepsia, a symptom often associated with TB and its treatment.[17,18]

In addition to targeted pharmacological interventions, supportive care measures played a pivotal role in the patient's recovery. Oxygen supplementation was provided to alleviate respiratory distress and ensure adequate oxygenation. Intravenous fluids were administered to maintain hydration and electrolyte balance, particularly crucial in the context of fever and potential fluid losses. Nutritional support, in the form of a calorie- and protein-rich diet, was instrumental in addressing the patient's unintentional weight loss and promoting overall recovery. The patient's positive response to this comprehensive treatment approach was remarkable. The resolution of respiratory distress, improvement in constitutional symptoms, and normalization of hemoglobin levels served as objective indicators of the effectiveness of the therapeutic strategy. The patient's swift recovery and subsequent uneventful follow-up visits further validate the success of this multi-pronged approach. This case report serves as a compelling illustration of the critical importance of early diagnosis, prompt initiation of appropriate treatment, and comprehensive management of both TB and its associated complications. The integration of ATT, adjunctive therapies, and supportive care measures is paramount for achieving favorable outcomes in patients with miliary TB, particularly those with concomitant anemia. The case also underscores the necessity for a multidisciplinary approach that addresses not only the infectious disease but also its systemic repercussions. Furthermore, this case highlights the significance of individualizing treatment plans based on the patient's specific clinical presentation and comorbidities. The judicious use of adjunctive therapies and supportive care measures, tailored to the patient's needs, can significantly enhance treatment efficacy and improve quality of life. The successful management of this patient with miliary TB and concomitant anemia through a comprehensive and individualized therapeutic strategy underscores the importance of a holistic approach in combating this challenging disease. The integration of ATT, adjunctive therapies, and supportive care measures, coupled with early diagnosis and prompt intervention, is crucial for achieving favorable outcomes and reducing the morbidity and mortality associated with miliary TB.[18,19]

The gravity of miliary TB as a public health concern cannot be overstated. Despite its relative rarity, the condition carries a disproportionately high mortality rate, posing a formidable challenge, particularly in regions grappling with a high prevalence of TB. The insidious nature of miliary TB, often presenting with non-specific symptoms that can mimic other diseases, further compounds the difficulties in achieving timely diagnosis and treatment. The urgency of early intervention is underscored by the potential for rapid progression

and devastating consequences if left untreated. The case presented in this report serves as a poignant reminder of the critical need for heightened awareness and vigilance among healthcare providers. The patient's initial presentation with seemingly commonplace respiratory and constitutional symptoms, coupled with the presence of anemia, could have easily led to a misdiagnosis or delayed diagnosis. This case underscores the importance of maintaining a high index of suspicion for miliary TB, even in the absence of classic risk factors. The ability to recognize the diverse and often subtle manifestations of miliary TB is paramount for ensuring timely referral for further investigation and management.[17,19]

The prompt initiation of treatment is equally crucial. The disseminated nature of miliary TB necessitates aggressive and comprehensive therapeutic intervention. The standard six-month anti-tuberculosis therapy (ATT) regimen forms the cornerstone of treatment, but it is often insufficient in isolation. The management of comorbidities, such as anemia, is equally vital for optimizing patient outcomes. Anemia, a frequent companion of miliary TB, can significantly impair quality of life and impede treatment response. Addressing anemia through iron supplementation, erythropoiesis-stimulating agents, or blood transfusions, as appropriate, is integral to the holistic care of patients with miliary TB. The public health implications of miliary TB extend beyond individual patient care. The prevention and control of miliary TB necessitate a multi-faceted approach that encompasses both individual and community-level interventions. Active case finding, which involves proactively identifying individuals with TB through systematic screening and testing, is crucial for early detection and treatment, thereby curtailing transmission. Contact tracing, the process of identifying and evaluating individuals who have been in close contact with TB patients, is another essential tool for preventing the spread of TB and identifying potential cases of miliary TB.[18,20]

Preventive therapy, which involves administering anti-TB medications to individuals at high risk of developing active TB, is a key strategy for reducing the incidence of miliary TB. This intervention is particularly important for individuals with latent TB infection, HIV infection, or other immunosuppressive conditions. Strengthening healthcare infrastructure and improving access to diagnostic and treatment facilities are fundamental for effectively managing miliary TB, especially in resource-limited settings. The availability of rapid and accurate diagnostic tests, such as GeneXpert MTB/RIF, and access to advanced imaging modalities, such as CT scans, can significantly expedite diagnosis and enable timely initiation of treatment. Ensuring the availability of anti-TB medications and supportive care, including the management of anemia, is equally critical for improving treatment outcomes and reducing mortality. The fight against miliary TB is a collective endeavor that requires the concerted efforts of healthcare providers, public health officials, policymakers, and communities. By raising awareness, enhancing diagnostic capabilities, and strengthening treatment and preventive measures, we can strive to reduce the burden of this devastating condition and improve the lives of individuals affected by miliary TB.[19,20]

4. Conclusion

The case report presented here illustrates the successful management of miliary tuberculosis (TB) complicated by anemia in a young adult. The patient's positive response to comprehensive treatment, which included anti-TB therapy, supportive care, and anemia management, underscores the importance of early diagnosis and prompt intervention. The case serves as a reminder for healthcare providers to maintain a high index of suspicion for miliary TB, even in patients with atypical presentations or comorbidities. The presence of anemia should be recognized and addressed as an integral part of TB management.

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