

## CASE REPORT



# Folic Acid Deficiency in Severe Hypothyroidism: A Case Report and a Review of Literature

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### Abstract:

**Introduction:** Folic acid deficiency anemia and hypothyroidism are common health issues with apparent clinical presentations. While the relationship between thyroid dysfunction and dysfunction in folate metabolism has been describing, comprehensive reports on the concurrent of severe hypothyroidism and folic acid deficiency are confined. This case study aims to explain the clinical presentation, diagnostic evaluation, and management of coexistence folic acid deficiency anemia and hypothyroidism, underscoring the significance of prompt diagnosis and intervention.

**Case Report:** A 22-year-old woman presented with symptoms suggestive of both folic acid deficiency anemia and hypothyroidism, including palpitation, fatigue, generalized body pain, and headache. Laboratory tests revealed macrocytic anemia, elevated thyroid-stimulating hormone (TSH) levels, and decreased free thyroxine (T4) levels, prompting further assessment for dual deficiencies. Thyroid ultrasound confirmed the diagnosis of thyroiditis, confirming the clinical findings. Early initiation of folic acid supplementation and thyroid hormone therapy led to importance clinical improvement, with resolution of symptoms and normalization of hematological and thyroid profiles during follow-up.

**Conclusion:** Early diagnosis and management of coexistence folic acid deficiency anemia and hypothyroidism are important for enhancing patient outcomes. By improving our understanding of this complex interplay, physicians can steer better intervention strategies and enhance patient care in clinical settings.

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## 1. INTRODUCTION:

Folic acid deficiency is an important nutritional concern characterized by decreased levels of folate in the body, leading to different health consequences including megaloblastic anemia and neurological deficits [1]. The metabolism of folate is associated with different physiological processes, including DNA synthesis and cell division, highlighting its significant role in maintaining overall health [2]. Hypothyroidism, a prevalent endocrine disorder resulting from lack of thyroid hormone synthesis, affects millions around the world and presents with a wide range of clinical symptoms [3]. While the link between thyroid insufficient and

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decreased folate metabolism has been described in literature, there remains a lack of detailed findings specially reporting folic acid deficiency induced by severe hypothyroidism or vice versa. This case report seeks to bridge this gap by presenting a clinical case and reviewing relevant literature to enhance our understanding of this rare known comorbidity.

The importance of investigating folic acid deficiency in the connection of severe hypothyroidism lies in its possibly clinical significance. Due to the universal prevalence of both hypothyroidism and folic acid deficiency, understanding their co-operation could contribute valuable understanding into enhancing patient outcomes and guiding clinical intervention settings. Moreover, explaining the mechanisms which is the foundation of this dual deficiency may inform future research endeavors aimed at developing targeted interventions and preventive measures. Furthermore, by inducing vigilant behavior of this underreported comorbidity, physicians can improve their diagnostic acumen and contribute more complete care to the affected individuals experiencing the symptoms insinuating both of the illnesses. In this case report, we present a case of 22-year-old woman who presented with folic acid deficiency anemia and hypothyroidism.

## 2. CASE REPORT

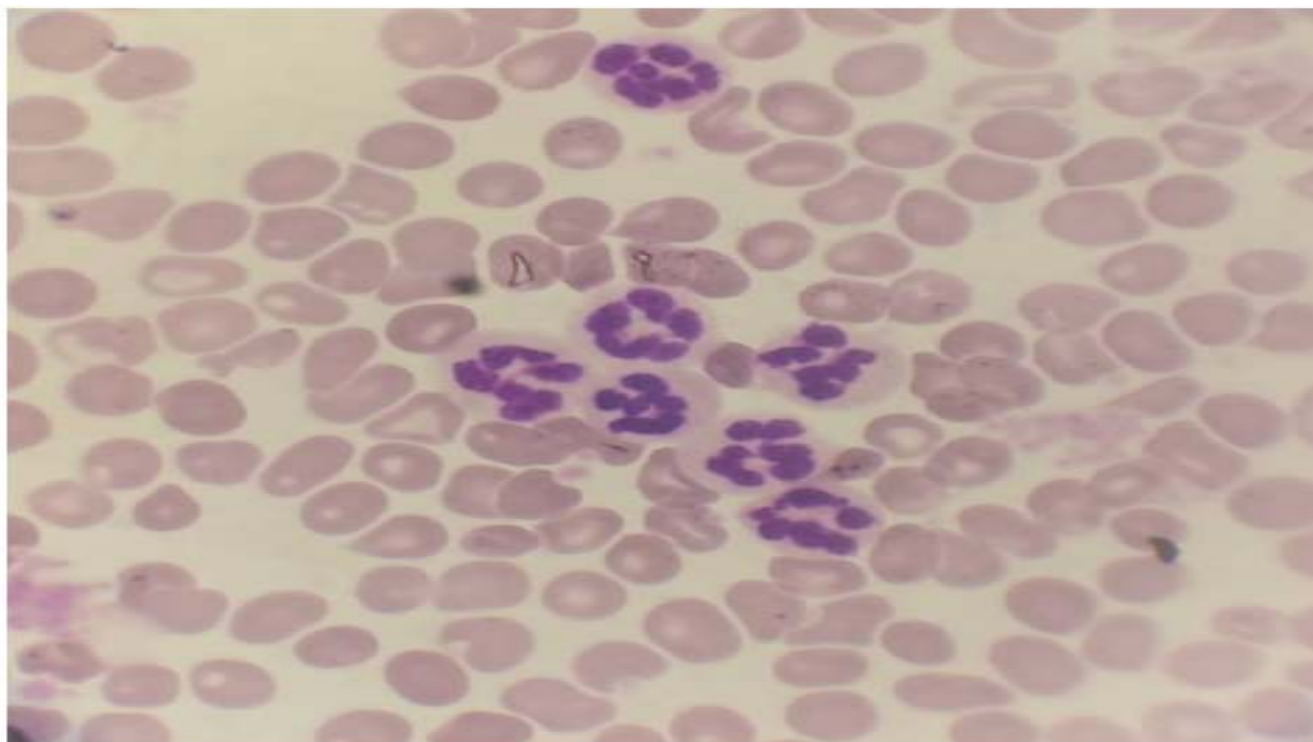
A 22-year-old, previously healthy women, with no known history chronic diseases presented to outpatient department with a complaint of palpitation, fatigue, generalized body pain, and headache. She had a history of 2-unit blood transfusion from another hospital 2 weeks ago. She had no history of bleeding or heavy menstrual cycle. The patient had no previous history of blood transfusion before this or any major surgery. On examination, she looked well, no gingival bleeding, epistaxis, her urine had no gross hematuria. She had no family history of bleeding or recurrent anemia. The vital signs showed a pulse of 110 bpm, Bp 130/75, respiratory rate 20 breaths per minute, and temperature of 36.4°C. She also had generalized ache in the extremities. Neurological examinations include motor, sensory, and cranial nerves were unremarkable. The abdomen was soft with no tender and no hepatosplenomegaly. Other systemic examinations including those of the respiratory and cardiovascular systems were unremarkable. ECG demonstrated sinus tachycardia and echocardiography was unremarkable. Abdominal ultrasound findings were normal.

Laboratory evaluations revealed normal kidney and liver function; hemoglobin 7.9g/dl, MCV 120 FL, folic acid 0.4ng/dl, vitamin b12 740pg/mL, TSH 173 mIU/L, T4 0.07 ng/mL (Table 1). The peripheral blood smear showed red blood cells with anisopoikilocytosis that includes macro-ovalocytes, fragments, tear drops and nucleated red blood cells, leukocytes, granulocytes show neutrophils with hyper segmentation (Figure 1). Thyroid ultrasound was requested and revealed thyroiditis.

**Table 1. Laboratory results from presentation to 4 weeks follow-up.**

Lab Results	Normal Range	On First Day	One Week	1 Month Follow Up
Hemoglobin (HB)	13-17 g/dl	7.9	8.5	12
MCV	80-100 FL	120	101	90
MCH	27-34PG/cell	37.4	34	29
PLT	100-430X1000mm <sup>3</sup>	547	547	540
IRON	37-147ug/dl	161	-	-
FERRITIN	20-200 ng/ml	250.8	-	-
Folic acid	3.20-19.60 ng/ml	0.4	2.1	5.3
VB12	187-883 pg/ml	740	-	785
Glucose	60/110 mg/dl	112	-	-
Urea	10-45 mg/dl	23	-	-
Creatinine	0.6-1.35 mg/dl	0.54	-	-
Aspartate aminotransferase (AST)	0-35 U/L	22	-	-

Lab Results	Normal Range	On First Day	One Week	1 Month Follow Up
Alanine aminotransferase (ALT)	0-45 U/L	16	-	-
LDH	0-247u/L	50	-	-
Thyroid Stimulating Hormone (TSH)	0.6 - 5.5 mIU/L	173	-	30
T4	0.7-2.1 ng/dL	0.07	-	0.3



**Figure 1.** Peripheral blood smear showing anisopoikilocytosis macro-ovalocytes and hyper segmented neutrophils.

The patient was the diagnosis with hypothyroidism complicated with macrocytic anemia due to folic acid deficiency. She was started with folic acid treatment and thyroid replacement therapy.

After 1 month of treatment the patient visited our outpatient department with no complains and she showed much improvement than her previous encounter. The palpitation and generalized body pain was resolved and her overall condition improved drastically. Her hemoglobin level, folic acid level, and thyroid profile were also improved. 2 months after follow-up her thyroid function test normalized within normal range.

### 3. DISCUSSION

The presented case of a 22-year-old woman with simultaneous folic acid deficiency anemia and hypothyroidism underlines the significance of prompt diagnosis and intervention in enhancing the patient outcomes. Folic acid deficiency is a well-known nutritional deficiency linked with a different health complications, namely megaloblastic anemia and neurological impairments [1]. Furthermore, hypothyroidism, arise from a decreased thyroid hormone synthesis, can present with a wide range of clinical symptoms, underlining the importance of early diagnosis and treatment [3]. The concurrence of these two illnesses in our case report shed the light in the necessity for vigilant clinical evaluation and comprehensive diagnostic workup in patients with a wide-range of symptoms indicative of both hypothyroidism and anemia.

It is universally recognizable that the thyroid hormones regulate metabolism, growth, and numerous other biological functions that are essential for optimal human development [4]. Studies around the world suggested that hypothyroidism is the second most prevalent endocrine disorder behind diabetes mellitus [5]. Deficiency of these hormones could lead to wide variety of clinical manifestations as these hormones acts almost all organs of our body. Anemia associated with hypothyroidism has been related to decreased hemoglobin production due to thyroxine insufficiency [6]. A study of the correlation between vitamin B12, folic acid and ferritin with thyroid hormones in hypothyroidism by Sinha and colleagues in 2022 demonstrated that folate level in the body were lower in hypothyroidism patients compared to patients with normal thyroid function [7].

Early recognition of folic acid deficiency anemia and hypothyroidism in our case was assisted by accurate clinical assessment and applicable laboratory investigations. The presence of macrocytic anemia on peripheral blood smear, in addition with increased thyroid-stimulating hormone (TSH) levels and decreased free thyroxine (T4) levels, led for further evaluation for dual deficiencies. Subsequent laboratory findings, including low serum folic acid levels and thyroid ultrasound findings consistent with thyroiditis, confirmed the diagnosis and guided commencing the suitable treatment.

Hypothyroidism could also cause a macrocytic megaloblastic anemia which is unresponsive to the vitamin B12 and folic acid treatment. For instance, Sims and coworkers described a case of 65 years old male patient with known history of pernicious anemia [8]. The patient developed unresponsive macrocytic anemia. They eventually found that the patient had underlying hypothyroidism and reported that treatment with levothyroxine led to the correction of the resistant macrocytic anemia.

The prompt commencing of folic acid treatment and thyroid hormone replacement treatment in our patient led to significant clinical improvement, underscoring the significance of prompt management in downplaying the negative effects of these deficiencies. Similar studies have concluded a positive outcome with early diagnosis and treatment of folic acid deficiency anemia and hypothyroidism, underscoring the possibility for improved patient outcomes with early clinical intervention [2]. Furthermore, our case adds to the existing body of literature by contributing the additional conformation of the relationship between severe hypothyroidism and folic acid deficiency, highlighting the necessity for future studies to explain the underlying mechanisms and clinical impact of this dual deficiency comorbidity.

Finally, the comprehensive diagnostic approach used in our patient's assessment serves as a valuable clinical example, highlighting the importance of contemplating dual deficiencies in patients with macrocytic anemia and hypothyroidism. By increasing vigilant behavior to this underreported comorbidity and underscoring the clinical importance of prompt diagnosis and treatment, our case provides to the broader understanding of thyroid-folate metabolism interplay and underscores the need for continued research in this area.

## **CONCLUSION**

The case study described illustrates the need of prompt identification and therapy in enhancing outcomes in individuals with both folic acid deficiency anemia and hypothyroidism. Conducting a comprehensive clinical assessment, performing necessary laboratory tests, and promptly starting specific treatments are crucial for improving patient care and avoiding complications related to these dual deficiencies. Further research is necessary to determine the basic reasons and clinical significance of this coexistence, eventually influencing the most effective treatment approaches to improve outcome for patients.

## **AUTHOR CONTRIBUTIONS**

AMA: conceptualization, writing original draft; MOS: original draft, reviewing; MSA: original draft; MOOJ: reviewing, supervision and editing the manuscript.

## **DECLARATION OF CONFLICT OF INTEREST**

The authors declare no competing interests relating to this case report.

## ETHICAL APPROVAL AND INFORMED CONSENT STATEMENT

Mogadishu Somali Turkish Training and Research Hospital waived approval for this case report. A written and Oral informed consent was obtained from the patient.

## DATA AVAILABILITY

The data is available from corresponding author if requested.

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Declared none.

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