

Hyperthyroidism in Sickle Cell Anaemia

¹Emmanuel Ifeanyi Obeagu^{1,7}, Farhan Salah Dahir¹, Uche Francisca Onwuasoanya³, Valerie Esame Njar⁴, Anthonia Onyinye Ngwoke⁵, Danchal Comfort Vandu¹, Getrude Uzoma Obeagu⁶ and Okechukwu Paul Chima Ugwu⁷

¹Department of Medical Laboratory Science, Kampala International University, Uganda.

²Department of General Surgery, Kampala International University Uganda.

³Department of Medical Laboratory Science, Nnamdi Azikiwe University, Nnewi Campus, Nnewi, Anambra State, Nigeria.

⁴Department of Haematology and Blood Transfusion Science, University of Calabar, Nigeria.

⁵Department of Physiology Faculty of Basic Medical Sciences, Enugu State, University of Science and Technology, Enugu, Nigeria. Kampala International University Uganda.

⁶Department of Nursing Science, Kampala International University Uganda.

⁷Department of Publications and Extension, Kampala International University Uganda.

ABSTRACT

Sickle cell anaemia is an excruciating disease with anaemia as a major pathological issues in the patients. Developing worlds are affected heavily by sickle cell anaemia and in malaria endemic region with high prevalent sickle cell trait. IDA and iron deficiency anaemia are common in thyroid disease and can lead to fatigue. Both hypothyroidism and hyperthyroidism can cause iron deficiency and anaemia. In turn, iron deficiency can also trigger hypothyroidism. Iron deficiency/IDA symptoms are similar to those of thyroid disease, making them hard to spot. Healthcare providers can order a blood test to check iron levels. This is called a serum ferritin test. Treatment for iron deficiency includes thyroid replacement medication, iron supplements, and/or a high-iron diet. Vitamins C, B6, B12, and others may improve iron absorption. When you have two conditions with similar symptoms, it can be hard to tell what's causing what symptoms. Pay attention to any new or worsening symptoms. Also, look at what does and doesn't improve with thyroid treatments. If you're still fatigued when your thyroid levels return to normal, talk to your doctor about the possibility of iron deficiency and IDA.

Keywords: hyperthyroidism, anaemia, sickle cell, nutritional and anaemia.

INTRODUCTION

Sickle cell disease refers to a set of inherited haemoglobin problems characterized through a predominance of extraordinary sickle haemoglobin in erythrocytes [1-2]. Sickle cell anaemia, which ends up from homozygous inheritance of sickle haemoglobin from each parents, is the maximum not unusual place and intense shape of sickle cell sickness. On deoxygenation, sickle haemoglobin undergoes a conformational alternate that promotes intracellular polymerisation, which results in distortion of the everyday biconcave erythrocyte disc into the extraordinary and pathological crescent shape [3-5]. A condition that occurs when

the thyroid gland makes more thyroid hormone than the body needs. Abnormal thyroid hormone levels, such as hyperthyroidism and hypothyroidism, can be potential causes of anemia (low blood count). All three of these are common medical problems [6]. If you have hyperthyroidism, it's likely you have high levels of ferritin, a protein that helps your body store iron. An overactive thyroid gland produces high amounts of ferritin. It seems logical that increasing iron storage would prevent anemia. The opposite is often true, though. High ferritin appears to trigger an inflammatory response that prevents the body from using iron normally [7]. This

is seen most often in Graves' disease (autoimmune hyperthyroidism). Graves' is associated with IDA and low levels of several kinds of blood cells. An overactive thyroid is often accompanied by high ferritin. This may lead to inflammation that results in iron deficiency or IDA [8].

Abnormal thyroid hormone levels, such as hyperthyroidism and hypothyroidism, can be potential causes of anemia (low blood count). All three of these are common medical problems. They also all can produce symptoms of fatigue. This study was done to see if there is a relationship between abnormal thyroid hormone levels and anemia using a large population of adults in the US, China, United Kingdom [9].

This was a study of nearly 9,000 adults in the United Kingdom who had blood tests for hyperthyroidism, hypothyroidism, and anemia. Approximately 10% of the group had either hyperthyroidism or hypothyroidism, and nearly 6% of the group had anemia. Some common causes

HYPERTHYROIDISM IN SICKLE CELL ANAEMIA

During the second week of the control period, a vascular ulcer developed over the left medial malleolus, enlarging by the fifth week to a maximum area of 3 X 4 cm. The ulcer subsequently healed, despite thyrosuppressive medication, with complete epithelialization by the 20th week of study. Throughout the entire period of thiouracil administration, the patient had transient (3-5 days) episodes of long bone pain and arthralgias, chiefly of the elbows and wrists, typical of his previous musculoskeletal symptoms and adequately relieved by average doses of propoxyphene hydrochloride. By the eighth week of thiouracil administration (450 mg daily), mean PB! And TSH values were consistent with early thyrosuppression. The thyroid gland was more easily palpable but not clearly enlarged, deep tendon reflexes were normal, and the patient was symptomatically unchanged. By the 12th week, definite thyroid enlargement was demonstrable, but the patient was otherwise unchanged. The dose of thiouracil was increased to 600 mg daily, and 2 wk later the thyroid gland was estimated to be two times enlarged and

of anaemia were also tested for, and 121 individuals in the group were identified as having either iron deficiency, inflammation, or chronic kidney disease that caused their anemia. Those who had hyperthyroidism more frequently also had anemia, compared to those who had normal thyroid hormone levels. The authors concluded that in adults with anemia that is not easily explainable, abnormal thyroid hormone levels are found only 5% of the time. Thus, testing for hyperthyroidism or hypothyroidism may not be particularly useful. This study suggests that abnormal thyroid hormone levels are a rather infrequent finding among adults with anemia. However, the authors did not study whether medications or other diseases that can affect thyroid hormone levels might have been present in the subjects. Future research that studies if having risk factors for abnormal thyroid hormone levels are present in anemic individuals can help us understand how these two common disorders might be related [10].

firm, the Achilles reflexes were "hanging and the patient was somewhat more lethargic. After 4 wk on the increased thiouracil dosage, the thyroid gland was two to three times enlarged, the Achilles reflexes showed marked delayed return, and the skin over the forearms and shins was dry and flaky. Although the pulse remained at 60-68 beats/mm, there was a prolongation of the precordial lift and some increase in intensity of the systolic murmur. The patient's weight had increased by 1.4 kg with no evidence of dependent edema. The patient was discharged from the clinical research unit in the 20th week to continue thiouracil, 600 mg daily, and to be followed at 2-wk intervals as an outpatient, with the anticipation of a final measurement of red cell mass and auto erythrocyte survival 1 mo later. However, 3 wk after discharge he became increasingly lethargic and anorectic, he slept for prolonged periods, had two acute episodes of vomiting, and complained of increasing neck discomfort from the thyroid enlargement. When the patient was examined in his home, the thyroid gland was three times enlarged and firm. The

skin was dry and flaky overall. Lethargy was striking. The pulse was 68 with occasional irregular beats, thought to be premature ventricular contractions. Although it was uncertain as to how much of the acute symptomatology was due to thyro suppression, thiouracil was immediately discontinued, and whole, dessicated thyroid was instituted at 30 mg daily for 10 days and increased to 60 mg daily for an additional 14 days [11]. The lethargy and nausea cleared within 1

Obeagu *et al* wk; Achilles reflexes were essentially normal within 2 wk. The goiter regressed Downloaded from <http://ashpublications.org/blood/article-pdf/40/6/905/754565/905.pdf> by guest on 12 March 2023 906 SEWARD, EATON, AND CHAPLIN Mean value; number of tests in parentheses. The range of values for the determinations to two times enlarged by 1 mo and was nearly normal size by 2 mo after cessation of thiouracil administration [11-12].

Causes of hyperthyroidism in sickle cell anaemia

Hyperthyroidism can be caused by several medical conditions that affect the thyroid gland. The thyroid is a small, butterfly-shaped gland at the base of the neck. It has a big impact on the body. Every part of metabolism is controlled by hormones that the thyroid gland makes [13]. The thyroid gland produces two main hormones: thyroxine (T-4) and

triiodothyronine (T-3). These hormones affect every cell in the body. They support the rate at which the body uses fats and carbohydrates. They help control body temperature. They have an effect on heart rate. And they help control how much protein the body makes [13].

Symptoms

Hyperthyroidism sometimes looks like other health problems. That can make it hard to diagnose. It can cause many symptoms, including [14].

- Losing weight without trying.
- Fast heartbeat, a condition called tachycardia.
- Irregular heartbeat, also called arrhythmia.
- Pounding of the heart, sometimes called heart palpitations.
- Increased hunger.
- Nervousness, anxiety and irritability.
- Tremor, usually a small trembling in the hands and fingers.

- Sweating.
- Changes in menstrual cycles.
- Increased sensitivity to heat.
- Changes in bowel patterns, especially more-frequent bowel movements.
- Enlarged thyroid gland, sometimes called a goiter, which may appear as a swelling at the base of the neck.
- Tiredness.
- Muscle weakness.
- Sleep problems.
- Warm, moist skin.
- Thinning skin.
- Fine, brittle hair.

DIAGNOSIS

Iron deficiency is diagnosed with a serum ferritin test. It measures the amount of iron storage in your body. If results are low, you'll be diagnosed with iron deficiency. If they're high, it can help confirm a hyperthyroidism diagnosis [15].

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SEX	LOW	HIGH
Men	40 ng/mL	300 ng/Ml
Women	20 ng/mL	200 ng/Ml

ng/mL = nanograms per milliliter

Serum ferritin is not a routine part of your complete blood count (CBC). Your healthcare provider will need to order it separately. If you're paying out of pocket,

the test will likely cost between \$25 and \$50. Results are usually back within two days (depending on your lab) [16].

Treatment

Iron deficiency alongside hyperthyroidism usually doesn't require treatment. It typically goes away with hyperthyroidism treatment. In other cases, treatments for iron deficiency and

IDA are based on the severity of symptoms and serum ferritin test results. It may involve iron supplements and/or an iron-rich diet [15].

Iron Supplementation

A twice-daily iron supplement is typically prescribed to treat iron deficiency in people with thyroid disease. For mild anemia, the recommended dosage is 60 milligrams twice a day. Your healthcare provider will likely re-test your serum

ferritin after 30 to 60 days of treatment. You can stay on the supplement for up to four months. The dosage is gradually decreased as levels get back to normal [17].

CONCLUSION

Females are more affected by thyroid disorders than males and the peak age is at the forties, thyroid dysfunction affects all blood parameters but platelets are less affected than other parameters indicating that thyroid hormones are very important for blood formation. The follow up of patients with thyroid disorders should include the complete blood count and all patients diagnosed with anaemia should be evaluated for thyroid disorders before the start of iron

therapy. In view of the significant impact of chronic anaemias on thyroid function pediatricians, haematologists and endocrinologists should advocate primary prevention and screening for these forms of anaemia according to their prevalence. Adequate correction of the anaemia, sound nutrition, early diagnosis and management of thyroid and other endocrine dysfunctions can markedly improve the final outcome of these patients.

REFERENCES

- Obeagu EI, Ochei KC, Nwachukwu BN, Nchuma BO. Sick cell Anaemia: A Review. *Scholars Journal of Applied Medical Sciences*. 2015; 3(6B):2244-2252.
- Obeagu EI. Sick cell anaemia: Historical perspective, Pathophysiology and Clinical manifestations. *Int. J. Curr. Res. Chem. Pharm. Sci.* 2018; 5(11): 13-15. DOI:<http://dx.doi.org/10.22192/ijcrpcps.2018.05.11.003>.
- Swem CA, Ukaejiofo EO, Obeagu EI, Eluke B. Expression of Micro RNA 144 in sickle cell disease. *Int. J. Curr. Res. Med. Sci.* 2018; 4(3): 26-32.
- Obeagu EI. An update on micro RNA in sickle cell disease. *International Journal of Advanced Research in Biological Sciences*. 2018; 5(10): 157-158.
- Obeagu EI, Muhimbura E, Kagenderezo BP, Uwakwe OS, Nakyeyune S, Obeagu GU. An Update on Interferon Gamma and C Reactive Proteins in Sickle Cell Anaemia Crisis. *Journal of Biomedical Sciences*. 2022; 11 (10): 84.
- Kobayashi R, Hasegawa M, Kawaguchi C, Ishikawa N, Tomiwa K, Shima M, Nogami, K. *Thyroid function in patients with selenium deficiency exhibits high free T4 to T3 ratio. Clinical Pediatric Endocrinology*. 2021; <https://doi.org/10.1297/cpe.30.19>
- Doubleday AR, Sippel RS. *Hyperthyroidism. In Gland Surgery*. 2020; <https://doi.org/10.21037/gs.2019.11.01>
- Allelein S, Schott M. *Graves' Disease. Deutsche Medizinische Wochenschrift*. 2021; <https://doi.org/10.1055/a-1258-5429>
- Li Y, Shan Z, Teng W. Estimated change in prevalence of abnormal thyroid-stimulating hormone levels in China according to the application of the kit-recommended or NACB standard reference interval. *Eclinical Medicine*. 2021; <https://doi.org/10.1016/j.eclinm.2021.100723>
- Chen AX, Leung AM, Korevaar TIM. *Thyroid Function and Conception. New England Journal of Medicine*. 2019; <https://doi.org/10.1056/nejmclde1902637>
- De Leo, S., Lee, S. Y., & Braverman, L. E. (2016). *Hyperthyroidism. In The Lancet*. [https://doi.org/10.1016/S0140-6736\(16\)00278-6](https://doi.org/10.1016/S0140-6736(16)00278-6)
- Obeagu EI. Burden of Chronic Osteomyelitis: Review of Associated Factors. *Madonna University Journal of Medicine and Health Sciences*. 2023; 3 (1): 1-6
- Wang JJ, Zhou JJ, Yuan XL, Li CY, Sheng H, Su B, Sheng CJ, Qu S, Li H. *Hyperthyroidism caused by acquired immune deficiency syndrome. European Review for Medical and Pharmacological Sciences*. 2014.
- Chung SK, Asban A, Hur J, Iyer P, Chen H. *Hyperthyroidism Symptoms, Management, and Outcomes in Children and Adults Seeking Definitive Surgical Treatment. Annals of Surgery*. 2021; <https://doi.org/10.1097/SLA.0000000000004053>
- Kravets I. *Hyperthyroidism: Diagnosis and treatment. American Family Physician*. 2016.
- Macaron CI, Macaron ZG. *Increased serum ferritin levels in hyperthyroidism. Annals of Internal Medicine*. 1982; <https://doi.org/10.7326/0003-4819-96-5-617>.
- Badenhoop K, Zeuzem S. *T3-thyrotoxicosis after repeated phlebotomies for hereditary hemochromatosis in a patient with long standing substituted hypothyroidism due to chronic hashimoto's thyroiditis and pituitary adenoma. Endocrine Reviews. Conference: 99th Annual Meeting of the Endocrine Society, ENDO 2017*.

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