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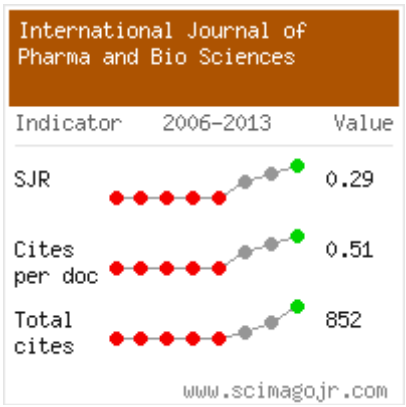


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# EFFECT OF ANEMIA IN HYPOTHYROIDISM

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## ABSTRACT

Hypothyroidism is a clinical syndrome resulting from deficiency of thyroid hormones in the target tissues, leading to a generalized slowing of all metabolic processes. Erythrocyte abnormalities are frequently associated with thyroid disorder. The aim of our study is to know the role of anemia and its significance in untreated and treated primary hypothyroidism patients.This study included 150 subjects which are untreated primary hypothyroid (n=50), treated primary hypothyroid (n=50) and euthyroid (n=50). This study was carried out at Department of Biochemistry, Sree Balaji Medical College and hospital. The thyroid profile of the subjects was assessed along with hematological parameters (Hb, HCT, RBC, and MCV). MCV is a significant parameter to study the types of anemia. In these study hematological parameters in the following groups: untreated primary hypothyroid, treated hypothyroid and euthyroid were compared. Its found that hematological parameters like Hb, RBC, MCV, HCT were significantly decreased in untreated hypothyroidsm, with the p value being less than 0.05 whereas, in treated Hypothyroid, results were in acceptable range. . In untreated primary hypothyroid, Hb (10.70±0.86 g/dl), RBC (4.63±0.51 ×10⁶/µl), MCV (83.34±6.92 FL), and HCT (38.6±2.6%) suggesting risk for developing anemia. Anemia is found to be associated with hypothyroidism. Untreated hypothyroid cases are more prone to develop anemia. This signifies prompt identification and treatment is necessary in thyroid dysfunction so as to prevent the effects. Hence, in conditions with anemia of any cause, ruling out hypothyroid is significant.

**KEYWORDS: Primary hypothyroidism, Blood count, Hemoglobin, Mean corpuscular volume, anemia**

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# INTRODUCTION

Hypothyroidism is a clinical syndrome resulting from deficiency of thyroid hormones in the target tissues, leading to a generalized slowing of all metabolic processes. Anemia is often the first sign of hypothyroidism**.** Thyroid hormones are essential for the normal development, differentiation, metabolic balance (1). Pathology of the thyroid gland (primary hypothyroidism) accounts for over 99.5% of cases of thyroid gland dysfunction and < 0.5% result from disorders of the pituitary gland or hypothalamus (central hypothyroidism). The incidence is 10-20 times more in iodine deficient areas than non-iodine deficient areas (2-3). Anemia causes include abnormality of the formation (13) and reduction of the half life time of the red cells (5). The size is reflected in mean corpuscular volume (MCV). The prevalence of anemia in patients with hypothyroidism has been shown to be 20-60% (6). Iron deficiency can affect the thyroid hormone metabolism and peroxidase enzyme which is catalyzed initial steps of thyroid hormone synthesis is dependent on the iron. Thyroid hormone is involved in hemoglobin synthesis in adults and maturation of hemoglobin in fetus (7,8) and by affecting hematopoietic process, hypothyroidism results in anemia through slowing the oxygen process (9).The present study is to assess haematological parameters in untreated and treated hypothyroidism patients so that we know the risk level of developing anemia.

# MATERIALS AND METHODS

Patients and controls were selected by age and sex matched. A total of 150 subjects was selected for the study. These included untreated hypothyroid (n=50), hypothyroid treated (n=50) and normal-controls (n=50).

***Exclusion criteria***

Patients with ischemic heart disease, cerebrovascular and neurological diseases, diabetes mellitus, chronic renal impairment, previous history of thyroid disease or previous thyroxine therapy and pregnancy.

***Inclusion criteria***

Hypothyroid patients and normal patient.

***Blood Sample collection***

About 5-6 ml of venous blood was collected, in which 3 ml blood was taken in EDTA vials and remaining 3 ml centrifuged to separate serum from the cells as soon as the clot formed.

***Measurement of Hematological parameter***

The 3ml peripheral venous blood was taken in sterilized EDTA vials. Blood samples were processed manually for various haematological indices mainly hemoglobin (Hb), total erythrocyte counts (TEC), total leukocyte count (TLC), mean corpuscular value (MCV), Red cell width distribution (RDW). The CBC and hemogram were assayed in mindray hemocytometer analyzer.

***Measurement of thyroid hormone profile***

Serum aliquots were stored at 4oC to be run in batches. Thyroid function test (TFT) comprising of T3, T4 and TSH levels was carried out by electrochemi luminescence Immunoassay method using fully automatic analyzer ECLIA.

***Statistical Analysis***

The results were expressed as mean ± standard deviation (SD). Differences in variables were analyzed and considered to be significant at $p<0.05$ or $p<0.01$.

# RESULTS

A total of 150 subjects participated, of which 50 are Primary hypothyroid (untreated), 50 are primary hypothyroid (treated) and 50 are normal controls (euthyroid). Median + Standard deviation values of Hb, RBC,WBC, MCV, RDW, Hct, Lym%, Hb% and RBC% with respect to T4 and TSH were assessed and data are presented as F-value and P-value. The value of $P<0.05$, denotes in results were statistically significant and had an association with the thyroid disorder. Results are shown in Table 1. In untreated primary hypothyroid, Hb (10.70±0.86 g/dl), RBC (4.63±0.51 106/µl), MCV (83.34±6.92 FL), HCT (38.6±2.6 %), RDW (14.93±5.47fL), RBC% (92.63± 10.30%)

which signifies that these patients are at risk of anemia (Normocytic). In treating hypothyroid state, Hb was 12.60±1.33, which is definitely increased the value than untreated state. Table 1 : Comparison of thyroid hormone level with Hb , RBC , HCT, MCV in untreated Hypothyroid , treated Hypothyroid and euthyroid state.

| PARAMETERS | EUTHYROID N= 50 | HYPOTHYROID | | P VALUE |
|---|---|---|---|---|
| | | UNTREATED HYPOTHYROID N= 50 MEAN±SD | TREATED HYPOTHYROID N= 50 MEAN±SD | Untreated hypothyroid vs. treated hypothyroid |
| T3(ng/dl) | 1.052+0.17 | 0.82±0.41 | 0.90±0.30 | 0.92 |
| T4(µg/dl) | 7.42±1.63 | 5.54±1.53 | 9.54±2.53 | <0.0001 |
| TSH(µIU/ml) | 2.23±0. 93 | 18.67±11.34 | 15.28±7.3 | <0.001 |
| Hb(g/dl) | 14.72±1.77 | 10.70±0.86 | 12.64±1.33 | <0.001 |
| RBC($10^6$/µl) | 5.15±1.59 | 4.63±0.51 | 5.14±0.62 | 0.04 |
| HCT(%) | 41.5±2 | 38.6±2.6 | 39.5±2.5 | <0.001 |
| MCV(fL) | 86.34±5.71 | 83.34±6.92 | 85.81±6.22 | <0.05 |

## DISCUSSION

It is now found that TSH measurement is a sensitive test for detecting both subclinical hypothyroidism and primary hypothyroidism. This measurement is recommended as the first test for diagnosing thyroid disorder in patients (9). Thyroid diseases are frequently associated with erythrocyte abnormalities (10). The anemia is usually normocytic anemia with an increased MCV, and hypothyroidism with moderate severity (9, 13). The anemia of hypothyroidism Will lead to to a physiological compensation for the diminished need of tissues for oxygen. The low plasma erythropoietin levels found in hypothyroid anemia correlates with this hypothesis. Hypothyroidism should always therefore be considered as a possible cause of unexpected and unexplained anemia. An increase in MCV may develop rapidly in association with the evolving hypothyroidism. On replacement therapy with thyroxine the MCV was found to fall progressively, even if the initial value was within the normal range. The cause of the increase in size of the red cells and of the minor degree of anisocytosis in uncomplicated hypothyroidism is unknown (11, 12). The present study also showed decreased RDW, HB, HCT and RBC in untreated hypothyroid as compared to hypothyroid patients.

## CONCLUSION

Thyroid hormones (T3 and T4) have a significant influence on erythropoiesis. In our study, we found decreased levels of haematological parameters like Hb, RBC, MCV, HCT, RBC% and RDW in untreated hypothyroid than the treated patients. Abnormal levels of thyroid hormones might substantially influence the size variability of circulating RBC's, predisposing patient with normocytic anemia. In any cause of anemia, it is significant to rule out hypothyroid. So, it is suggested that prompt and early recognition and treatment of hypothyroid is needed to prevent the risk of developing anemia.

## REFERENCES

1. Yen PM. Physiological and molecular basis of thyroid hormone action. Physiol Rev. 81(3): 1097-1142., 2001;
2. Kochupillai N, Mehta M. Iodine deficiency disorders and their prevention in India. Rev Endocr Metab Disord 9:237-244, 2008;
3. UshaMenon V, Sundaram KR, Unnikrishnan AG, Jayakumar RV, NairV, Kumar H. High prevelance of undetected thyroid disorders in an iodine sufficient Adult South Indian population. J Indian Med Assoc 107:72-77., 2009;

4. Thorley-Lawson DA. Basic virological aspects of Epstein-Barr virus infection. Semin Hematol. 25(3):247-60. ,1988;
5. Lande WM, Mentzer WC. Hemolytic anaemia associated with increased action permeability. Clin Haematol.; 14(1):89-103., 1985
6. Kosenli A, Erdogan M, Ganidagli S, Kulaksizoglu M, Solmaz S, Kosenli O,Unsal C, Canataroglu A. Anemia frequency and etiology in primary hypothyroidism. Endocr Abstr; 20:140, 2009.
7. Chu JY, Monteleone JA, Peden VH, Graviss ER, Vernava AM. Anemia in children and adolescents with hypothyroidism. Clin Pediatr (Phila). Nov; 20(11): 696-9., 1981.
8. Franzese A, Salemo M, Argenziano A, Buongiovanni C, Limauro R, Tenore A. Anemia in infants with congenital hypothyroidism diagnosed by neonatal screening. J Endocrinol Invest; 19:613-19., 1996.
9. Lippi G, Montagnana M, Salvagno GL and Guidi GC. Should women with abnormal serum thyroid stimulating hormone undergo screening for Anaemia? Arch Pathol Lab Med 132(3):321-2, 2008;
10. Omar S, Hadj-Taeib S, Kanoun F, Hammami MB, Kamoun S, Ben Romdhane Net al. Erythrocyte abnormalities in thyroid dysfunction.Tunis Med 88(11):783-8. 2010;
11. Sahin M, Toprak SK and Altintas ND. Should Women with Abnormal Serum Thyroid Stimulating Hormone Undergo Screening for Anemia? Arch Pathol Lab Med 133(8): 1188-9., 2009;
12. Horton L, Coburn RJ, England JM, Himsworth RJ. The Thehematology of hypothyroidism. Q J Med; 45(177):10123, 1976.
13. Ibrahim A, Nurcan B, Nihat S and Halil LK. Evaluation of biochemical, hematological and thyroid function parameters in nondipper and dipper hypertensive patients. Cent Eur J Med 124(13-14: 439-443., 2012.