Original Research Article

A study of prevalence of anemia among hypothyroid women during pregnancy

N. Muthulakshmi[1], S. Luijim Mala[2*]

[1,2]Assistant Professor, Department of Obstetrics and Gynecology, Government Tirunelveli Medical College, Tirunelveli, Tamil Nadu, India
[*]Corresponding author email: **Arun raja13@gmail.com**

International Archives of Integrated Medicine, Vol. 8, Issue 2, February, 2021.
Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 22-01-2021 **Accepted on:** 02-02-2021
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: N. Muthulakshmi, S. Luijim Mala. A study of prevalence of anemia among hypothyroid women during pregnancy. IAIM, 2021; 8(2): 50-55.

Abstract

Background: Hypothyroidism is termed asunder activity of the thyroid gland, affects 1% of the general population. Primary hypothyroidism is the etiology in approximately 99% of cases of hypothyroidism. Anemia is often the first sign of hypothyroidism. In a study that looked at the frequency of anemia in overt hypothyroidism, clinical hypothyroidism, and control groups, the frequency of anemia in patients with subclinical hypothyroidism was as high as that in patients with overt hypothyroidism. The most common cause of hypothyroidism in pregnancy is Hashimoto thyroiditis, characterized by glandular destruction from autoantibodies, particularly anti-TPO antibodies. Another cause is posted ablative Grave's disease. Clinical identification of hypothyroidism is especially difficult during pregnancy because many of the signs or symptoms are also common to pregnancy itself. Severe hypothyroidism during pregnancy is uncommon, probably because it is often associated with infertility and higher spontaneous abortion rates.

Aim of the study: Classification of hypothyroid patients introvert hypothyroid and subclinical hypothyroid among hypothyroid women during pregnancy.

Materials and methods: This was a prospective observational study conducted in the Tirunelveli Medical College Hospital, Department of Obstetrics and Gynecology, comprising of 150 antenatal mothers attending the outpatient department with hypothyroidism in their first trimester during the study period of January 2019 to December 2019. Basic investigations such as hemoglobin, blood grouping and typing, HIV, HbsAg, ANTI-HCV, routine urine examinations, RBS, and serum TSH were done for all the antenatal patients. For the antenatal mothers with raised serum TSH, indicating hypothyroidism, a test for free T3, free T4 was done, and the hypothyroid females with anemia were further investigated for the type of anemia by doing a peripheral blood smear study.

Results: Out of the 150 hypothyroid patients taken in the study group, 104 patients were found to be anemic (Hb<11g /dL), hence the prevalence of anemia among the hypothyroid patients was 69.33% and 46 patients were found to be non-anemic (Hb>11g/dL) which was about 30.66 %. 116 patients

belong to the subclinical hypothyroid group, which was 77.33%, and 34 patients belong to the overt hypothyroid group(22.66%). In the study group, 12 of the overt hypothyroid patients had dimorphic anemia (52.17%) followed by 10 patients with microcytic anemia (43.47%). And in the subclinical hypothyroid group, the majority of the patients - 61 patients had dimorphic anemia (75.3%).

Conclusion: Majority of the Indian women have a nutritional iron deficiency. It is highly difficult to differentiate nutritional iron deficiency among them. In the absence of a nutritional iron deficiency, the exact mechanism of IDA in hypothyroidism is not understood. Further studies on the enzyme thyroid peroxidase may provide more information.

Key words

TSH – Thyroid-stimulating hormone, Hb– Hemoglobin, Menarche, Parity, Maternal outcomes, Pregnancy.

Introduction

Thyroid gland diseases are quite common among the general population and their frequency is estimated to be about 5% and predominantly among females [1]. Thyroid gland dysfunction is relatively common during pregnancy as the pregnant state has a profound influence on thyroid gland structure and also its function. Hypothyroidism during pregnancy poses a significant health challenge, as it is associated with adverse maternal and perinatal outcomes specifically with an impact on the cognitive development of the fetus [2, 3]. Anemia is one of the most commonly encountered medical disorders in pregnancy, is associated with significantly high maternal mortality, and high levels of maternal and fetal morbidity. The regulation of hematopoiesis in bone marrow by the thyroid hormones and the mutual relationship between anemia and hypothyroidism is being studied in a large number of studies recently [4, 5, 6]. Hypothyroidism causing certain forms of anemia on one hand and hyper proliferation of immature erythroid progenitors cells on the other hand is well known. In contrast, anemia is not frequently observed in patients with hyperthyroidism, whereas erythrocytosis is quite common [7, 8]. This study is conducted to find out the prevalence of anemia and to evaluate the severity and type of anemia in hypothyroid pregnant women.

Materials and methods

This was a prospective observational study conducted in the Tirunelveli Medical College Hospital, Department of Obstetrics and Gynecology, comprising of 150 antenatal mothers attending the outpatient department with hypothyroidism in their first trimester during the study period of January 2019 to December 2019.

Inclusion criteria

- Patients attending antenatal clinic in the first trimester with hypothyroidism.
- Singleton pregnancy.

Exclusion criteria

- A known case of anemia.
- Multiple gestations.
- Any patient with chronic diseases like chronic kidney disease, chronic liver disease, cardiovascular disease, tuberculosis, hypertension, diabetes, hemorrhoids, or other diseases with gastrointestinal bleeding, hemoglobinopathies, and malignancy.
- Threatened abortion.
- Multiple pregnancies.

Patients attending the outpatient department fulfilling the above criteria were included in the study. Written and informed consent was obtained from all of the patients allocated to the study. Information including the basic history and detailed obstetric history was obtained and detailed examination was done on all the patients in the study. Basic investigations such as

hemoglobin, blood grouping and typing, HIV, HbsAg, ANTI-HCV, routine urine examinations, RBS, and serum TSH were done for all the antenatal patients. For the antenatal mothers with raised serum TSH, indicating hypothyroidism, a test for free T3, free T4 was done, and the hypothyroid females with anemia were further investigated for the type of anemia by doing a peripheral blood smear study.5 mL of the random blood sample was collected from all subjects and 3 mL of the sample was transferred to serum tube and 2 mL to K2 EDTA tubes. After adequate clotting, the serum tube was centrifuged. The serum which gets separated in the tube was aliquoted and was then used for further testing of thyroid profile. From the EDTA tubes, plasma was separated and CBC was analyzed. For peripheral blood smear profile, a drop of blood was collected by needle prick. The aliquoted sample was then stored at – 20 C. American thyroid association (ATA) Guidelines were used for classifying the patients. The trimester-specific cut-off values are as follows. First trimester: 0.1-2.5 µIU/L, second trimester: 0.2-3.0µIU/L, third trimester: 0.3-3.0 µIU/L. Patients were classified as anemic when the hemoglobin level was found to be <11 gm/dl (ICMR classification): as mild (>10-10.9 gm/dl), moderate (7-9.9 gm/dl), severe (4-6.9 gm/dl), very severe (<4 gm/dl).

Statistical analysis

The data were analyzed using SPSS (Statistical Package for Social Science) Version 16.01. The data collected were tabulated in an excel sheet and analyzed. Pearson Correlation was used to find out the relationship between variables. All the Statistical results were considered to be significant at a P-value of ≤0.05.

Results

As shown in the **Table - 1**, the majority of patients i.e. 43.3% were in the 26-30 years age group, followed by the 19-25 years age group which was 38%, with a mean age of 26.81 years.

Out of the 150 hypothyroid patients taken in the study group, 104 patients were found to be anemic (Hb<11g /dL), hence the prevalence of anemia among the hypothyroid patients was 69.33% and 46 patients were found to be nonanemic (Hb>11g/dL) which was about 30.66% (**Table – 2**).

Table – 1: Age group distribution of antenatal mothers included in the study group.

Age (in years)	Frequency (n=150)
<=18	2 (1.33 %)
19-25	57 (38 %)
26-30	65 (43.33 %)
31-35	16 (10.66 %)
36-40	8 (5.33 %)
>40	2 (1.33 %)

Table – 2: Prevalence of anemia among the study group.

Hemoglobin level	n=150
Anemic (Hb<11g/dL)	104 (69.33%)
Non-anemic (Hb11g/dL)	46 (30.66%)

Table – 3: Distribution of overt hypothyroidism and sub-clinical hypothyroidism among the study group.

Hypothyroidism severity	Number of participants (n=150)
Overt hypothyroid	34 (22.66%)
Subclinical hypothyroid	116 (77.33%)

Table – 4: Parity wise distribution of overland sub clinical hypothyroid patients.

Obstetric Code	Overt hypothyroid N=23
Primi (including G2A1 and G3A2)	3
Multi	20

Table – 5: Distribution of severity of anemia among the anemic patients in the study group.

Severity of anemia	Frequency (n=104)
Mild (10-10.9)	53 (50.96%)
Moderate (7.0 - 9.9)	50 (48.07%)
Severe (4.0 - 6.9)	1 (0.71%)
Very severe (<4)	-

Table – 6: Grading of severity of anemia among the overt and sub clinical hypothyroid patients.

Grade of anemia (g)/dL)	Overt hypothyroid (N=23)	Subclinical hypothyroid (N=81)	Total N=104	
Mild	15 (65.21%)	38 (46.91%)	53 (50.96%)	**p=0.03**
Moderate	7 (30.43%)	43(53.08%)	50 (48.07%)	
Severe	1 (4.34 %)	-	1 (0.96%)	

Table – 7: Type of anemia in hypothyroid antenatal patients in the study group.

Type of anemia	Overt hypothyroid (n=23)	Subclinical hypothyroid (n=81)	Total (n=104)
Microcytic	10 (43.47%)	19 (23.45%)	29 (27.88 %)
Macrocytic	1 (4.34%)	1 (1.23%)	2(1.92%)
Dimorphic	12 (52.17%)	61 (75.30%)	73 (70.19%)

Of all the hypothyroid patients taken in the study group (n=150), 116 patients belong to the subclinical hypothyroid group, which was 77.33%, and 34 patients belong to the overt hypothyroid group (22.66%) as per **Table - 3**.

Of all the hypothyroid patients with anemia in the study group, 23 patients belonging to the overt hypothyroid group, 3 patients were primigravida (including G2A1 and G3A2), 20 patients were multigravida. In the subclinical hypothyroid group of 83 patients, 53 patients were primigravida (including G2A1 and G3A2) and 28 patients were multigravida (**Table – 4**).

The severity of anemia was classified among the anemic patients according to the ICMR classification. Out of the 104 patients who were found to be anemic, 53 patients were found to be mildly anemic which was about 50.96%, 50 patients were found to be moderately anemic which was about 48.07%. Only 1 patient was found to be severely anemic (0.71%) as per **Table – 5**.

In the study, after classifying the anemic patients according to the ICMR classification, mild anemia was seen in most of the patients with overt hypothyroidism -15 patients (65. 21%), moderate anemia in 7 patients i.e. (30.43%) while moderate anemia was seen in subclinical hypothyroid patients group - 43 patients (53.08%) followed by mild anemia in 38 patients (46.91%). P-value was found to be 0.03 which implies that the difference was statistically significant (**Table – 6**).

In the study group, 12 of the overt hypothyroid patients had dimorphic anemia (52.17%) followed by 10 patients with microcytic anemia (43.47%). And in the subclinical hypothyroid group, the majority of the patients - 61 patients had dimorphic anemia (75.3%) as per **Table – 7**.

Discussion

The present article assessed the relationship between maternal thyroid dysfunction and gestational anemia. The meta-analysis showed that OH and TPOAb-positive status were risk factors of gestational anemia, while SCH and hyperthyroidism were not [9]. In new data from our team, we found that Hb levels of pregnant women with hypothyroidism were lower during the second half of pregnancy and longitudinal reductions in the Hb, RBC, and Hct levels were higher from the first to the second half of pregnancy. Moreover, RBC levels were significantly increased in the hyperthyroid pregnant women throughout pregnancy [10]. Affected by factors such as human chorionic gonadotropin (hCG), iodine level, and serum thyroxine-binding globulin (TBG), thyroid function levels fluctuate during pregnancy. This means that the diagnostic criteria for thyroid dysfunction during pregnancy differ from those in non-pregnancy [11]. At present, several

studies have noted that abnormal thyroid function during pregnancy can lead to obstetric adverse outcomes and adverse fetal neurodevelopment, including miscarriage, gestational diabetes mellitus, preeclampsia, and intrauterine growth restriction (IUGR). Therefore, it is necessary to assess thyroid function during pregnancy based on specific reference values for people with abnormal thyroid function [12]. Charcot conducted a study in the 18th century which showed an association between Graves' disease and anemia. Another study was conducted by Kocher who observed that a decrease in several red blood corpuscles (RBCs) of patients who had undergone thyroidectomy. It has also been found that all hematological parameters return to normal when the thyroid hormone levels are corrected and a euthyroid state is achieved. It has also been postulated that the thyroid hormones increase the production of erythropoietin and thus influence hematopoiesis [13]. It has been found that anemia affecting up to 60% of patients with hypothyroidism is not related either to the severity or duration of thyroid insufficiency. As the overall metabolism of the human body is decreased in hypothyroidism, the hematopoietic system being the primary one among all other affected organ systems results in anemia [14]. The Hypo cellular structure of the bone marrow in hypothyroidism can substantiate the fact that thyroid hormones play an important role in hematopoiesis. .In the study, mild anemia was seen in most of the patients with overt hypothyroidism -15 patients (65. 21%), moderate anemia in 7 patients i.e. (30.43%) while moderate anemia was seen in the subclinical hypothyroid patient's group – 43 patients (53.08%) followed by mild anemia in 38 patients (46.91%) [15]. A similar study was conducted by De Groot L, et.al, in which the study has shown a significant association between uncontrolled hypothyroidism and adverse feto-maternal outcome. There was a significant correlation between the thyroid status and prevalence of hypertension, diabetes, anemia in the study [16]. As seen in this present study, 12 of the patients in overt hypothyroidism had dimorphic anemia (52.17%), 10 patients had microcytic anemia (43.47%) and 1 patient had macrocytic anemia (4.34%). And also in the sub-clinical hypothyroid group, 61 patients were found to have dimorphic anemia (75. 30%), 19 of them had microcytic anemia (23.45%) and one patient had macrocytic anemia (1.23%). These results are by the previous studies by Scoccia B, et al. who also had dimorphic anemia as the commonest type in peripheral blood picture of patients of anemia of chronic disease [17].

Conclusion

Iron deficiency anemia is one of the most frequently seen diseases in our population. Malabsorption and iron deficiency anemia occur as a result of various hormonal instability are observed in hypothyroidism. Hypothyroidism being a common endocrine disorder encountered in our population, can lead to anemia as a result of various causes stated above. An increase in anemia frequency in hypothyroidism is found in our study. More researches are needed to be conducted so that a clear link associated with thyroid function and iron status can be ruled out to prevent the adverse effects of the disorder to both mother and fetus to achieve a normal pregnancy outcome.

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