



PREVALENCE AND TYPES OF ANAEMIA IN THYROID DISORDERS

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ABSTRACT

Aim: To study the prevalence and types of anaemia in patients with thyroid disorders. **Methods & Materials:** A cross sectional study was conducted on 160 patients ≥ 18 years including both hypothyroid & hyperthyroid patients at OPD/IPD in SRN Hospital affiliated to MLN Medical College, Prayagraj between July 2021 & June 2022. CBC, GBP with Reticulocyte count and thyroid profile was done. **Result:** The prevalence of anaemia was found to be 67.50% in the study population. Among hypothyroid patients, majority of the patients were found to be anaemic (70.8%), however in hyperthyroid patients, majority of the patients were found to be non-anaemic (62.5%). The most common type of RBC morphology found in the study population was normocytic normochromic (69.4%), followed by microcytic hypochromic (16.8%) and macrocytic (13.8%). Majority of the study subjects in the study population had moderate anaemia (80.6%), followed by mild anaemia (11.1%) and severe anaemia (8.3%). The severity of anaemia was more in hypothyroid patients (82.4% patients had moderate anaemia) as compared to hyperthyroid patients (50% patients had moderate anaemia). **Conclusion:** The prevalence of anaemia was found to be 67.50% in the study population. Higher prevalence of anaemia was found in hypothyroid patients (70.8%) as compared to that in hyperthyroid patients (37.5%). The most common type of RBC morphology found in the study population was normocytic normochromic (69.4%). Severity of anaemia was found to be more in hypothyroid patients as compared to hyperthyroid patients.

KEYWORDS : Anaemia, Hypothyroid, Hyperthyroid.

INTRODUCTION

Thyroid hormones increase the oxygen consumption of peripheral tissues, which in turn increases the erythropoietin production if relative hypoxia develops in the renal circulation.^[1] Anaemia in hypothyroidism can be as a result of depressed bone marrow stimulation, decreased erythropoietin production or nutrient deficiency (including iron, vitamin B12, or folate).^[1] In Autoimmune thyroid disease (AITD), the risk of anaemia increases by concomitant autoimmune diseases such as pernicious anaemia.^[2] Hypothyroidism can cause low iron levels due to poor gut absorption.^[2] Anaemia may also be as a result of heavy menstruation seen in some female patients.^[2]

Thyroperoxidase is the key enzyme in thyroid hormone biosynthesis, is iron dependent.^[2] Potential causes of anaemia in thyrotoxicosis can be due to altered iron metabolism, haemolysis, and oxidative stress resulting in shortened erythrocyte survival.^[2]

Patients who are starving, particularly for protein, and those with a variety of endocrine disorders that produce lower metabolic rates, may develop a mild to moderate hypoproliferative anemia. The release of Erythropoietin from the kidney is sensitive to the need for O₂, not just O₂ levels. Thus, EPO production is triggered at lower levels of blood O₂ content in disease states (such as hypothyroidism and starvation) where metabolic activity, and thus O₂ demand, is decreased.^[3]

OBJECTIVES-

To study the prevalence and types of anaemia in patients with thyroid disorders.

MATERIALS AND METHODS-

A cross sectional study was conducted on 160 patients ≥ 18 years including both hypothyroid & hyperthyroid patients at OPD/IPD in SRN Hospital affiliated to MLN Medical

College, Prayagraj between July 2021 & June 2022. CBC, GBP with Reticulocyte count and thyroid profile was done.

Exclusion Criteria

- Age < 18 years.
- Pregnant or lactating females.
- Patients with associated chronic medical condition (hypertension, diabetes mellitus), infections, malignancies, haemoglobinopathies, bleeding diathesis.
- Patients on drugs/ supplements which may affect iron metabolism.
- Patients unwilling for study related diagnostic procedures.

RESULTS-

The study population consisted of 160 study subjects of patients of hypothyroidism and hyperthyroidism; ranging from 22 to 75 years of age.

Out of a total of 160 patients in the study population of hypothyroid and hyperthyroid patients, 144 patients were Hypothyroid and 16 patients were Hyperthyroid; 60 were males and 100 were females.

Frequency Distribution of Hypothyroid and Hyperthyroid patients in the study Population

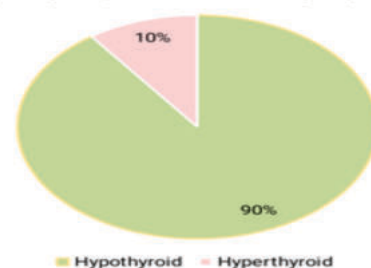


Figure 1- Pie chart showing Frequency distribution of Hypothyroid and Hyperthyroid patients in the study population.

Table 1- Comparison of Means and Standard Deviations of Haematological Indices in Patients of Hypothyroidism and Hyperthyroidism.

Hematological Parameter	Hypothyroid		Hyperthyroid		t value	p-value
	Mean	SD	Mean	SD		
Hb (g/dl)	10.75	2.43	12.93	1.93	-3.449	0.001
TLC (cells/mm ³)	6084.8	1341.85	5999.44	1105.36	0.245	0.807
MCV(fl)	80.30	14.71	78.14	10.50	0.571	0.569
MCHC(g/dl)	32.76	1.78	34.13	2.51	-2.784	0.006
RDW(%)	16.19	2.68	15.43	1.21	1.125	0.262
RETICULOCYTE COUNT (corrected)%	.95	.22	1.05	.17	-1.731	0.085

The haemoglobin levels were found to be reduced in both the groups of hypothyroidism and hyperthyroidism. The mean ± SD of hemoglobin and MCHC levels in hypothyroid patients was 10.75 ± 2.43g/dl and 32.76 ± 1.789 g/dl while in hyperthyroid patients was 12.93 ± 1.93 g/dl and 34.13 ± 2.51g/dl respectively. The table depicts that the haemoglobin levels were significantly reduced in patients of hypothyroidism as compared to that of the patients of hyperthyroidism (p value 0.001). There was a significant difference in the means of MCHC levels in the patients of hypothyroidism and hyperthyroidism (p value 0.006).

Table 2: Frequency Distribution of Anaemic and Non Anaemic patients in the study population.

	Frequency(N)	Percentage (%)
Anaemic	108	67.5
Non anaemic	52	32.5
Total	160	100.0

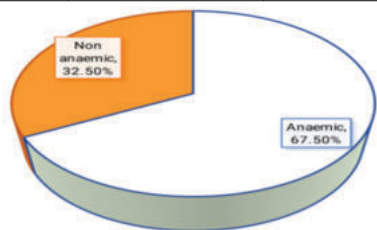


Figure 2- Pie Chart Showing Frequency Distribution of Anaemic And Non Anaemic Patients In The Study Population.

Out of 160 patients, 108 (67.50%) patients were anemic and 52 (32.50%) patients were non-anemic.

The mean haemoglobin level in patients was 10.97 ± 2.47 g/dl with a maximum of 16.25 g/dl and a minimum of 6.93 g/dl in the study population of hypothyroid and hyperthyroid patients.

Table 3 : Comparison of Frequency Distribution of Anaemia in the patients of Hypothyroidism and Hyperthyroidism

	Hypothyroid		Hyperthyroid		2 value	p-value
	N	%	N	%		
Anaemic	102	70.8%	6	37.5%	7.29	0.007
Non anaemic	42	29.2%	10	62.5%		

In patients of Hypothyroidism, 102 (70.8%) patients were anaemic and 42 (29.2%) were non-anaemic. In patients of hyperthyroidism, 6 patients (37.5%) were anaemic and 10 patients (62.5%) were non-anaemic.

It shows that more number of hypothyroid patients were anaemic as compared to hyperthyroid patients, and this difference was found to be statistically significant (p-value = 0.007).

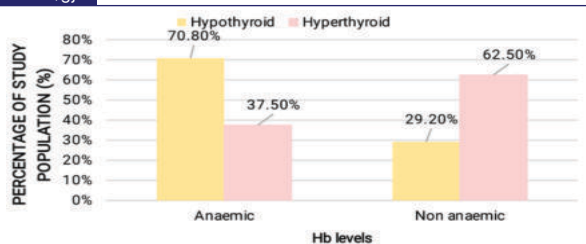


Figure 3- Bar Graph Showing Comparison of Frequency Distribution of Anaemia in the patients of Hypothyroidism and Hyperthyroidism

Table 4: Comparison of Frequency Distribution of RBC morphology in the patients of Hypothyroidism and Hyperthyroidism

	THYROID HORMONE LEVELS				2 value	p-value
	Hypothyroid		Hyperthyroid			
	N	%	N	%		
Macrocytic	21	14.6%	1	6.2%	1.29	0.525
Microcytic Hypochromic	25	17.4%	2	12.5%		
Normocytic Normochromic	98	68.1%	13	81.2%		

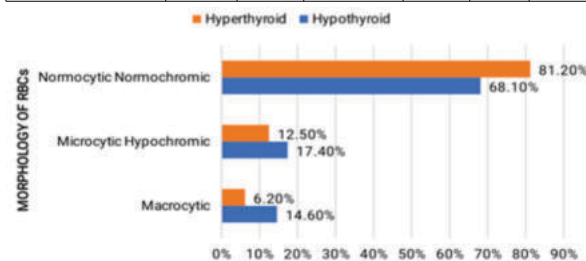


Figure 4 showing Comparison of Frequency Distribution of RBC morphology in the patients of Hypothyroidism and Hyperthyroidism

The above table and figure depict the comparison of frequency distribution of RBC morphology in the patients of hypothyroidism and hyperthyroidism. In Hypothyroid patients, the percentage of macrocytic, microcytic hypochromic and normocytic normochromic is 14.6%, 17.4%, and 68.1% respectively. And in Hyperthyroid patients, the percentage of macrocytic, microcytic hypochromic and normocytic normochromic is 6.2%, 12.5%, and 81.2% respectively. It shows no significant difference in RBC morphology between the 2 subgroups of hypothyroidism and hyperthyroidism (p value 0.525).

Table 5- Frequency Distribution Of Anaemia In Study Population Based on Severity

Haemoglobin(g/dl)	Frequency (N)	Percentage (%)
Mild	12	11.1
Moderate	87	80.6
Severe	9	8.3
Total	108	100.0

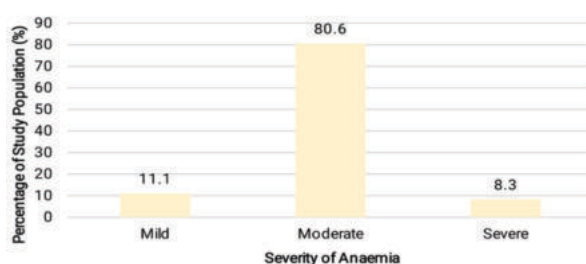


Figure 5 - Bar Graph showing Frequency Distribution Of Anaemia In Study Population Based on Severity

Out of 108 anaemic patients, 12 patients had mild anaemia, 87 patients had moderate anaemia and 3 patients had severe anaemia. It shows majority of the study subjects had moderate anaemia (80.6%), followed by mild anaemia (11.1%) and severe anaemia (8.3%).

Table 6 - Comparison of severity of anaemia in hypothyroid and hyperthyroid patients.

Severity of Anaemia	Hypothyroid		Hyperthyroid		Total	
	Frequen cy (N)	(%)	Frequen cy (N)	(%)	Frequen cy (N)	(%)
Mild	9	8.8%	3	50.0%	12	11.1%
Moderate	84	82.4%	3	50.0%	87	80.6%
Severe	9	8.8%	0	.0%	9	8.3%
Total	102	100%	6	100%	108	100%

p value=0.007; consider very significant

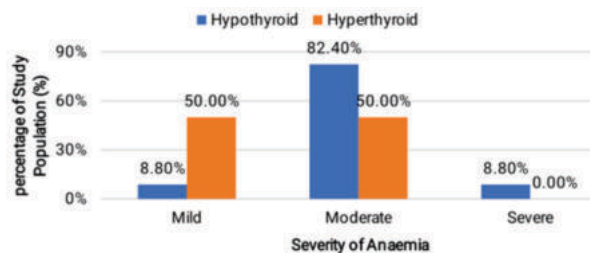


Figure6 - Bar Graph showing Percentage Distribution Of Anaemia In Hypothyroid and Hyperthyroid patients based on Severity of Anaemia

The above table and bar graph show comparison of severity of anaemia in hypothyroid and hyperthyroid patients.

Out of 102 anaemic patients with hypothyroidism, 9 patients(8.8%) had mild anaemia, 84 patients (82.4%) had moderate anaemia and 9 patients(8.8%) had severe anaemia.

Out of 6 anaemic patients with hyperthyroidism, 3 patients(50%) had mild anaemia, 3 patients (50%) had moderate anaemia and no patients had severe anaemia.

It shows that the severity of anaemia was more in hypothyroid patients as compared to hyperthyroid patients. This difference in severity of anaemia was statistically significant in hypothyroid patients when compared with hyperthyroid patients (p value 0.007)

DISCUSSION-

This study was conducted on a total of 160 study subjects comprising of patients of hypothyroidism and hyperthyroidism. 144 patients (90% of the study population) were found to be hypothyroid and 16 patients (10% of the study population) were found to be hyperthyroid. The prevalence of anaemia was found to be 67.50% in the study population. Among hypothyroid patients, the majority of patients were found to be anaemic (70.8%), however in hyperthyroid patients, the majority of patients were found to be non-anaemic (62.5%).Hence anaemia was found to be more prevalent in hypothyroid as compared to hyperthyroid subjects.

- Study of Suhail et al., (2020) in Saudi Arabia showed that the hypothyroid group had a higher prevalence of anaemia (60.27%) and iron deficiency (49.31%) than the hyperthyroid and euthyroid groups.^[4]
- Study of Imteyaz et al. (2020) in Delhi to ascertain the prevalence and characteristics of anemia in pregnancy associated with hypothyroidism showed that out of 207

euthyroid patients, 131 (63.28%) were anaemic, while 60 out of 65 hypothyroid patients (92.31%) had anemia. Hypothyroidism and anemia were shown to be significantly correlated (p-value<0.001).^[5]

- The most common type of RBC morphology found in the study population was normocytic normochromic (69.4%), followed by microcytic hypochromic (16.8%) and macrocytic (13.8%) .
- Majority of the study subjects in the study population had moderate anaemia (80.6%), followed by mild anaemia (11.1%) and severe anaemia (8.3%).
- The severity of anaemia was more in hypothyroid patients(82.4% patients had moderate anaemia) as compared to hyperthyroid patients(50% patients had moderate anaemia).
- Study by Peraka et al. (2019) in 1500 patients to investigate the occurrence and type of anaemia in hypothyroid patients showed the prevalence of anaemia to be 41.8%. The most prevalent kind of anaemia was normocytic hypochromic anaemia (0.95%), and macrocytic anaemia (0.49%). There was mild anaemia in 59.34%, moderate anaemia in 39.71%, and severe anaemia in 0.95%.^[6]
- Study by Patil (2018) on 200 individuals with primary hypothyroidism showed that anemia was found to affect more hypothyroid women (54%) than hypothyroid males (45%). Microcytic hypochromic anemia (20.75%), macrocytic hypochromic anemia (12.26%), and dimorphic anemia (8.49%) were the following most prevalent types of anemia after normocytic normochromic anemia (58.49%).^[7]

CONCLUSION-

This study was conducted on a total of 160 study subjects comprising of patients of hypothyroidism and hyperthyroidism. 144 patients (90% of the study population) were found to be hypothyroid and 16 patients (10% of the study population) were found to be hyperthyroid.

The prevalence of anaemia was found to be 67.50% in the study population. Among hypothyroid patients, the majority of patients were found to be anaemic (70.8%), however in hyperthyroid patients, the majority of patients were found to be non-anaemic (62.5%).

The most common type of RBC morphology found in the study population was normocytic normochromic (69.4%), followed by microcytic hypochromic (16.8%) and macrocytic (13.8%) .

Majority of the study subjects in the study population had moderate anaemia (80.6%), followed by mild anaemia (11.1%) and severe anaemia (8.3%).

The severity of anaemia was more in hypothyroid patients(82.4% patients had moderate anaemia) as compared to hyperthyroid patients(50% patients had moderate anaemia).

The analysis showed a significantly reduced haemoglobin levels and MCHC levels in the patients of hypothyroidism and hyperthyroidism .

Haemoglobin levels and MCHC levels were reduced significantly in hypothyroid patients when compared with hyperthyroid patients(p value - haemoglobin- 0.001 and MCHC- 0.006.)

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