

# To Compare the Levels of Vitamin B12, Folate and Ferritin with Thyroid Hormones in Hypothyroidism Patients: An Institutional Based Study

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## ABSTRACT

**Background:** Thyroid hormone is required for normal development as well as regulating metabolism in the adult. Thyroid hormones regulate blood cells metabolism and proliferation as regulate metabolism of all cells in the human body. The present cross-sectional study was carried out to compare the levels of vitamin B12, Folate and Ferritin with thyroid hormones in hypothyroidism patients.

**Materials and Methods:** The present study was carried out among 400 persons in which 200 individuals were normal and 200 were hypothyroid patients. The sample was collected by overnight fasting. 5ml venous blood samples were collected from each subject. Measurements of serum concentrations of Total T3, Total T4, TSH, Vitamin B12, Folate and Ferritin were done using Chemiluminescence Immunosorbant Assay. The statistical analysis was performed with SPSS v22 (IBM SPSS, Chicago, IL). The p-value of less than 0.05 was taken to be significant.

**Results:** The present study was carried out among 400 persons in which 200 individuals were normal and 200 were hypothyroid patients. In normal individual group, all the serum values were in normal range. The levels of TSH of hypothyroid patients show a significant increase in comparison to normal individuals. Hypothyroid patients had significantly lower levels of serum total T<sub>3</sub> and T<sub>4</sub>. The mean serum vitamin B<sub>12</sub> and folate were also significantly decreased as compared to normal. In case of serum ferritin, the level was observed lower in comparison to normal. TSH was observed significantly

correlated with folate. There was no correlation found of TSH with vitamin B12 and ferritin. There was no correlation found between total T3 and Vitamin B12. A negative correlation was observed between total T3 and folate but it was not significant. No association was found between total T3 and ferritin. Total T4 was observed negatively associated with Vitamin B12 and ferritin but both are not significant. There was no correlation found between Total T4 and folate.

**Conclusion:** This study concluded that hypothyroid patients were observed to have lower levels of serum Vitamin B12, Folate and Ferritin in comparison to normal individuals.


**Keywords:** Vitamin B12, Ferritin, Hypothyroid, Thyroid Hormone.

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## INTRODUCTION

Thyroid hormone (TH) regulates metabolic processes essential for normal growth and development as well as regulating metabolism in the adult.<sup>1</sup> Hypothyroidism, reduced thyroid hormone levels, is associated with hypometabolism characterized by reduced resting energy expenditure, weight gain, increased cholesterol levels, reduced lipolysis, and reduced gluconeogenesis.<sup>2</sup> It is a common disease with different frequency in different countries. It is characterized biochemically by a reduction in serum T3 and T4

levels that result in an increase in serum thyroid stimulating hormone (TSH) concentration.<sup>3,4</sup> The prevalence of thyroid disorder in pregnancy is approximately 2–5%, with hypothyroidism being more common, approximately 6.47–14.32%.<sup>5</sup> Anemia affects one-quarter of the world's population and is concentrated in preschool-aged children and women, making it a global public health problem. Over 90% of affected individuals live in developing countries.<sup>6</sup> Only 50% of anemia is caused by iron

deficiency, the remainder is caused by vitamin A, B12, folate deficiencies, malaria, HIV, other infectious diseases, sickle cell disease and other inherited anemia.<sup>7</sup> Patients with deficiency of vitamin B12 and hypothyroidism usually have symptoms of fatigue, weakness, poor memory retention, itching and loss of sensation.<sup>8,9</sup>

The present cross-sectional study was carried out to compare the levels of vitamin B12, Folate and Ferritin with thyroid hormones in hypothyroidism patients.

**MATERIALS AND METHODS**

The present study was carried out among 400 persons in which 200 individuals were normal and 200 were hypothyroid patients in a tertiary care hospital of Western Uttar Pradesh, India. Informed consent was obtained from all participants. Persons between age 20-60 years were included. Persons with Hypertension, Diabetes Mellitus, Secondary hypothyroidism were excluded from the study. The sample was collected by overnight fasting. 5ml venous blood samples were collected from each subject. These blood samples were allowed to stand for complete clot formation at room temperature and subsequently centrifuged for 10 minutes at approximately 3500 rpm. Measurements of serum concentrations of Total T3, Total T4, TSH, Vitamin B12, Folate and Ferritin were done using Chemiluminiscence Immunosorbant Assay. The statistical analysis was performed with SPSS 22 (IBM SPSS,

Chicago, IL). The results are presented in mean±SD and percentage. Chi-square test was used to compare the categorical variables between hypothyroid and normal. The Pearson correlation coefficient was calculated among the study parameters. p-value of less than 0.05 was taken to be significant.

**RESULTS**

The present study was carried out among 400 persons in which 200 individuals were normal and 200 were hypothyroid patients. In normal individual group, all the serum values were in normal range. In normal individual group, all the serum values were in normal range. The levels of TSH of hypothyroid patients show a significant increase in comparison to normal individuals. Hypothyroid patients had significantly lower levels of serum total T<sub>3</sub> and T<sub>4</sub>. The mean serum vitamin B<sub>12</sub> and folate were also significantly decreased as compared to normal. In case of serum ferritin, the level was observed lower in comparison to normal. TSH was observed significantly correlated with folate. There was no correlation found of TSH with vitamin B12 and ferritin. There was no correlation found between total T3 and Vitamin B12. A negative correlation was observed between total T3 and folate but it was not significant. No association was found between total T3 and ferritin. Total T4 was observed negatively associated with Vitamin B12 and ferritin but both are not significant. There was no correlation found between Total T4 and folate.

**Table 1: Laboratory findings of both groups**

	Hypothyroid Mean±SD (n=200)	Normal Mean±SD (n=200)	p-value
TSH	7.45±2.45	2.65±1.54	<0.05
Total T <sub>3</sub>	0.56±2.01	2.66±0.34	
Total T <sub>4</sub>	3.34±1.42	6.67±1.23	
Vitamin B <sub>12</sub>	211.34±121.45	456.43±243.54	
Folate	2.54±0.86	6.56±0.89	
Ferritin	24.10±1.24	64.46±3.47	

**Table 2: Pearson Correlation Coefficient among the Vitamin B12, Folic Acid and Ferritin with TSH, T3, T4 in Hypothyroid Group**

	Correlation		
	Vitamin B12	Folic Acid	Ferritin
TSH	0.04	0.183*	0.034
T3	0.120	-0.042	0.067
T4	-0.036	0.068	-0.014

**DISCUSSION**

Normal thyroid status is dependent on the presence of many trace elements e.g., iron, iodine, selenium, and zinc for both the synthesis and metabolism of thyroid hormones. Deficiencies of these elements can impair thyroid functions.<sup>10</sup>

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significant increase in comparison to normal individuals. Hypothyroid patients had significantly lower levels of serum total T<sub>3</sub> and T<sub>4</sub>. The mean serum vitamin B<sub>12</sub> and folate were also significantly decreased as compared to normal. In case of serum ferritin, the level was observed lower in comparison to normal. TSH was observed significantly correlated with folate. There was no correlation found of TSH with vitamin B12 and ferritin. There was no correlation found between total T3 and Vitamin B12. A negative correlation was observed between total T3 and folate but

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B12 deficiency in hypothyroid patients in India was reported as 10%.<sup>11</sup> Beard et al. found that plasma T4 and T3 concentrations were significantly ( $p < 0.002$ ) lower in anemic than in control women at baseline and during cold exposure.<sup>12</sup>

Azizi et al. found a relation between the frequency of goitre and serum ferritin level in school children in Iran and reported that the frequency of goitre was related to Iron Deficiency.<sup>13</sup>

Another study, conducted in Turkey, reported Vitamin B12 deficiency as 25.6% among 100 patients with subclinical hypothyroidism and 18.6% among 100 patients with overt hypothyroidism.<sup>14</sup>

Another study also reported iron deficiency in a significant portion of patients with primary hypothyroidism.<sup>15</sup>

## CONCLUSION

This study concluded that hypothyroid patients were observed to have lower levels of serum Vitamin B12, Folate and Ferritin in comparison to normal individuals.

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