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Evaluation of Vitamin B12, folic acid in hypothyroidism patients

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Abstract

Thyroid hormone is required for proper development as well as to control blood cell metabolism and proliferation, which affects the metabolism of all cells in the human body. Vitamin B12 is a water-soluble vitamin that deficiency causes a range of ailments. The current study evaluated the levels of vitamin B12, folic acid, and thyroid hormones in hypothyroid people. The study included 384 hypothyroid individuals who visited the OPD of General Medicine at Santosh Medical College. The control group consisted of healthy adults of similar age and sex. The current investigation found that serum vitamin B12 levels were considerably low, whereas TSH, Folic acid, and normal serum T3 and T4 levels were much higher.[1]

INTRODUCTION

Thyroid disease is a medical condition that affects the function of the thyroid gland. Hypothyroidism, also known as underactive thyroid, occurs when the thyroid gland does not produce enough thyroid hormones to fulfill your body's requirements. The thyroid is a tiny, butterfly-shaped gland situated in the front of the neck. Thyroid hormones regulate how your body utilizes energy; therefore they impact almost every organ in your body, including the way your heart beats. Many bodily systems slow down when you don't have adequate thyroid hormones.

Hypothyroidism affects up to 5% of the general population, with a further estimated 5% being undiagnosed. Over 99% of affected patients suffer from primary hypothyroidism. Worldwide, environmental iodine deficiency is the most common

cause of all thyroid disorders, including hypothyroidism, but in areas of iodine sufficiency, Hashimoto's disease.[2]

Thyroid illness is a major problem in India as well. According to projections from several thyroid illness research, around 42 million individuals in India suffer from thyroid problems.[3]

An underactive thyroid gland results in hypothyroidism. Typical symptoms are abnormal weight gain, tiredness, constipation, heavy menstrual bleeding, hair loss, cold intolerance, and a slow heart rate. Iodine deficiency is the most common cause of hypothyroidism worldwide;[4]and the autoimmune disease Hashimoto's thyroiditis is the most common cause in the developed world.[5]

Vitamins A, E, D, and B all have a moderating influence in thyroid function. Previous investigations have found vitamin deficits in thyroid diseases (TD) patients [6,7].Among the B complex vitamins, B12 is one of the most significant since it is required for various metabolic activities. Vitamin B12, often known as cobalamin, is essential for hematopoiesis and is found in enzymes like methylmalonyl-coenzyme. Although the reasons of vitamin B12 insufficiency in TD patients may be multifaceted, they are mostly connected to the presence of other autoimmune illnesses and dietary habits [8]

The prevalence of vitamin B12 insufficiency rises with age. Patients with vitamin B12 insufficiency with hypothyroidism typically experience fatigue, weakness, poor memory retention, itching, and loss of feeling.Folic acid is another vitamin that inhibits intestinal absorption and causes macrocytic anaemia in hypothyroidism. Low diet of green leafy vegetables, legumes, and meat is a leading cause of folate insufficiency.[9] Humans cannot synthesise folate, thus it must be obtained from dietary sources such as fresh and frozen green leafy vegetables, citrus fruits and juices, wheat bread, and legumes such as beans. Research suggests that folate can prevent neurodegeneration in adults, enhance cognitive performance, and reduce depression.[10,11]Vitamin B12 insufficiency may also induce a drop in folate levels because the available tetrahydrofolate is not used owing to the folate trap. Ferritin is the body's stored form of iron. Iron deficiency inhibits thyroid hormone production. Low serum ferritin is one of the most common reasons of thyroid dysfunction.[12,13]

The prevalence of vitamin B12 insufficiency rises with age. Patients with vitamin B12 insufficiency with hypothyroidism typically experience fatigue, weakness, poor memory retention, itching, and loss of feeling.[14]

Folic acid is another vitamin that causes macrocytic anaemia in hypothyroidism due to reduced intestinal absorption.[15] Folate insufficiency is caused mostly by a lack of consumption of green leafy vegetables, legumes, and meat.[16] Because humans are

unable to synthesize folate, it must be obtained from dietary sources such as fresh and frozen green leafy vegetables, citrus fruits and juices, whole wheat bread, and legumes such as beans. It has been found that folate protects neurodegeneration in adults, enhances cognitive abilities, and reduces depression.[17]

Its diagnostic and crucial significance in hypothyroid individuals has received little attention. The current study compared vitamin B12, Folic acid levels with thyroid hormone levels in hypothyroid individuals.

Material and method

The following study was conducted in the Department of Biochemistry, Santosh Medical College, and Ghaziabad, Uttar Pradesh. Necessary approval was obtained to conduct the study from the Santosh Medical College and Hospital, ethical committee, Ghaziabad. A total 384 Patients were included and given an explanation regarding the intention of the study and informed written consent was obtained, confidentiality about their results was assured. Patient of age from 18-60 ages and Patient having diagnosed and newly diagnosed cases of Hypothyroidism was included in the study. On the other hand patients with any kidney, liver and heart disease, cancer, psychiatry disorders, pregnant women, diabetes was excluded.

RESULT

Table 1: Frequency and Percentage of Gender & age of patients of Hypothyroidism patient and control group

DEMOGRAPHICAL VARIABLES	CATEGORIES	GROUP	
		HYPOTHYROIDISM PATIENT	CONTROL PATIENT
Gender	Female	271	278
	%	70.6%	72.4%
	Male	113	106
	%	29.4%	27.6%
Age	Mean \pm SD	40.66 \pm 11.973	40.43 \pm 12.335

According to Table 1, 70.6% of hypothyroidism patients and 72.4% of control patients were females, whereas 29.4% of hypothyroidism patients and 27.6% of control patients were males. The average age of patients in the Hypothyroidism patient group was 40.66 years, whereas in the control group it was 40.43 years. Females are more likely to have hypothyroidism than male.

Table 2: Comparison between Hypothyroidism patient and control patients group in TSH, T3, T4, vitamin B12 and folic acid

Parameters	Hypothyroidism patient Group (Mean \pm SD)	Control patients group (Mean \pm SD)	t-value	P-value*	Result
TSH	8.342 \pm 3.749	2.686 \pm 1.413	27.667	0.001	Significant
T4	6.725 \pm 2.066	7.087 \pm 1.649	2.683	0.007	Significant
T3	1.571 \pm 1.033	1.189 \pm 0.319	6.913	0.001	Significant
Vitamin B12	184.11 \pm 174.465	534.29 \pm 197.954	26.006	0.001	Significant
Folic acid	5.56 \pm 5.124	7.43 \pm 3.172	6.097	0.001	Significant

Table 2 shows that comparison Hypothyroidism patient and control patients group in TSH, T3, T4, vitamin B12 and folic acid. There was statistical significant difference between Hypothyroidism patient and control patients group in vitamin B12 & folic acid with $P < 0.05$. Hypothyroidism patient group had greater mean value than control group in this table.

Hypothyroidism patients had significantly lower levels of vitamin B12 and folic acid compared to the control group ($P < 0.05$). In this study, the hypothyroidism patient group had a higher mean value than the control group in TSH, T3, whereas the control group had a higher mean value in T4, vitamin B12, and folate.

DISCUSSION

A thyroid disease affects the function of thyroid gland which results in hampering of normal functions of the gland. Due to these abnormalities occurrence of various problems takes place. Hypothyroidism is caused due to underproduction of thyroid hormones by the respective gland or due to unable to respond to or unable to utilize existing hormones efficiently or not having enough free thyroid hormones. Symptoms of hypothyroid patients include fatigue, low energy, weight gain, slow heart rate, inability to tolerate the cold, dry skin, and constipation.

Hypothyroidism being a very common disease, it's under evaluated in terms of biomarkers. Biomarkers for early detection of it are not available for clinical purpose.

For this evaluation of Vitamin B12, Folic acid in these patients can be helpful. These parameters are playing very important role in Hypothyroidism.

Evaluation of Frequency and Percentage of Gender & age of patients of Hypothyroidism patient and control group was done as shown in **Table 1**. It shows that 70.6% patients in Hypothyroidism patient group & 72.4% in control were female while 29.4% patients in Hypothyroidism patient group & 27.6% patients in control were male respectively. The average age of patients was 40.66 years in Hypothyroidism patient group and average age of patients was 40.43 years in control group.

Raju P. investigated individuals with hypothyroidism to determine the prevalence of vitamin B12 insufficiency and discovered that 26 of 50 (52%) had low B12 levels. Females had a higher incidence (54%), compared to males (46%). Our investigation revealed a link between hypothyroidism and vitamin B12 insufficiency.[18]

Comparison between Hypothyroidism patient and control group in TSH, T3, T4, vitamin B12 and folic acid was done by applying Independent t test. **Table 2** shows that there was statistical significant difference between There were significant differences ($P < 0.05$) in TSH, T3, T4, vitamin B12 and folic acid levels between hypothyroidism patients and control individuals. In this study, the hypothyroidism patient group had a higher mean value than the control group in TSH, T3, whereas the control group had a higher mean value in T4, vitamin B12, and folate.

Jabbar A. concluded that there is a high (approx 40%) prevalence of B12 deficiency in hypothyroid patients. Traditional symptoms are not a good guide to determining presence of B12 deficiency. Screening for vitamin B12 levels should be undertaken in all hypothyroid patients, irrespective of their thyroid antibody status.[19]

A result of Lippi G. does not support the routine screening for either B12 or folic acid deficiency in subjects with subclinical disturbances of thyroid function.[20]

Level of Vitamin B12 was significantly decreased in Hypothyroidism in comparison to normal individual. Folate was significantly decreased in Hypothyroidism as compared to normal[13].

Another study concluded that abnormalities of thyroid function per se did not alter serum folate or vitamin B₁₂ levels in our patients.[21]

Higher odds of having anemia were observed in participants with both hypothyroid function and hyperthyroid function.

Hypothyroidism patients had significantly lower levels of TSH, T3, T4, vitamin B12, and folic acid compared to the control group ($P < 0.05$). In this study, the

hypothyroidism patient group had a higher mean value than the control group in TSH, T3 whereas the control group had a higher mean value in T4, vitamin B12, and folate.

CONCLUSION

Hypothyroid individuals had considerably higher levels of TSH, folic acid as well as lower levels of blood vitamin B12, as compared to healthy controls. According to the study, vitamin B12 deficiency might contribute to the development of hypothyroidism. Because of the large number of patients in our research who had low Vit B12 levels, vitamin B12 treatment in hypothyroidism can be considered interventional therapy. More research is needed to determine more particular facts. Anemia in hypothyroidism might result from comorbid diseases.

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