

Assessment of Uric Acid Levels in Primary Hypothyroid Patients of RIMS, Ranchi Jharkhand

Dr. Tarique Aziz¹, Dr. Visesh Kumar²

¹Associate Professor, Department of Biochemistry, Rajendra Institute of Medical Sciences Ranchi, Jharkhnad, India

²Junior Resident, Department of Biochemistry, Rajendra Institute of Medical Sciences Ranchi, Jharkhnad, India

Abstract: *Introduction:* Thyroid gland disorders are one of the commonest endocrinal disorders. Thyroid hormones influences uric acid levels. *Objectives:* To assess serum uric acid levels in hypothyroid patients and compare it with euthyroid individuals. *Materials and Methods:* 50 patient samples and 50 control samples were taken. Serum was separated and serum uric acid levels were estimated by fully Automated Analyzer AU480. Thyroid estimation was done on ABOIT ARCHITCT i1000SR IMMUNOASSAY machine. Data was analyzed using SPSS 20 software. *Results:* Cases have significantly higher values for serum uric acid and levels than controls and have significant positive correlation with TSH. *Conclusions:* Hypothyroidism is associated with increased serum uric acid.

Keywords: Primary hypothyroidism, TSH, Renal fuction, Uric acid

1. Introduction

Thyroid gland disorders are amongst the most abundant endocrinal disorders second only to diabetes. Primary hypothyroidism is a frequent syndrome, whose prevalence is 0.5–2.0% among women and around 0.2% among men. According to several authors, recently the number of patients with autoimmune diseases with hypothyroidism have increased by 2.1%. (1) Hypothyroidism is state of thyroid hormone deficiency or their impaired functions with compensatory thyroid enlargement. (2) Impaired production of thyroid hormones primarily due to thyroid abnormality or iodine deficiency; sometimes may be secondary to pituitary or hypothalamic disorders. Hypothyroidism is associated with weight gain, cold intolerance, constipation. These thyroid hormones have important biological effects such as regulation of body hemodynamic, thermoregulation, and various metabolisms. It influences almost all metabolisms in the body including carbohydrate, proteins, lipids, and maintenance of water and electrolyte homeostasis, which are well-established (3,4). Hypothyroidism may also associated with kidney derangement resulting in uric acid levels. Hyperuricemia can result from increased production or decreased excretion of uric acid or from a combination of two processes. (5,6)

Uric acid is the end product of purine metabolism in humans. uric acid is an antiageing and antioxidant agent. The daily synthesis of uric acid by body is approximately 400 mg and food intakes provide another 300 mg. Approximately 70% of the uric acid is excreted by the kidneys and the rest by the gut. Hyperuricemia is defined by serum uric acid concentrations greater than 7.0 mg/dl in men or greater than 6.0 mg/dl in women (7). Excess serum accumulation can lead to diseases and mainly involved in gout. So this study was designed for estimation and observation of changes in serum uric acid level in hypothyroid patients.

2. Material and Method

This study was performed in the Department of Biochemistry, RIMS RANCHI from period of Jan 16 to Dec 16. 50 patient samples and 50 control samples were taken.

The study subjects was divided into two groups of which include:

Group 1:

Comprising of 50 newly diagnosed and untreated cases of hypothyroidism. The diagnosis was based on decreased serum T3 and T4 levels associated with increased TSH levels. All patients suffering from hypothyroidism was diagnosed and confirmed by the physician based on free T3 (Normal: 2.4-4.2 pg/ml), free T4 (Normal: 0.7-1.4 ng/dl) and TSH (Normal: 0.34-4.25 μ IU/ml) levels of the patients. (8)

Group 2:

Comprising of 50 healthy controls in the similar age group having normal thyroid profile.

Inclusion Criteria:

Newly diagnosed and untreated cases of hypothyroidism was included in the study.

Exclusion Criteria:

- Pregnancy
- Paediatric age group (<18 yrs).
- Elderly age group (> 60 yrs).
- Renal disorders.
- Hepatic disorders.
- Bone disorders.
- Diabetes, hypertension or any other systemic illness that may affect the renal function.
- Patients on drugs for treatment of thyroid disorders or any other medications that might affect renal function.

Thyroid Assay Include: Thyroid assay test was done by chemiluminescent microparticle immunoassay method on ABOIT ARCHITCT i1000SR IMMUNOASSAY machine.

Uric Acid Assays: Uric acid was estimated by Uricasemethod on BECKMAN COULTER AU480 machine .

3. Statistical Analysis and Results

Table 1: Age distribution of study subjects:

	Control	Cases
No of study subject	50	50
Age(yrs) Mean±SD	32.30±11.94	36.73±12.56

Table 1 suggest that cases were slightly older than controls.

Table 2: Sex distribution of study subjects:

	Control	Cases
Female	83.3%	80%
Male	16.7%	20%
Total	100%	100%

Table 2 suggest most of the cases and control were females

Table 3: Comparison of levels of TSH and Uric acid between cases and controls:

	Group 1 (N=50) Hypothyroid MEAN±SD	Group 2 (N= 50) Healthy controls MEAN±SD
TSH (µIU/ml)	83.10±15.49	2.88± 1.18
Uric acid (mg/dl)	7.82± 1.42	5.28± 0.93

Table 4: Result of uric acid between case and control group

Group	Mean	SD	P value
Case	7.82	1.42	<0.001
Control	5.82	0.93	

Table 4 depicting the comparison of the serum uric acid levels between the cases and the controls. Mean serum uric acid levels in cases were 7.82±1.42 mg/dL and 5.28 ± 0.93 mg/dL in controls. Mean serum uric acid levels were significantly increased in cases as compared to controls. This difference is statistically significant (p<.0001).

Table 5: Pearson's correlation:

parameters	Cases	
	r value	p value
UA vs TSH	0.479	<0.001

Table 5 showing the correlation of TSH with Uric acid and it is clear from table data that TSH is positively correlated with Uric acid. The difference between two variables is statistically significant (p<.001).

4. Discussion

Thyroid hormones are important for functioning of almost every body organ or tissue so thyroid deficiency can cause a wide range of metabolic disturbances. severe symptomatic cases of hypothyroidism can cause marked elevation of serum Uric acid either due to increased production or decreased excretion of uric acid or from a combination of two processes.

Our study showed the possible interrelationship between purine nucleotide metabolism and thyroid endocrine

disorders. Significant increase in uric acid levels was found in the patients with hypothyroidism.

Giordano et al. conducted a study among 28 patients with primary hypothyroidism and showed 33.3% prevalence of hyperuricemia in patients with hypothyroidism. Similar studies were conducted by Erickson et al.,(9) Dariyerli et al.,(10) and Yokogoshi and Saito (11) and found hyperuricemia in patients with hypothyroidism.

In hypothyroid patients, there is an excess ADP which is degenerated to xanthine. Xanthine is a substrate for Xanthine oxidase resulting in increased Uric acid production (12,13). Our study showed decreased level of T3 and T4 and increased TSH in the study when compared to that of control group. This is due to decreased synthesis of thyroid hormones and loss of negative feedback control when compared to healthy individuals.

The pathophysiology of renal function in hypothyroidism is multifactorial and many theories had been proposed. In hypothyroid state, cardiac output is decreased and circulating volume is diminished, resulting in a decreased renal blood flow or pre-renal insufficiency. In addition, the increase in systemic and renal vasoconstriction, probably from direct effect of thyroxine, may further lead to decrease renal blood flow. It may result in less excretion of uric acid.

5. Conclusion

Our studies shows there was increased level of uric acid in hypothyroid patient compared to normal individuals. The present study indicates the profound influence of thyroid hormone on renal function. Therefore, patients presenting with these biochemical abnormalities are recommended to be investigated for hypothyroidism and viceversa.

References

- [1] Orlova M M, Rodionova T I. Functional state of kidneys in patients with clinical manifestations of hypothyroidism. Russian Open Medical Journal. 2: 1-5 (2013)
- [2] Helford M, Grapo LM. Screening for thyroid disease. Ann intern Med 1990;112(11):840–58.
- [3] Schwarz C, Alexander BL, Spiros A, Georg MF, Heinz Z, Aristomenis KE, et al. Thyroid function and serum electrolytes: Does an association really exist? Eur J Med Sci 2012;142:w13669.
- [4] Farnsworth AE, Dobyns BM. Hypercalcaemia and thyrotoxicosis. Med J Aust 1974;2(21):782-4.
- [5] Karanikas G, Schutz M, Szabo M, Becherer A, Wiesner K, Dudczak R, et al. Isotopic renal function studies in severe hypothyroidism and after thyroid hormone replacement therapy. Am J Nephrol. 2004;24:41–5.
- [6] Giordano N, Santacroce C, Mattii G, Geraci S, Amendola A, Gennari C. Hyperuricemia and gout in thyroid endocrine disorder. ClinExpRheumatol. 2001;19:661–5. Excess serum accumulation can lead to diseases and mainly involved in gout.
- [8] Kidney Function Tests, page 686-689, Tietz Text book of Clinical Chemistry and Molecular Diagnostics, edited

- by Carl A. Burtis, Edward R. Ashwood et al, 5th edition, published by Saunders Elsevier
- [9] Harrison's principles of internal medicine. 18th ed. New York: McGraw Hill; 2008. Appendix table 2 page no 3595
- [10] Erickson AR, Enzenauer RJ, Nordstrom DM, Merenich JA. The prevalence of hypothyroidism in gout. Am J Med. 1994;97:231-4.
- [11] Dariyerli N, Andican G, Catakoglu AB, Hatemi H, BurcakG. Hyperuricemia in hypothyroidism: is it associated with post-insulin infusion glycemic response? Tohoku J Exp Med. 2003;199:59-68.
- [12] Yokogoshi Y, Saito S. Abnormal serum uric acid level in endocrine disorders. Nippon Rinsho. 1996;54:3360-3.
- [13] T.Sharmila Krishna, D.PavaniPriyanka and E.VenkatRao, Alterations of Serum Uric acid concentrations in subjects with Hypothyroidism, International Journal of Applied Biology and Pharmaceutical Technology, 2011; 2(2):322-326.
- [14] Giordano N, Santacroce C, MattiiG, Geraci S, Amendola A and GennariC, Hyperuricemia and gout in thyroid endocrine disorders, Clinical and Experimental Rheumatology. 2001 Nov-Dec; 19(6):661-665.

