

Evaluation of URIC Acid Levels in Hypothyroid Patients

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Abstract:Introduction:Thyroid gland produces hormones T3 and T4. The release of thyroid hormones from the thyroid gland is controlled by thyrotropin releasing hormone from the hypothalamus in the brain and by thyroid stimulating hormone produced by pituitary gland.Hypothyroidism is a clinical condition characterised by transient or progressive impairment of biosynthesis of thyroid hormones with compensatory thyroid enlargement. Its prevalence in the developed world is 4-5%^(1,2).

Aim:To evaluate uric acid levels in hypothyroid patients and to prevent onset of Gout in hypothyroidism.

Materials And Methods: The study was conducted in Osmania general hospital between January and March 2019.Both male and female subjects were included and in age group of 20-50 years. 40 Patients who were diagnosed clinically and biochemically as hypothyroid attending Out Patient Department were enrolled for the study.40 normal healthy individuals were included in the study as control group.

Results:serum uric acid level in hypothyroid subjects was significantly higher than in control subjects($P<0.001$).

Conclusion:It is important to evaluate serum uric acid levels routinely in hypothyroidism patients, to correct the possible altered purine nucleotide metabolism and to prevent the onset of gout.

Key words: hypothyroidism, serum uric acid, gout.

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I. Background

INTRODUCTION:

The thyroid gland produces two hormones, tri-iodothyronine (T3) and thyroxine (T4).The release of thyroid hormones from the thyroid gland is controlled by thyrotropin releasing hormone from the hypothalamus in the brain and by thyroid stimulating hormone produced by pituitary gland.T3 is synthesized from T4 and it is the active form. Thyroid hormones influence a wide array of metabolic pathways including protein, carbohydrate and lipid metabolism and maintenance of water and electrolyte homeostasis^(3,4). Thyroid hormones play a main role in cell differentiation during development and helps in maintaining thermogenic and metabolic homeostasis in the adult. Thyroid hormones affect metabolism, brain development, breathing, heart and nervous system functions, body temperature, muscle strength, skin dryness, menstrual cycles, weight, and cholesterol level^(5,6).

Primary hypothyroidism is a frequent syndrome, whose prevalence is 4-5%.Hypothyroidism occurs when thyroid gland is not producing enough of thyroid hormones.Impaired production of thyroid hormones primarily due to thyroid abnormality or iodine deficiency; sometimes may be secondary to pituitary or hypothalamic disorders⁽⁷⁾.Hypothyroidism is associated with weight gain, cold intolerance, constipation and also associated with kidney derangement resulting in increase in uric acid levels⁽⁸⁾.

Uric acid is the end product of purine metabolism in humans. Uric acid production varies with the purine content of the diet, rate of purine biosynthesis, degradation, and salvage pathway.^(9,10).Many studies revealed that hyperuricemia is associated with CVD & premature death from MI & stroke⁽¹¹⁻¹³⁾.Lowering uric acid levels associated with reduced risk.

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.Excess uric acid leads to accumulation leading to gout and increases risk of CVD . So this study was designed for estimation and observation of changes in serum uric acid level in hypothyroid patients.

II. Materials And Methods

The study was conducted in Osmania general hospital between Jan and Mar 2019.Both male and female subjects were included and in age group of 20-40 years. Prior consent was taken. 40 Patients who were diagnosed clinically and biochemically as hypothyroid attending Out Patient Department were enrolled for the study.40 normal healthy individuals were included in the study.

INCLUSION CRITERIA: Patients with Primary hypothyroidism .

EXCLUSION CRITERIA: a) Pregnancy b) Renal disorders. c) Hepatic disorders. d) Bone disorders. e) Diabetes, hypertension or any other systemic illness that may affect the renal function.

5ml of venous blood was collected observing universal precautions into red vacutainers. blood was allowed to clot and serum was separated after centrifuging at 3000rpm for 5 minutes and T3,T4,TSH were analysed by CLIA, and uric acid by Uricasemethod on BECKMAN COULTER AU480 machine .

III. Statistical Analysis

From our data the mean and SD of all the parameters were calculated in patients and control subjects. The p value was used to compare the patient mean value with control mean value and p value of <0.05 was considered statistically significant.

IV. Results

The study designed in Indian population for estimation of uric acid levels in hypothyroid patients. In the literature, the correlation between hypothyroidism and hyperuricemia is well established.

Tab 1: Age distribution of study subjects:

	Control	Cases
No of study subjects	40	40
Age (yrs) mean+/-SD	35.22+/-2.64	32.82+/-361

Tab 2:Comparison of study parameters in hypothyroid patients (cases) and control subjects:

PARAMETER	HYPOTHYROID MEAN+/-SD	CONTROL MEAN+/-SD	P VALUE
SERUM T3(ng/ml)	0.68+/-0.32	1.40+/-0.29	<0.001
SERUM T4 (µg/dl)	4.06+/-0.53	9.01+/-1.16	<0.001
SERUM TSH(µIU/ml)	14.51+/-2.24	2.86+/-1.18	<0.001
SERUM URIC ACID(mg/dl)	7.4+/- 0.89	4.33+/-0.29	<0.001

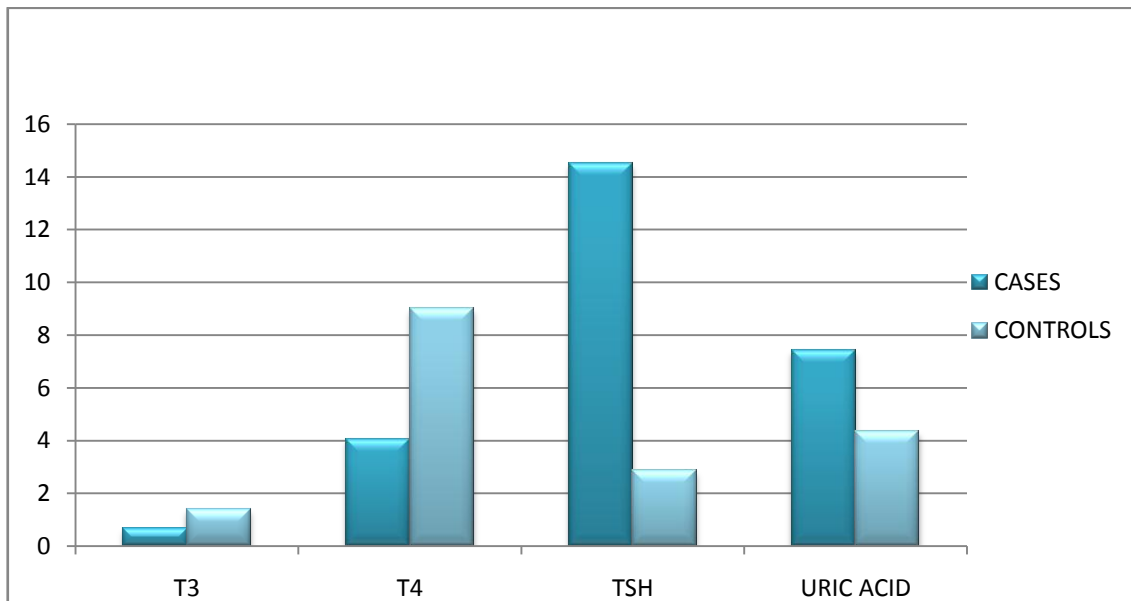


Fig 1.Biochemical variation in cases along with controls.

In the present study mean serum uric acid level in hypothyroid subjects was significantly higher than in control subjects. This finding is consistent with the studies done by other investigators. Mean serum uric acid levels in cases were 7.4+/-0.89 compared to 4.33+/-0.29 in controls.

V. Discussion

Thyroid hormones are important for functioning of almost every organ or tissue, deficiency can cause a wide range of metabolic disturbances. 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. In our study, we measured serum Uric acid in Primary hypothyroid patients and compared the same with the normal

healthy individuals. The mean serum Uric acid level was significantly high in the study group (7.4 ± 0.89 mg/dl) when compared to the control group (4.33 ± 0.29 mg/dl) and the p value is statistically significant.

S.Uric acid level depends on purine content of the diet, rate of purine synthesis, degradation and salvage pathway. In hypothyroidism, as metabolic rate is reduced ADP levels will be more as against ATP. Hence adenine is oxidized through xanthine oxidase system and liberates more uric acid^(14,15). In primary hypothyroidism, renal plasma flow is reduced in accordance with the changes in cardiovascular hemodynamics and glomerular filtration rate is decreased⁽¹⁶⁾. 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 So Serum Uric acid level is increased.

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.,⁽¹⁷⁾Dariyerli et al.,⁽¹⁸⁾ and Yokogoshi and Saito⁽¹⁹⁾ and found hyperuricemia in patients with hypothyroidism.

As cause and effect are not clear, more studies are required. As many studies support the present study, analysis of uric acid levels in hypothyroid subjects may be used as an associated biochemical parameter to follow the course of the disease. It may also be used to assess any myopathic changes are going on, as seen in advanced hypothyroidism.

VI. Conclusion

Our studies shows there was increased level of uric acid in hypothyroid patient compared to controls. Increase in Uric acid levels in hypothyroid cases may be due to increased production from excess ADP and decreased renal clearance either by systemic or renal vaso constriction. Therefore, patients presenting with hypothyroidism are recommended to be investigated for serum uric acid to prevent possible onset of Gout and hyperuricemia associated premature death from MI and stroke.

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