Study of uric acid levels in hypothyroid patients

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Abstract

Introduction: The thyroid gland produces two hormones, Thyroxin (T4) and Triiodothyronine (T3). These hormones play a critical role in cell differentiation during development and help maintain thermogenic and metabolic homeostasis in the adult. Hypothyroidism is a clinical condition in which the thyroid hormones production is below normal. It affects approximately 2% of the population.

Materials and Methods: This study was conducted over a period of one year among subjects having hypothyroidism at Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka. Ethics committee approval obtained prior to the study. Both female and male subjects were included in the study and all of them in the age group of 20-60 years. Patients (N = 120) who were diagnosed clinically and biochemically as hypothyroid for the first time who were attending OPD or admitted were enrolled for the study. 60 normal healthy individuals working in Sri Siddartha Medical College were included as control group.

Results: Serum uric acid levels were significantly increased in hypothyroid subjects when compared to controls (p value = 0.0001).

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. It may also help to observe set in myopathic changes in advanced hypothyroidism.

Keywords: Uric acid, Hypothyroidism, Triiodothyronine and Tetraidothyroxin.

Introduction

The thyroid gland synthesis of two hormones, Thyroxin (T4) and Triiodothyronine (T3).[1-3]

Uric acid is the end product of purine metabolism in humans due to loss of uricase activities.[4,5] The evolutionary advantages of uric acid Anti-oxidantinc life expect and BP control in times of low salt ingestion, Intelligence along with Neurodegenerative protective effects. Uric Acid pathologically associated with vascular damage & inflammation.[6,7]

Recent studies shows that hyperuricemia is associated with CVD & premature death from MI & stroke.[8-10] Lowering uric acid levels associated with reduced risk. In hypothyroidism, because of low metabolic profile ADP levels will be more as against ATP. Hence adenine is oxidised through xanthine oxidase system and liberates more uric acid.[11-13]

Uric acid is the final breakdown product of purine degradation in humans. Uric acid production varies with the purine content of the diet, rates of purine biosynthesis, degradation, and salvage.[14,15] The present study was undertaken to evaluate serum uric acid levels in subjects along with hypothyroidism.

Materials and Methods

This study was conducted over a period of one year at Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka. Ethics committee approval was obtained prior to the study. Both male and female subjects were included and all age group of 20-60 years.

Patients who were diagnosed clinically and biochemically as hypothyroid (n=120) attending Out Patient Department or admitted in the wards were enrolled for the study. 60 normal healthy individuals working in Sri Siddartha Medical College were included as control group. Patients with diabetes mellitus, hypertension, renal disease and those on drugs that affect uric acid excretion like thiazide diuretics were excluded. Highly lipaemic and haemolysed specimens were also excluded.

Informed consent was taken from all subjects. 5 ml of blood collected in a plain vacutainer. Serum obtained after centrifugation was divided into two aliquots – one for thyroid profile and the other for uric acid, and were stored at -20 °C until batch analysed.

Serum fT3, fT4, TSH were assayed using ELISA (enzyme linked immuno sorbent assay) kit obtained from HUMAN GmBH, GERMANY. Serum uric acid was estimated by PAP method (enzymatic colorimetric test for uric acid with lipid clearing factor) in semi-automated Chemistry Analyser [Erba Chem 7 (Transasia)] using available commercial kit. Normal values of fT3, fT4, TSH, and Uric acid are 1.4-4.2pg/ml, 0.8-2ng/dl, 0.3-6.2mIU/L and 2.5-6.2mg/dl respectively.

Statistical Analysis

Our data suggested that values were mean ± standard deviation. The mean and SD of all the parameters of the study were calculated in patients and control subjects. The p value was used to compare the patient mean value with control mean value and A p value of <0.05 was considered statistically significant.

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.

Table 1: Comparison of study parameters in hypothyroid patients (cases) and control subjects

Parameter	Hypothyroid (n=120) Mean ± SD	Controls (n = 60) Mean ± SD	*p* value
Serum FT_3 (pg/ml)	2.02 ± 0.10	2.63 ± 0.11	<0.0001
Serum FT_4 (ng/dl)	0.55 ± 0.09	1.23 ± 0.12	<0.0001
Serum TSH (mIU/ml)	26. 3 ± 1.68	2.34 ± 0.16	<0.0001
Serum uric acid (mg/dl)	6.1 ± 0.29	4.33 ± 0.29	<0.0001

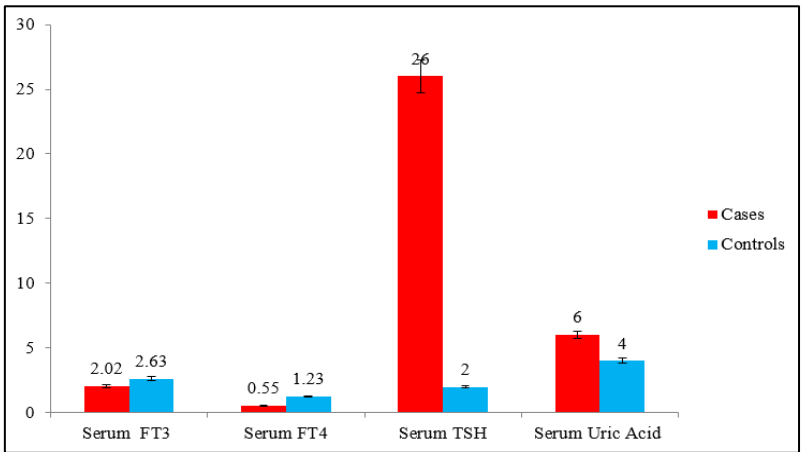

Fig. 1: Biochemical variation in cases along with controls

Serum Free T_3 *p* value and the 2-tailed *p* value is < 0.0001, this difference is highly statistically significant.
Serum Free T_4 *p* value and the 2-tailed *p* value is < 0.0001, this difference is highly statistically significant.
Serum Thyroid Stimulating Hormone *p* value and the 2-tailed *p* value is < 0.0001 by conventional criteria, this difference is this difference is highly statistically significant.
Serum Uric acid *p* value and the 2-tailed *p* value is <0.0001 by conventional criteria, this difference is this difference is highly statistically significant.

Discussion

In hypothyroidism, because of low metabolic profile ADP levels will be more as against ATP. Hence adenine is oxidized through xanthine oxidase system and liberates more uric acid. The purpose of the present study was therefore to determine the relationship between renal function and thyroid status. Thurman JM et al shows Long-standing hypothyroidism can cause significant reversible changes in renal function such as a decrease in sodium resorption in the proximal tubules, impairment in the concentrating and diluting capacities of the distal tubules, a decrease in urinary urate excretion, and a decrease in renal blood flow and glomerular filtration rate (GFR).[16] del Greco FR, et al[17] shows in hypothyroid state, hypovolemia occurs due to decreased cardiac output shows fall in renal blood flow. Thyroxine was to an high in systemic and renal vasoconstriction and also finally leading to decreased renal blood flow.[18]

The cause of the low renal plasma flow and GFR observed is believed to be normally due to the commonly hypodynamic state of the Cardio vascular system in hypothyroidism. K Reisman SH et al[19] and Kaptein EM.[20] Hypothyroidism was related with low plasma renin, which might cause an high levels of creatinine and uric acid ranges.

Cause & effect not entirely clear. Data available are insufficient for proof. Challenge – adjusting for multiple comorbidities. Do reveal trends– more studies indicated the present study, based on a limited number of cases, showed a increased prevalence in hyperuricemia in hypothyroid patients. Hence 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 used to assess any myopathic changes are going on, as seen in advanced hypothyroidism.

Conclusion

Uric acid levels within physiological limits are elevated in hypothyroid subjects. Hypothyroidism affects renal blood flow, GFR, tubular function and also water and electrolyte balance.

Therefore, our assumption was the importance of the routine estimate of serum uric acid ranges in hypothyroid patients. The possible corrected purine nucleotide metabolism and also to prevent the onset of gout. It may also help to observe set in of myopathic changes in advanced hypothyroidism.

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Conflict of Interest: None.

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