Association Of Serum Uric Acid And Creatinine Levels With Hypothyroidism

Gulab Kanwar
Kusum Bala Jain
Jitendra Jain
Kshetrapal Singh Shekhawat
Rahul Kabra
Rohit Jain
Department of Biochemistry,
Government Medical College, Kota, Rajasthan, India

Abstract: Introduction: Thyroid disorders are the most common disorders of the endocrine glands. In recent studies it was found that hypothyroidism may also associated with kidney derangement resulting in high serum creatinine and uric acid levels. So this study was conducted for estimation and observation of changes in serum uric acid and creatinine levels in hypothyroid patients.

Material And Method: This study was conducted in Department of Biochemistry, GMC Kota. 50 patient samples and 50 control samples were taken. Serum was separated and serum uric acid and creatinine levels were estimated by fully Automated Analyzer ERBA EM 360. Thyroid estimation was done on Roche Chemiluminescence Analyzer. Data was analyzed using Mann-Whitney U test.

Result: Cases have significantly higher values for serum uric acid and creatinine levels than controls and have significant positive correlation with TSH.

Conclusion: Hypothyroidism is associated with increased serum uric acid and creatinine and impaired renal function. Therefore, patients presenting with these biochemical abnormalities are recommended to be investigated for hypothyroidism and vice versa.

Keywords: Hypothyroidism, uric acid, Creatinine, Hyperuricemia

I. INTRODUCTION

Thyroid disorders are the most common disorders of the endocrine glands. It is estimated that about 42 million people suffer from thyroid disorders in India and women are 6 times more prone than men.

Hypothyroidism is the most common pathologic hormone deficiency among the endocrine disorders. It may be due to primary disease of the thyroid gland itself or lack of pituitary TSH.

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones which, in turn, results in a generalized slowing down of metabolic processes. Hypothyroidism may also associated with kidney derangement resulting in high serum creatinine and uric acid levels.

Uric acid is the end product of purine metabolism in humans. Excess serum accumulation can lead to various diseases, and most notably uric acid is causally involved in the pathogenesis of gouty arthritis.

As hypothyroidism is associated with many biochemical abnormalities including high serum creatinine and uric acid levels. It is of paramount clinical importance, proper knowledge of these abnormalities and their consequential effects are very important and useful for clinical management of the patients.

So, this study was designed for estimation and observation of changes in serum uric acid and creatinine levels in hypothyroid patients.

II. MATERIAL AND METHOD

This study was performed in the Department of Biochemistry, Government Medical College, Central Laboratory NMCH and MBS Hospital Kota from period of
September 2014 to August 2015. 50 patient samples and 50 control samples were taken.

**INCLUSION CRITERIA:**
- Patients with newly diagnosed hypothyroidism.
- Age group between 10 years to 70 years.

**EXCLUSION CRITERIA**: Patients with the following diseases were excluded from the study
- Patients on thyroxine treatment
- Patients on hypolipidemic drugs, antihypertensives, steroids.
- Patients with renal disease, liver disease, cardiovascular disease and diabetes mellitus.
- Critically ill patients admitted in intensive care unit
- Pregnancy and patients on drugs.
- Patients with gout and hypertension.
- Patients not willing to participate in study.

After explaining the type of study, written consent was taken from all the subjects. A 12-hour fasting period, venous blood samples were collected from all the cases and controls. Serum was separated and serum uric acid and creatinine levels were estimated by fully Automated Analyzer ERBA EM 360. Thyroid estimation was done on Roche Chemiluminescence Analyzer.

**STATISTICAL ANALYSIS**: Statistical analysis was done using suitable statistical tool. Data was estimated on excel sheet and analysed statistically. Quantitative data was summarized in the form of MEAN ± SD and differences in means of both the groups was analyzed using Mann-Whitney U test. The P value <.05 was taken as significant.

### III. RESULTS

Table between serum Uric acid levels in cases and controls:

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD (mg/dl)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>6.2 ± 1.19</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Controls</td>
<td>4.78 ± 1.18</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1**

Table between serum Creatinine levels in cases and controls:

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD (mg/dl)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>0.992 ± 0.32</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Controls</td>
<td>0.79 ± 0.21</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>Lab variables</th>
<th>Cases</th>
<th>r value</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA vs TSH</td>
<td>0.394</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Creatinine vs TSH</td>
<td>0.496</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2**

Table no.2 depicts the serum Creatinine levels in cases and controls, showing mean serum Creatinine 0.992 ± 0.32 (mg/dl) in cases and 0.79 ± 0.21 (mg/dl) in controls. This difference is statistically significant (p<.05).

Table no.3 depicts the correlation of TSH with Uric acid and Creatinine and showing TSH is positively correlated with Uric acid and Creatinine. These all differences were statistically significant (p<.05).

### IV. DISCUSSION

Hypothyroidism is a condition in which the body suffers from insufficient thyroid hormone. Thyroid hormones are crucial for the proper functioning of almost every body organ or tissue, and thyroid deficiency thus produces a wide range of metabolic disturbances.

Hypothyroid state may induce subtle renal impairment and in several severe symptomatic cases of hypothyroidism progressive marked elevation of serum Uric acid and creatinine has been described.

This study was undertaken to understand the effect of Uric acid and creatinine in hypothyroid patient compared to healthy control subjects. Serum Uric acid level was significantly increased in hypothyroid patients than controls (p<.05) as illustrated in Table no. 1. Hyperuricemia leading to gout had been reported in Hypothyroid subjects in a few studies done around the world. The study done by Tayal D et al showed that no case of gout was reported despite the presence of Hyperuricemia in overly Hypothyroid cases. The increase in uric acid in Hypothyroid state may result from either increased production due to myopathy associated with Hypothyroidism or due to the decreased renal clearance of uric acid.

Table No. 2 describes increased serum creatinine level in hypothyroid patients than controls (p<0.05). Kreisman and Hennessy in their study found that mean serum creatinine level in hypothyroid cases was significantly greater in comparison to euthyroid value. In another study on 14 newly diagnosed hypothyroid patients in Switzerland, mean serum creatinine level was found elevated and decreased after thyroxine replacement therapy.

The pathophysiology of renal function in hypothyroidism is multifactorial and many theories had been proposed. First, 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. Second, it has also been suggested that thyroxine may mediate tubular secretion of creatinine. Thyroxine may regulate transcription in the sarcoplasmatic reticulum, affecting the Na+/Ca2+exchanger and the Na+/K+ -ATPase activity in the kidneys and these processes are related to the active secretion of creatinine. Third, in hypothyroid patients, myopathy, elevated serum creatinine phosphokinase and even rhabdomyolysis may occur. Enhanced release of creatinine may lead “pseudo” renal dysfunction and Kreisman et al found
that there was lack of apparent correlation between levels of creatine kinase and degree of renal failure.

we also found uric acid and creatinine were significantly correlated with TSH illustrated in Table No 3, which is in accordance of previous studies.

V. CONCLUSION

The present study was designed to evaluate the changes of serum uric acid and creatinine in hypothyroidism patient and to correlate the changes in uric acid and creatinine according to thyroid profile. This study confirms that hypothyroidism is associated with increased serum uric acid and creatinine and impaired renal function. Therefore, patients presenting with these biochemical abnormalities are recommended to be investigated for hypothyroidism and vice versa.

REFERENCES