Original Article

Association of Hyperurecmia with Hyperthyriodism - A Cross Sectional Descriptive Study

Hyperurecmia with Hyperthyriodism

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ABSTRACT

Objective: To assess the uric acid levels of hypothyroid individuals in order to potentially prevent and cure issues resulting from hyperuricemia.

Study Design: A Cross Sectional Descriptive Study

Place and Duration of Study: This study was conducted at the Gulab Devi Hospital, Lahore from 05 Jan 2021 to 05 January 2022.

Methods: This was a cross sectional descriptive study in which random sampling technique was used. Clotted blood samples (3cc each) of 100 diagnosed hypothyroid patients were collected randomly and processed at Pathology lab of Gulab Devi Educational Complex.

Results: Of the 100 people who received a hypothyroidism diagnosis, 93 (93%) were found to be female and 7 (7%) to be male. The average age of the participants was 26.01 ± 5.21, and the standard deviation showed how variable this mean was. After measurements of uric acid concentrations, an average value of 4.2930 ± 1.82415 was obtained. Interestingly, 16 people had increased uric acid levels and 84 people had levels within the usual range. Of the latter, two were men and fourteen women. Interestingly, there was no statistically significant link found in this investigation between blood uric acid levels and thyroid hormones.

Conclusion: The present investigation revealed a modest correlation between hyperuricemia and hypothyroidism. Interestingly, there was no significant relationship seen between blood uric acid levels and thyroid hormones T3, T4, and TSH. The nature of this association is still up for debate, which emphasizes the need for further thorough studies to come to a definitive conclusion.

Key Words: Hypothyroidism, Uric acid, Hyperuricemia

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INTRODUCTION

Under the influence of TSH, which is released from the anterior pituitary and acts on TSH receptors to release thyroid hormones, the (thyroid gland) synthesizes and secretes thyroxine (T4) and triiodothyronine (T3).

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By binding thyroid hormone receptors, these hormones control several metabolic processes[1]. The maintenance of thermogenic homeostasis and several metabolic pathways is significantly influenced by thyroid hormones[2]. A clinical condition known as hypothyroidism is brought on by a thyroid hormone shortage, which slows down metabolic activities generally[3]. According to recent research, thyroid hormone may control our body's uric acid levels[4]. Uric acid is produced as a byproduct of purine metabolism in humans due to a lack of uricase enzyme activity[5].

Reduced renal plasma flow and GFR as a consequence of hemodynamic alterations brought on by hypothyroidism's decreased metabolic rate may result in abnormal renal function and high uric acid levels[6]. Hypothyroidism also affects purine metabolism and may result in changes to uric acid levels[7]. In summary, long-term hypothyroidism may result in major alterations such as a reduction in renal blood flow and glomerular filtration rate, impairment of the distal tubule's ability to concentrate and dilute, decreased urate excretion, and decreased salt reabsorption by the proximal tubule[8].

A number of earlier studies have shown a significant association between hyperuricemia and unbalanced

blood thyroid hormone levels. In these investigations, a prevalent mechanism that has been suggested by many researchers as the possible reason for elevated blood uric acid levels in a hypothyroid condition is related to reduced glomerular filtration rate and renal perfusion[9,10].

Uric acid has been shown in literature to have an additional significant protective effect as an antioxidant in humans to guard against oxidative stress; hence, hypothyroidism may result in an increase in uric acid levels to lessen continuous oxidative stress[11]. The antioxidant system is significantly impacted by thyroid diseases, which may result in an increase in oxidative stress, which is marked by an increased generation of reactive oxygen species. Elevated oxidative stress resulting from thyroid dysfunction may serve as a trigger for the development of hyperuricemia in hypothyroid individuals[12].

Numerous investigations revealed that hypothyroid individuals had higher uric acid levels. This research aimed to assess the relationship between hyperuricemia and hypothyroidism in our experimental setup.

METHODS

During the course of six months, this cross-sectional descriptive research was prepared and carried out. From Jan 2021 to Jan 2022, the study was conducted at the Gulab Devi Educational Complex's pathology lab in Lahore. Following all ethical guidelines and with informed agreement, 100 patients at Gulab Devi Teaching Hospital who had been diagnosed with hypothyroidism were chosen to participate in this research.

Sample size = n = Z2α/2pq is the formula (Cochran equation).

One hundred samples in all were gathered. The study's participants were chosen using the random sampling technique. Three milliliters of clotted blood were drawn from each of the one hundred patients who had been diagnosed with hypothyroidism. These samples were acquired in an unbiased way. The obtained samples were then processed to ascertain the uric acid content. This assay was performed at the Pathology department of the Gulab Devi Teaching Hospital in Lahore using a uric acid kit.

Inclusion criteria: The patients who had been diagnosed with hypothyroidism were included.

• Been alive for 13 to 45 years.

Exclusion-criteria:

Following patients were excluded from the study:

• Alcoholic patients.
• Who refuse to give consent.
• Critically ill patients
• Patient with end stage renal disease.

The current study included 100 people in which both males and females were selected. An informed consent was taken from the people involved in the study. Uric acid levels were measured by uric acid kit.

Statistical Analysis: Following the collection of data from surveys, the Chi Square Test and descriptive statistics like mean, median, mode, and standard deviation were used to analyze the data. SPSS version 25 was used to statistically evaluate all of the data that was gathered.

RESULTS

Among the 100 people who received a hypothyroidism diagnosis, there was a significant gender difference: 93% of the cases were in females and 7% in males. According to the cohort's demographic profile, the mean age ranged from 18 to 38 years old, with a mean of 26.01±5.21 years. The results of the quantitative evaluation of uric acid concentrations showed that the mean was 4.2930±1.82415 mg/dL, and the maximum was 8.00 mg/dL. Of the subjects, 84 had uric acid levels that were within the normal range and 16 had high levels. There were two men and fourteen women among them. It's interesting to note that the study found a weak and ambiguous link between hyperuricemia and hypothyroid function. Interestingly, within the confines of this investigation, the complex interactions between serum uric acid levels and thyroid hormones (TSH, T3, T4, and TSH) did not produce statistically significant associations.

The following are the parameters' descriptive statistics: The mean and standard deviation for thyroxine (T4) were 2.38±0.74 µg/dL. The mean and standard deviation of triiodothyronine (T3) were 36.64±9.08 ng/dL.

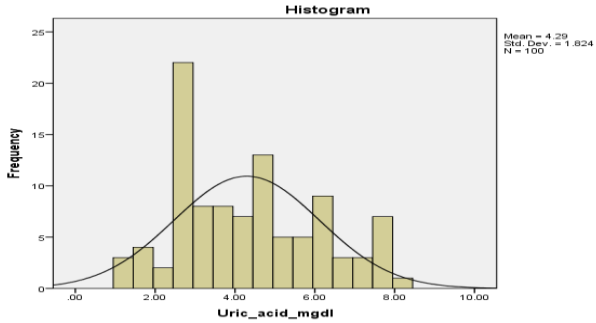

Figure No.1: Frequency Distribution of uric acid.

Table No.1: Demographic and Uric Acid Level Characteristics of Hypothyroid Patients

Characteristic	Total (N=100)	Male (N=7)	Female (N=93)
Mean Age (years)	26.01 ± 5.21		
Uric Acid Level (mg/dL)			
- Normal Range	84 (84%)	2 (29%)	82 (88%)
- Elevated	16 (16%)	5 (71%)	11 (12%)

Table No.2: Descriptive Statistics of Uric Acid Levels (mg/dL)

Statis-tic	N	Mean	Median	Std. Deviation	Min.	Max.
Uric Acid	100	4.2930	4.2000	1.82415	1.20	8.00

The mean and standard deviation of thyroid-stimulating hormone (TSH) were 26.64±25.54 mlU/L. The weight distribution was 61.18±7.62 kg for the mean and standard deviation. The mean and standard deviation of the diastolic blood pressure (DBP) and systolic blood pressure (SBP) were found to be 84.75±6.33 mmHg and 128.15±8.547 mmHg, respectively.

DISCUSSION

The (thyroid gland) is a key component of the endocrine system, which produces, stores, and releases a wide range of hormones into the bloodstream that are essential for carrying out bodily processes. Thyroid hormones are produced by the (thyroid gland) and released into the bloodstream to carry out various bodily processes. Effects of thyroid hormones (T3, T4) and thyroid stimulating hormone (TSH) on the kidney, pituitary, liver, brain, and heart[13]. Human purine metabolism produces uric acid (UA), a water-soluble byproduct mostly generated by the liver. Additionally, it functions as a potent antioxidant, preventing damaging effects of free radicals and shielding vital cellular components, such as nuclear material and cell membranes, from oxidative stress. (DNA). One of the most significant biochemical markers is uric acid, which functions as an antioxidant and is impacted by thyroid dysfunction. Thyroid dysfunction also has an impact on purine metabolism, which may lead to an increase in uric acid levels.

In those with hypothyroidism, reduced renal plasma flow and impaired glomerular filtration may also result in hyperuricemia[14]. Significant and reversible changes in renal function linked to chronic hypothyroidism have been shown in a study[15]. These changes include decreased excretion of urates in the urine, a decrease in sodium resorption in the proximal tubules, a compromise in the concentration and dilution capacities of the distal tubules, and a reduction in renal blood flow and glomerular filtration rate (GFR). These results are consistent with earlier studies by other investigators who found significantly higher uric acid levels in hypothyroid individuals[16,17]. Previous research has shown that those with hypothyroidism are more likely to develop hyperuricemia. Thus, measuring uric acid levels in hypothyroid individuals may be an important biochemical indicator for tracking the course of the condition and reducing the risks related to hypothyroidism.

There has been conflicting evidence in the scientific literature on the relationship between thyroid problems and hyperuricemia. A modest correlation was found in a research by Jat A et al. between hyperuricemia and hypothyroidism[1]. Evidence suggests that renal function is a more significant factor in determining serum uric acid levels in people, even if hyperuricemia in the setting of hypothyroidism is thought to be produced by increased uric acid synthesis in response to oxidative stress brought on by the illness. Serum uric acid levels are elevated in hypothyroidism due to a combination of diminished renal plasma flow and impaired glomerular filtration.

There is still uncertainty about the connection between hypothyroidism and hyperuricemia despite the amount of research that has been done. The purpose of this research was to look at the relationship between hypothyroidism and hyperuricemia. Of the 100 instances of hypothyroidism that were detected within the parameters of this research, 93 were found to be female and 7 to be male. Out of these people, 84 had normal uric acid levels and 16 (two men and fourteen women) had increased levels.

We investigated the possibility of a connection between uric acid levels and hypothyroidism since hypothyroidism is known to cause impaired renal perfusion and disturbances in purine nucleotide metabolism. Nevertheless, there was no statistically significant link found in our research between hypothyroidism and hyperuricemia. This suggests that the metabolism and excretion of uric acid may not be significantly impacted by hypothyroidism. More thorough studies with bigger patient cohorts are necessary to get a conclusive result.

CONCLUSION

In several investigations, the possible effects of hypothyroidism on blood uric acid levels have been examined. Nevertheless, there was no discernible correlation between hyperuricemia and hypothyroidism in our investigation. Variations in the environment and the small sample size may have had an impact on the results. In order to get a more thorough knowledge of the impact of hypothyroidism on blood uric acid levels, future research attempts should include bigger sample sizes.

Abbreviations: Thyroid stimulating hormone (TSH), uric acid (UA), glomerular filtration rate (GFR), systolic blood pressure (SBP), diastolic blood pressure (DBP), deoxyribose nucleic acid (DNA).

Author's Contribution:

Concept & Design of Study:	Faiza Javaid
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Revisiting Critically:	Faiza Javaid, Nida Javed
Final Approval of version:	Faiza Javaid

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