

FREQUENCY OF HYPERURICEMIA IN THYROID DYSFUNCTION

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ABSTRACT

Objective: To determine the frequency of hyperuricemia in patients with thyroid dysfunction.

Study Design: Cross-sectional descriptive study.

Place and Duration of Study: Department of Chemical Pathology, Army Medical College Rawalpindi, National University of Sciences & Technology (NUST) Islamabad and Military Hospital (MH) Rawalpindi, from Apr 2013 to Jun 2014.

Material and Methods: Fifty five individuals with thyroid dysfunction were included in this study. Detailed history was recorded on a questionnaire, blood samples were collected and serum total tri-iodothyronine (T3), free thyroxine (T4), thyroid stimulating hormone (TSH) and uric acid levels were measured.

Results: Among the fifty five participants, 16 (29.1%) were male while 39 (70.9%) were females. Mean age of the subjects was 45.49 ± 16.7 years in this study. Hyperuricemia was observed in seventeen (30.9%) individuals with thyroid dysfunction. Mean serum uric acid level was found to be 418.3 ± 147 $\mu\text{mol/l}$ in participants.

Conclusion: High frequency of hyperuricemia occurs in patients with thyroid dysfunction. Therefore in patients presenting with thyroid dysfunction, evaluation of underlying hyperuricemia should be considered by the clinicians.

Keywords: Thyroid dysfunction, Uric acid, Hyperuricemia.

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INTRODUCTION

Uric acid has been regarded since long as a non-specific finding, unless it is complicated by gout or renal stones¹. However, a number of recent epidemiological studies have found a significant association between hyperuricemia and cardiovascular diseases, in addition to other risk factors including obesity, hypertension, dyslipidemia and metabolic syndrome²⁻⁴. Uric acid is the product of purine metabolism and has physiological interactions with thyroid hormone levels. Thyroid dysfunction may alter the rate of purine metabolism resulting in hyperuricemia⁵. A number of studies have proven a significant correlation between deranged serum thyroid hormone levels and hyperuricemia⁶⁻⁸. The most possible mechanism suggested by various researchers to be responsible for raised serum uric acid levels in hypothyroid state is decreased

renal perfusion and decreased glomerular filtration rate. On the other hand, increased rate of purine metabolism during hyperthyroid state has been suggested to result in hyperuricemia⁹.

A protective role of uric acid has also been reported in literature owing to its anti-oxidant properties and it has also been suggested that hyperuricemia may result from the ongoing oxidative stress inside the body¹⁰. On the other hand, literature also shows that thyroid disorders have a strong effect on antioxidant system and oxidative stress, with the increased production of reactive oxygen species¹¹. This increased oxidative stress resulting from thyroid dysfunction may serve as a possible stimulus for causing hyperuricemia in these patients. Apart from this, the association of hyperuricemia and thyroid dysfunction with cardiovascular diseases, as reported in a large number of studies, cannot be overlooked^{2,4,12,13}. According to a Chinese cohort study, serum uric acid levels were found to be increased in 16% of all causes of mortality and in 39% of deaths due to cardiovascular

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diseases¹⁴. Co-occurrence of thyroid dysfunction and hyperuricemia can further increase the risk of predisposition to cardiovascular diseases and can influence the diagnosis, prognosis and management of these patients. Keeping in view this point of paramount clinical importance, this study was designed to estimate the frequency of hyperuricemia in patients with thyroid dysfunction.

MATERIAL AND METHODS

This cross-sectional descriptive study was carried out at Department of Chemical Pathology, Army Medical College Rawalpindi, National University of Sciences & Technology (NUST) Islamabad and Military Hospital (MH)

included in this study. After documenting the detailed medical history of the participants on a questionnaire, blood samples were collected. Centrifugation of these samples was carried out followed by the biochemical analysis on chemistry autoanalyzers. Serum total triiodothyronine (T3), free thyroxine (T4) and thyroid stimulating hormone (TSH) levels were estimated using Immulite 1000 (Siemens Laboratory Diagnostics, Germany) while LFTs, RFTs and serum uric acid level were estimated using fully automated chemistry analyzer (Vita Lab Selectra E, Netherlands).

The normal ranges for serum TSH, free T4 and total T3 were: 0.40-4.50 mIU/L, 8-24 pmol/L

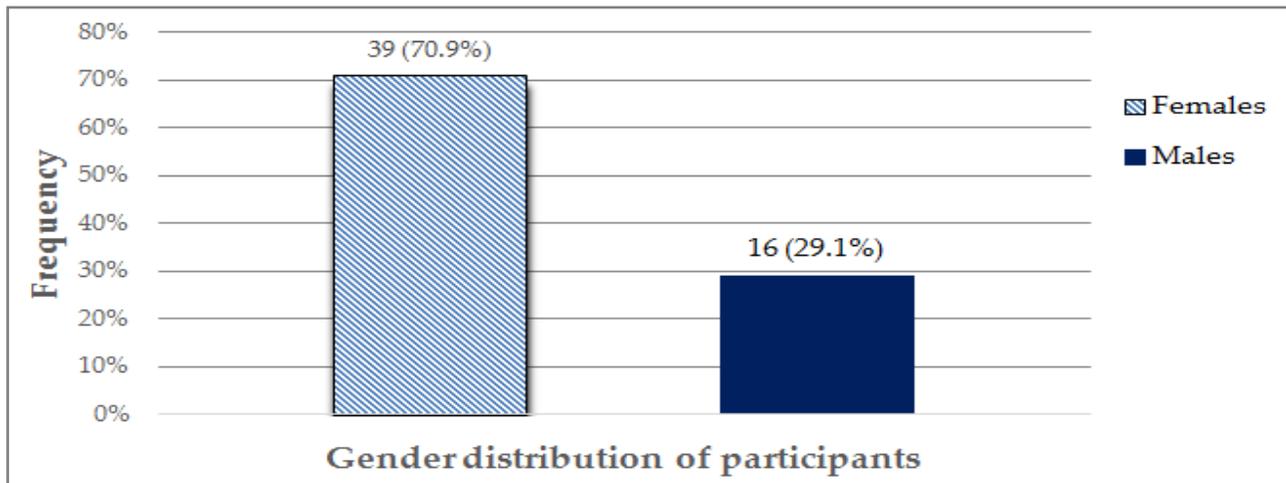


Figure-1: Gender distribution of study subjects.

Rawalpindi, from April 2013 to June 2014 after getting institutional permission. Formal consent was obtained from the subjects. Fifty-five patients who were recently diagnosed to have thyroid dysfunction (hypothyroidism or hyperthyroidism) were included in this study by non probability convenience sampling. Thirty three of these participants were hyperthyroid while twenty two were hypothyroid. Subjects with any chronic illness and those with any hepatic or renal disease were excluded. Liver function tests (LFTs) and renal function tests (RFTs) were carried out to rule out any hepatic or renal derangements. Subjects using medications that may have affected our results were also not

and 1.2-3.0 nmol/L respectively. Hyperuricemia was defined as serum uric acid level >380 $\mu\text{mol/L}$ in females and >430 $\mu\text{mol/L}$ in males. SPSS version 21 was used to analyze data. Mean and standard deviation were calculated for quantitative variables while frequency and percentage were calculated for qualitative variables.

RESULTS

Fifty five patients with thyroid dysfunction were included in this study comprising of 33 (6%) hyperthyroid and 22 (40%) hypothyroid subjects. Out of total fifty five participants, thirty nine (70.9%) were female while sixteen (29.1%) were

male (fig-1). Mean age of the participants was 45.5 ± 16.7 years. When serum uric acid level was measured, high frequency of hyperuricemia was noted in these individuals. Seventeen (31%) participants had hyperuricemia while normal serum uric acid level was seen in rest of the subjects (fig-2). Hyperuricemia was found to be more common among the hyperthyroid 13 (39.4%) than the hypothyroid patients 4 (18.2%). Mean serum uric acid level was also high among the participants $418.3 \pm 147 \mu\text{mol/L}$.

population⁶. Khan et al also reported increased serum uric acid levels among hypothyroid subjects than euthyroid controls and concluded in their study that hyperuricemia was associated with hypothyroidism¹⁶. Similar findings have been reported by other studies conducted in this regard^{15,17}. In concordance to the findings of these studies, high frequency of hyperuricemia was observed among the patients with thyroid dysfunction in our study. Hyperuricemia was found to be more common among the hyperthyroid individuals in the present study. In

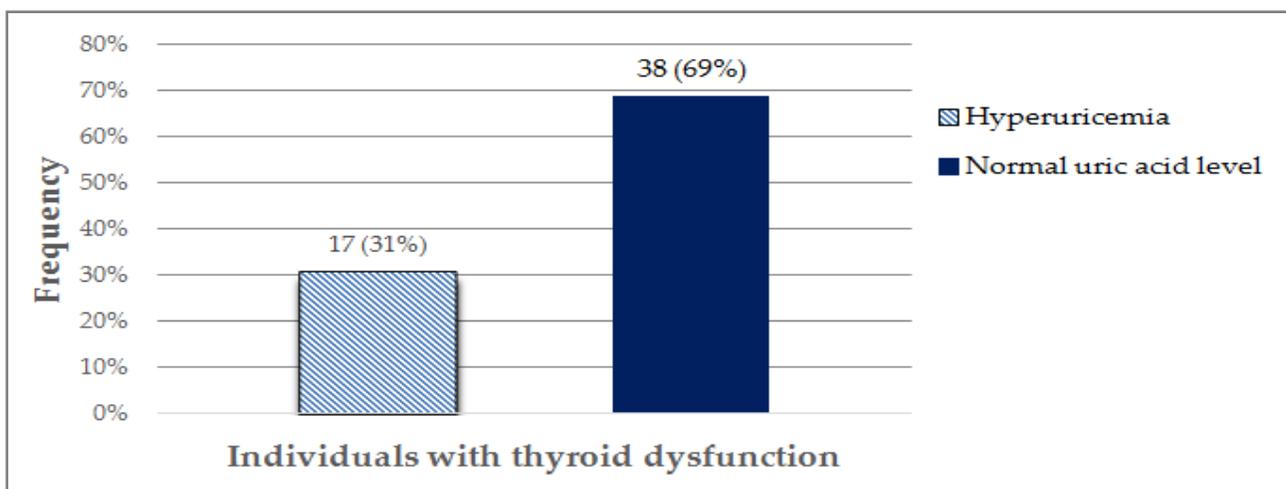


Figure-2: Frequency of hyperuricemia in individuals with thyroid dysfunction.

DISCUSSION

Thyroid dysfunction causes several biochemical abnormalities in body including abnormalities in uric acid metabolism⁵. A number of scientific studies have explored the association of thyroid dysfunction with serum uric acid levels. It was revealed by most of these studies that a high frequency of hyperuricemia occurs in patients with deranged serum thyroid hormone levels when compared to general population^{6,9,15}. In hypothyroidism, hyperuricemia occurs secondary to decreased renal plasma flow along with impaired glomerular filtration, while hyperuricemia in hyperthyroidism is the result of increased uric acid production⁶. Giordano et al estimated the prevalence of hyperuricemia in patients having thyroid dysfunction and revealed that hyperuricemia was significantly increased in these patients than its prevalence in general

contrast to our finding, Khan et al and Wedaatala & Abdella found high frequency of hyperuricemia in hypothyroid group than the hyperthyroid group^{5,16}

Arora et al reported significantly raised mean serum uric acid level among the patients with thyroid disorders than their healthy counterparts¹⁷. Similar results were reported in a study conducted by Tayal et al and in addition to that, they also noted a positive correlation between serum TSH levels and serum uric acid levels¹⁵. In agreement to the findings of these studies, mean serum uric acid level of individuals with thyroid dysfunction was found to be elevated in our study.

CONCLUSION

The study concludes that a high frequency of hyperuricemia occurs in individuals with thyroid

dysfunction. Individuals presenting with thyroid dysfunction should be assessed for the presence of hyperuricemia and likewise, hyperuricemic individuals should be assessed for underlying thyroid disease. Since both hyperuricemia and thyroid dysfunction pose independent risk of cardiovascular diseases, frequent evaluation of such individuals is recommended for the development of cardiovascular co-morbidities.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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