Evaluation of serum Uric Acid levels in Primary Thyroid Dysfunction

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Submission date: 18-Dec-2017 11:08PM (UTC+0500)
Submission ID: 897687604
File name: 17964-Aisha_Ayyub.docx (35.95K)
Word count: 1421
Character count: 8540

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ABSTRACT

Objective: To evaluate the levels of serum uric acid in patients with primary thyroid dysfunction

Methods: This cross sectional study was carried out at Military Hospital (MH) Rawalpindi, from July 2014 to December 2014 after obtaining the ethical and institutional permission. A total of sixty patients, both males and females newly diagnosed with primary thyroid dysfunction were recruited through non-probability purposive sampling. Informed written consent was obtained from each participant. Patients were categorized in primary hyperthyroid (serum TSH < 0.40 mIU/L) and primary hypothyroid (serum TSH > 4.50 mIU/L) groups. Serum uric acid levels of both groups were estimated and levels > 420 µmol/L in males and > 360 µmol/L in females were labeled as hyperuricemia. Results were entered and analyzed through SPSS version 21.

Results: Out of sixty participants, 21 (35%) patients were male while 39 (65%) patients were females with mean age of 42.31±11.27 years. Primary hypothyroidism group consisted of 43 (71.7%) patients while 17 (28.3%) patients fell in primary hyperthyroidism group. Elevated serum uric acid levels were present in 65% patients including 31 (79%) hypothyroids and 8 (21%) hyperthyroid patients. However, difference among mean Serum uric acid levels of both groups was insignificant (385.27 ± 182 µmol/L and 316.95 ± 169 µmol/L, $p>0.01$).

Conclusion: Patients with primary thyroid dysfunction have elevated serum uric acid levels that are more frequent in primary hypothyroidism as compared to primary hyperthyroidism.

MeSH Key words: Endocrine system Diseases, Hyperuricemia**,** Hypothyroidism, Primary Hyperthyroidism, Thyroid diseases, Uric acid

INTRODUCTION

Thyroid dysfunctions are among the commonest endocrine disorders, affecting almost 2 billion individuals worldwide. South Asian population with insufficient iodine intake is particularly affected and is suffering with multiple impairments due to inadequate production of thyroid hormones.[1] Thyroid hormones are essential for optimal functioning of almost all body tissues and therefore play a critical role in growth, cell differentiation and cellular metabolism including metabolic rate and oxygen consumption.[2] Both, overproduction (Hyperthyroidism) and underproduction (hypothyroidism) of thyroid hormones influences the majority of metabolic processes of human body thereby resulting in overt biochemical abnormalities.[3]

Uric acid is the end-product of purine nucleotide metabolism which is also affected by thyroid dysfunction. Altered purine metabolism may lead to increased serum uric acid (SUA) level which is the primary risk factor for development of gout.[4] Increased SUA levels and gout, both are robustly associated with other co-morbid conditions including coronary artery disease, metabolic syndrome, hypertension, chronic kidney disease and type 2 diabetes mellitus.[5,6] The National Health and Nutrition Examination Survey also reported that elevated SUA levels are independently and significantly associated with risk of cardiovascular mortality.[7]

Previous studies have reported inconsistent results while exploring the link between thyroid dysfuncion and serum uric acid levels.[8-12] However, both, elevated as well as decreased SUA levels were attributed to increased rate of purine metabolism in primary hyperthyroidism and decreased renal perfusion and glomerular filtration rate (GFR) in primary hypothyroid patients.[13] The concurrence of deranged SUA levels in patients suffering from primary

thyroid dysfunction may not only increase the risk of all-cause mortality but can also affect the management and prognosis of the disease.[6,14] Therefore, this study was designed to evaluate the levels of SUA in patients suffering from primary thyroid dysfunction.

METHODS:

This cross sectional study was carried out at Military Hospital (MH) Rawalpindi, from July 2014 to December 2014 after obtaining the ethical and institutional permission. A total of sixty patients, both males and females newly diagnosed with primary thyroid dysfunction were recruited through non-probability purposive sampling and informed written consent was obtained from each participant. Patients with history of any other endocrine disorder, hepatic disease, renal disease and taking medicines which can affect the serum uric acid and thyroid hormone levels were excluded out.

After obtaining the detailed medical history, blood specimen was collected under aseptic conditions. Serum TSH, Total T3 and fT4 levels were measured through Chemiluminescence immunoassay. On the basis of measured levels of serum TSH, study participants were then categorized in primary hyperthyroid (serum TSH < 0.40 mIU/L) and primary hypothyroid (serum TSH > 4.50 mIU/L) groups. SUA levels of both group were determined through standard method using chemistry autoanalyzer and hyperuricemia was defined as SUA levels > 420 µmol/L in males and > 360 µmol/L in females.[15]

Results were entered and analyzed through SPSS version 21. Mean and standard deviation were calculated for quantitative variables while frequency and percentage were calculated for qualitative variables. *p* value <0.01 was considered to be statistically significant.

RESULTS

Out of total sixty participants, 21 (35%) patients were male while 39 (65%) patients were female with mean age of 42.31±11.27 years. Primary thyroid dysfunction was further categorized into primary hypothyroidism and primary hyperthyroidism as shown in Table I.

Elevated SUA levels were found in 39 (65%) patients among which 31 (79%) were hypothyroid while 8 (21%) patients were hyperthyroid. The difference between mean SUA level of both groups was insignificant (*p* value >0.01). The frequency distribution of hyperuricemia in primary hypothyroid patients and primary hyperthyroid patients is shown in Figure 1.

DISCUSSION

Primary thyroid dysfunction is one of the most common endocrine disorders that results in various biochemical abnormalities including altered purine metabolism and deranged SUA levels.[16] Therefore, this study was designed to evaluate the SUA levels in patients suffering from primary thyroid dysfunction. In our cross-sectional study, majority of patients were suffering from primary hypothyroidism with mean serum TSH level of 15.23 $\pm$ 11.4 mIU/L. Elevated SUA levels were observed in 65% of patients affected from primary thyroid dysfunction. Furthermore, mean SUA levels of hypothyroid patients were higher than the mean SUA levels of primary hyperthyroid patients but the difference was insignificant. Hyperuricemia was also more frequent (72%) in hypothyroid patients as compared to primary hyperthyroid patients.

Many previous studies have reported contradictory findings while exploring the link between thyroid dysfuncion and serum uric acid levels.[8-12] Results of Giordano *et al*[8], Yakogoshi[17], and Khan *et al*[18] studies are in agreement with our results as all of these researchers found elevated SUA levels in patients with thyroid dysfunction. See *et al*[12] also investigated the risk of hyperuricemia associted with thyroid dysfunction in a prospective study and found that both hypothyroid and hyperthyroid patients have elevated SUA levels, however, consistent with our findings, the difference between both groups was insignificant.

On the contrary, an African study demonstrated the lower SUA level in both, hypothyroid as well as hyperthyroid patients.[19] Similarly, a large screening study that determined the SUA of 2359 consecutive patients suffering from various degrees of thyroid dysfunction including hypothyroidism and hyperthyroidism, could not find any association between SUA and TSH and therefore did not warrant routine estimation of SUA levels in such patients.[11] The

disgreement between these findings and our study results can be explained through differences in sample size and study population of these studies.

Mean SUA levels in our study were higher in hypothyroid group participant as compared to hyperthyoid patients. This finding is consistent with the previous studies.[8,18,20,21] that claimed higher SUA levels in primary hyperthyroidism not more than the primary hypothyroidism patients. An indian study also reported elevated SUA levels in 35% patients of thyroid dysfunction among which 23% were hypothyroid while 12% were hyperthyroid patients.[22] Although, these results were much lower than our findings where 65% patients had elevated SUA levels, higher % distribution of hyperuricemia among hypothyroid patients is in agreement with our study findings. As elevated SUA levels in hypothyroid patients are attributed to reduced renal perfusion and impaired GFR, such patients should also be monitored closely for chronic kidney disease in additon to gout and coronary artery disease.

Our study has certain limitations also. Being a single centered, cross sectional study, it's findings can not be generalised for our population. Moreover, we did not followup the study participants for developent of any clinical menifestaions. Therefore, keeping in view the clinical importance of primary thyroid dysfunction, future prospective multicentric studies must be carried out at national level.

CONCLUSION

Patients with primary thyroid dysfunction have elevated serum uric acid levels that are more frequent in primary hypothyroidism as compared to primary hyperthyroidism.

REFERENCES

Table I: Baseline characteristics of Patients with Primary Thyroid Dysfunction (n=60)

Characteristics of study Participants (n=60)		**Primary Hypothyroidism (n= 43)**	**Primary Hyperthyroidism (n=17)**
Gender distribution	Males	15	6
	Females	28	11
Mean serum TSH levels (mIU/L)		15.23 ± 11.4	1.89 ± 0.69
Mean *SUA levels (µmol/L)		385.27 ± 182 µmol/L	316.95 ± 169 µmol/L

*SUA: Serum Uric Acid

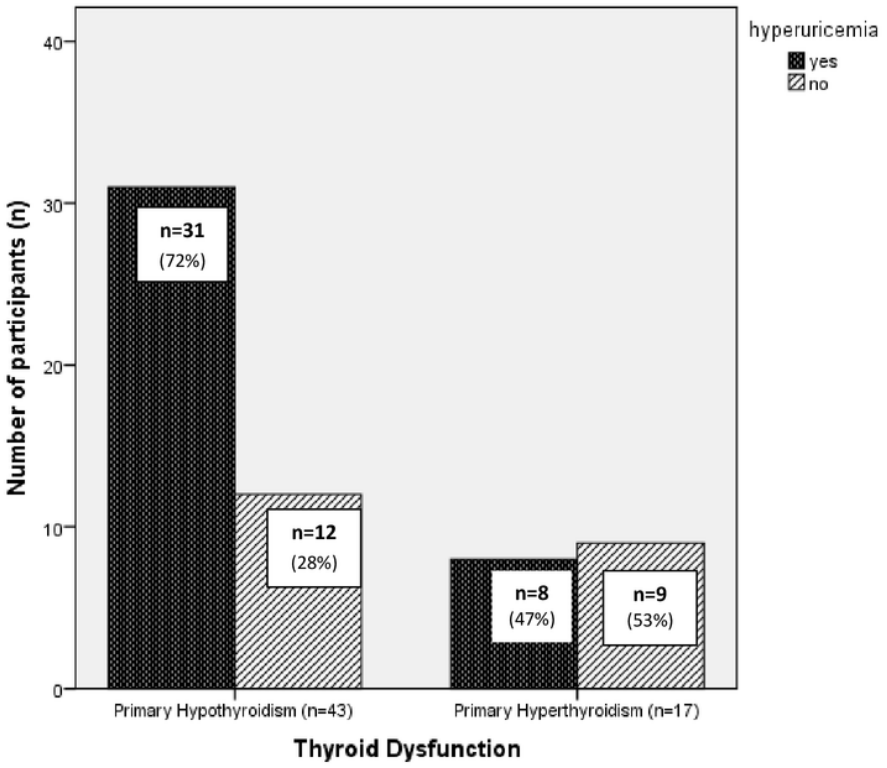

Figure 1: Frequency Distribution of hyperuricemia in patients with Primary Hypothyroidism and primary hyperthyroidism

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