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ORIGINAL ARTICLE

ASSOCIATION OF HYPERURICEMIA AND PERCEIVED STRESS IN ADULT AGE NEWLY DIAGNOSED THYROID DYSFUNCTION PATIENTS IN TERTIARY CARE HOSPITAL BANNU- A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Thyroid hormones are crucial for the normal functioning of virtually all body tissues. The abnormal levels of thyroid hormones result in several biochemical alterations that increase the risk of various diseases including uric acid levels and stress. This study aimed to evaluate the prevalence of hyperuricemia and perceived stress and their association with thyroid hormone levels in patients with newly diagnosed thyroid dysfunction.

Materials & Methods: This cross-sectional study conducted at Khalifa Gulnawaz Teaching Hospital included 500 newly diagnosed patients of thyroid dysfunction through non- probability purposive sampling. Sociodemographic variables, perceived stress scale-10 (PSS-10), a detailed medical history and blood sampling for biochemical analysis were done. Frequency and percentages were calculated for qualitative variables. For categorical variables, a chi-square test was used.

Results: Of the 500 participants 65% had hyperthyroidism and 35% had hypothyroidism *(p=0.02)*. 61% were females while 39% were males *(p= 0.04)*. The mean serum TSH levels in the hyperthyroid group were 1.9±0.68 while 15.25±0.27 in the hypothyroid group. Although, the mean levels of serum uric acid were deranged in both the groups, 5.9 ± 1.88 and 5.3 ± 1.9, the difference was not statistically significant *p=0.06*. The prevalence of hyperuricemia in hyperthyroid group was 47% and in hypothyroid group 69%. The hypothyroid group showed a significantly higher level of PSS -10 score *p=0.05.*

Conclusion: Patients with thyroid dysfunction have elevated serum uric acid levels and high PSS scores. Future studies focusing on variables like the dietary history, physical activity and genetic analysis may help further clarify this association.

KEY WORDS: Hyperthyroidism; Hypothyroidism; Hyperuricemia; Perceived stress; Serum uric acid.

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INTRODUCTION

Thyroid dysfunction is one of the most common clinical endocrine disorders with a worldwide prevalence of more than 1.9 billion individuals.[1] Thyroid hormones include thyroid stimulating hormone (TSH), triiodothyronine (T3) and thyroxine (free) (FT4). Thyroid hormones are crucial for the normal functioning of virtually all body tissues. Cellular differentiation, metabolism and cell growth depend on optimal thyroid hormone levels. The abnormal levels of thyroid hormones result in several biochemical alterations that increase the risk of various diseases like musculoskeletal, cardiovascular, obesity and diabetes.[2-4] Along with other biochemical abnormalities, thyroid gland dysfunction also affects serum uric acid levels, which is a major risk factor for the development of gout .[5]

Gout is a metabolic disease resulting from increased uric acid concentrations in the blood.[6] Depositions of uric acid crystals affect more than 4 million adults worldwide causing severe pain and swelling

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in joints.[7] Gout is constantly disturbing the daily physical activity and quality of life along with increasing economic burden and disturbed mental health.[8] Like thyroid dysfunction, the increased serum uric acid levels are also related to other co-morbid conditions including metabolic syndrome, hypertension, Type 2 diabetes mellitus and chronic kidney disease.[9] Studies have shown a significant association between elevated serum uric acid levels and risk of cardiovascular mortality. Previous literature also reports a significantly increased prevalence of hypothyroidism in patients with aspirate-proven gouty arthritis.[10] Both hypothyroidism and hyperthyroidism affect the serum uric acid levels. A few researchers from the past have suggested some possible mechanisms of altered uric acid levels in hypo and hyperthyroid states. In patients with hyperthyroidism, an increased rate of purine metabolism is attributed to increased uric acid levels, while, reduced renal perfusion and glomerular filtration rate (GFR) are responsible for altered uric acid in hypothyroid patients.[11,12] Stress is also a common manifestation in patients with thyroid dysfunction.[13] However, the previous studies about the relationship between thyroid dysfunction and serum uric acid concentrations with perceived stress are still unclear. The co-occurrence of unstable serum uric acid levels in patients suffering from thyroid disease also increases the risk of all-cause mortality. In addition, it can also affect the management plan. Although local literature on this issue is still in progress, we considered this study to assess serum uric acid levels and perceived stress in patients presenting with untreated thyroid dysfunction in our community.

The main aim of the present study was to evaluate the prevalence of hyperuricemia and perceived stress in patients with newly diagnosed thyroid dysfunction and also to find an association between thyroid hormone levels, serum uric acid levels and perceived stress.

MATERIALS & METHODS

This cross-sectional study was conducted between 1st January 2024 and 31st October 2024 at Khalifa Gulnawaz Teaching Hospital (KGNTH). Ethical approval was obtained from Ethical Review Committee of Bannu Medical College. Written informed consent was obtained from all the participants.

500 newly diagnosed patients of thyroid dysfunction between 30 and 45 years were recruited through non-probability purposive sampling. The sample size was calculated based on the estimated prevalence of hyperuricemia 65%[13], 95% confidence interval, margin of error 5%. Patients were included if the duration of disease was 2months with mild symptoms without symptomatic features of hyperuricemia. Patients with thyroid dysfunction with a history of any other endocrine disorder, cardiovascular, hepatic, or renal disease and taking medicines which affect the thyroid hormone levels and serum uric acid levels were excluded from the study.

The data included a questionnaire about the sociodemographic variables, perceived stress scale-10(PSS-10), a detailed medical history and blood sampling to estimate serum uric acid levels, TSH, and free T4 levels. All the biochemical and hormonal analyses were processed in the KGNTH laboratory by trained medical laboratory technicians. Based on the levels of TSH and free T4, thyroid disorder was further categorized as hyperthyroid (serum TSH $<$4.50 mIU/L and elevated free T4), while, (serum TSH $<$4.50 mIU/L and reduced free T4) was grouped as hypothyroid[14]. Serum uric acid concentration of more than 6.8 mg/dl in males and serum uric acid concentration of more than 6.0 mg/dl in females was defined as hyperuricemia. Data Analysis was achieved by using SPSS version 22. For descriptive statistics, Mean and Standard Deviation were used. Frequency and percentages were calculated for qualitative variables. For categorical variables, a chi-square test was used. A p-value of $\leq$0.05 at a 95% confidence interval was considered as a level of significance.

RESULTS

The present study included 500 newly diagnosed patients with thyroid dysfunction (hypo- and hyperthyroidism). There was a significant difference between the number of hyperthyroid and hypothyroid patients. 325 (65%) had hyperthyroidism and 175 (35%) had hypothyroidism (Table 1). The mean age of the participants in hyperthyroid group was 41 $\pm$ 3.45 years and in the hypothyroid group was 39 $\pm$3.21years but the difference was not statistically significant. Of the 500 participants, 305(61%) were females and 105(39%) were males. There was a significant difference in gender distribution of hyper and hypothyroid groups with females exceeding the males in both groups. Among the hyperthyroid group, females comprised n=188 and males n=117. In the hypothyroid group, there were n=137 females and, males were n=58 *(p=0.043)*. The mean serum TSH levels in the hyperthyroid group were 1.9$\pm$0.68 while 15.25$\pm$0.27 in the hypothyroid group. Although, the mean levels of serum uric acid were deranged in both the groups, 5.9 $\pm$ 1.88 and 5.3 $\pm$ 1.9, the difference was not statistically significant *p=0.06.* The PSS-10 score was high in both the hypothyroid and hyperthyroid groups. The difference between the two groups was also statistically significant with PSS-10 score higher in hypothyroid as compared to hyperthyroid patients (Table 1). The frequency distribution of hyperuricemia and PSS-10 in hypo and hyperthyroid patients are shown in Table 2 and Table 3 respectively.

Table 1: Characteristics of patients with thyroid dysfunction (N=500)

General characteristics of participants N=500		Hyperthyroidism N= 325 (65%)	Hypothyroidism N=175 (35%)	P value
Mean age (years)		41 ± 3.45	39 ±3.21	0.235
Gender distribution	Females N=305 (61%)	188	117	0.043
	Males N=195 (39%)	137	58	
Mean TSH levels (mIU/L)		1.9±0.68	15.25±0.27	0.02
Mean serum Uric acid Levels (mg/dl)		5.9 ± 1.88	5.3 ± 1.9	0.06
Mean PSS -10 score		20.79 ± 6.61	25.67 ± 6.58	0.057

TSH; thyroid stimulating hormone, PSS-10; perceived stress scale 10

Table 2. Frequency distribution of elevated serum uric acid levels in thyroid patients

Thyroid status	Normal uric acid	Elevated uric acid
Hypothyroid (n=175)	31% (n=54)	69% (n=121)
Hyperthyroid (n=325)	53%(n=172)	47% (n=153)

Table 3. Frequency distribution of raised PSS-10 in thyroid patients

Thyroid status	Normal PSS-10	Raised PSS-10 (>20)
Hypothyroid (n=175)	25% (n=44)	75% (n=131)
Hyperthyroid (n=325)	30% (n=97)	70% (n=228)

PSS -10 perceived stress score -10

DISCUSSION

Amongst the common metabolic disorders, thyroid diseases are one of these found among general populations. Deficiency of thyroid hormones leads to hypothyroidism while a rise in the thyroid hormones causes hyperthyroidism. Thyroid diseases often affect renal functions. Serum uric acid is regulated by rate of purine catabolism, renal tubular secretion and reabsorption. Raised uric acid level is the major risk factor for development of gout. Multiple studies have been conducted to date to find an association between thyroid dysfunction and deranged uric acid levels but the results are contradictory. In this study we examined the association between both disorders and also prevalence of perceived stress in these patients in our community.

Our study observed a 55% prevalence of elevated serum uric acid levels in patients with thyroid dysfunction (Table 2.) Our findings are consistent with those reported in the past.[15] In contrast, Bhattarai et al gave a 30% prevalence of hyperuricemia in their study.[16] While some researchers reported the frequency of serum uric acid levels more than 60%.[14,17] Furthermore, the mean serum uric acid levels of hyperthyroid patients were higher than the mean serum uric acid levels in hypothyroid patients but the difference was statistically insignificant. Our findings are consistent with those reported by Bhattarai et al.[18] The frequency of elevated uric acid levels amongst the hypothyroid patients was 69% and 41%in hyperthyroid subjects. Ayub et al also reported hyperuricemia more in hypothyroids as compared to hyperthyroids in their study.[14]

Stressful life events or stressors can disturb the hypothalamic–pituitary–thyroid (HPT) axis. This affects the psychological and physiological responses. In our study, both hyperthyroid and hypothyroid patients reported high perceived stress scores. The difference in perceived stress scores between the two groups was also statistically significant. The overall prevalence of raised PSS-10 score was 72%. PSS 10 was higher in hypothyroid group as compared to the hyperthyroid group. Similar results were reported in the past[19]. The raised PSS 10 scores further aggravates the clinical presentation and disease severity.[20]

CONCLUSION

Patients with thyroid dysfunction have elevated serum uric acid levels and high PSS scores. The elevated serum uric acid levels not only affect the management and prognosis of the disease but also increase the risk of other co-morbid conditions. More studies can be planned to know the causal relationship between thyroid status, serum uric acid levels and stress with additional variables like the dietary history, physical activity and genetic analysis.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	SB, ZU
Acquisition, Analysis or Interpretation of Data:	SB, ZU
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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.