

# Increased Lower Urinary Tract Symptoms in Male Hyperthyroid Patients

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## Abstract

**Objective:** Hyperthyroidism is a condition characterized by excessive thyroid hormone production that affects multiple body systems, including the autonomic nervous system. The present study aimed to investigate the relationship between hyperthyroidism and lower urinary tract symptoms (LUTS) in male patients.

**Methods:** This prospective controlled study. Men newly diagnosed with hyperthyroidism were compared with a control group without any comorbidities. Patients with a history of urinary tract infections, neurogenic bladder diseases, and Benign prostatic hyperplasia /prostate cancer were excluded from the study. International Prostate Symptom Scores (IPSS) between the groups were compared, and the correlation between IPSS scores and free T4 levels was examined.

**Results:** Of the 58 patients, 20 were in the hyperthyroidism group and 38 were in the control group. The mean total IPSS and mean voiding scores were statistically higher in the hyperthyroidism group than in the control group. A positive correlation was found between IPSS scores and free T4 levels in the hyperthyroidism group.

**Conclusion:** In patients with hyperthyroidism, increased LUTS are observed. As serum free T4 levels increase, LUTS symptoms also increase.

**Keywords:** Hyperthyroidism, IPSS, lower urinary tract symptoms, storage, voiding

## INTRODUCTION

Thyroid hormones play an important role in maintaining homeostasis and regulating the sympathoadrenergic system (1). In iodine-sufficient countries, the global prevalence of hyperthyroidism is estimated to be 0.2-2.5% (2). Clinically, hyperthyroidism is primarily characterized by symptoms such as weight loss, sweating, tachycardia, and diarrhea. These symptoms are attributed to a malfunction in the automatic nervous system (1,3). Benign prostatic hyperplasia (BPH), urinary tract stones, and neurogenic bladder dysfunction are among the many potential causes of lower urinary tract symptoms (LUTS) in men. Additionally, normal urinary function, including both storage and voiding phases, requires coordinated activities of

the sympathetic, parasympathetic, and somatic nervous systems (4). Hyperthyroidism increases the effects of the sympathetic nervous system while reducing the effects of the parasympathetic nervous system. Through this pathway, hyperthyroidism may be a risk factor for LUTS. Although some studies have linked LUTS with hyperthyroidism, the association is not definitive (5,6). Therefore, we aimed to evaluate the effect of hyperthyroidism on LUTS in males.

## METHODS

This prospective controlled study was conducted after obtaining approval from the local ethics committee (approval number: 67, date: 22.02.2023). Male patients who presented to the internal



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medicine outpatient clinic between June 2023 and June 2024 were prospectively evaluated. Informed consent was obtained from all patients included in the study. The control group comprised male patients newly diagnosed with hyperthyroidism, whereas the control group comprised individuals without any known illnesses who underwent general health checkups. Patients with a history of conditions known to affect LUTS, such as urolithiasis, recurrent urinary tract infections, BPH treatment (alpha blockers), prostate cancer treatment, or bladder diseases, were excluded from the study. Hyperthyroidism was defined as low thyroid stimulating hormone (TSH) levels accompanied by elevated free T3 and free T4 levels based on normal reference ranges. The normal range of TSH levels was defined as 0.35-4.5 mU/L. The normal ranges of free T4 and free T3 levels were defined as 0.9-1.7 ng/dL and 2.0-4.4 pg/mL, respectively. The demographic data of the study population, including age, body mass index (BMI), and comorbidities, were recorded. Additionally, data such as prostate specific antigen (PSA) levels and prostate volume were analyzed in men for their potential association with LUTS. Finally, the International Prostate Symptom Scores (IPSS) were recorded to assess LUTS, including both the storage and voiding phases. All data were prospectively compared between the two groups prospectively established.

### Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 21.0 (SPSS Inc., Chicago, IL, USA). Data are presented as mean  $\pm$  standard deviation.

The Shapiro-Wilk test was used to assess the normality of the variables. The Mann-Whitney U test and independent samples t-test were used to compare the control and hyperthyroidism groups. We used The Pearson correlation test to measure the correlation between T4 levels and IPSS scores. A p-value of  $<0.05$  was considered statistically significant.

## RESULTS

A total of 58 male patients were included in the study. Among the patients, 20 were assigned to the hyperthyroidism group and 38 were included in the control group. The demographic and clinical data of the groups are presented in Table 1. The mean ages of the hyperthyroidism and control groups were  $53.6 \pm 10.3$  and  $58.6 \pm 13.5$  years, respectively ( $p=0.15$ ). The mean BMIs of the hyperthyroidism and control groups were respectively  $31.9 \pm 3.2$   $\text{kg/m}^2$  and  $30.3 \pm 4.4$   $\text{kg/m}^2$  ( $p=0.17$ ). In the hyperthyroidism group, 4 of 20 patients had diabetes mellitus, whereas in the control group, 6 of 38 patients had diabetes mellitus ( $p=0.724$ ). In the hyperthyroidism group, 3 of 20 patients had hypertension, whereas in the control group, 6 of 38 patients had hypertension ( $p=0.937$ ). The mean PSA levels in the control and hyperthyroidism groups were  $2.4 \pm 1.9$  ng/mL and  $2.5 \pm 1.5$  ng/mL, respectively ( $p=0.57$ ). The mean prostate volume was  $62.3 \pm 24.9$  cc in the hyperthyroidism group, compared to  $52.7 \pm 19.6$  cc in the control group ( $p=0.11$ ). The mean TSH levels were  $0.002 \pm 0.004$  mU/L in the hyperthyroidism group, compared to  $3.58 \pm 2.21$  mU/L in the control group ( $p<0.001$ ). The mean free T4 level was

**Table 1. Demographic and clinical data of the groups**

	Hyperthyroidism group n=20	Control group n=38	p
Age	53.6 $\pm$ 10.3	58.6 $\pm$ 13.5	0.15
BMI (kg/m <sup>2</sup> )	31.9 $\pm$ 3.2	30.3 $\pm$ 4.4	0.17
Diabetes mellitus (Yes/No)	4/16	6/32	0.724
Hypertension (Yes/No)	3/17	6/32	0.937
PSA (ng/mL)	2.5 $\pm$ 1.5	2.4 $\pm$ 1.9	0.57
Prostate volume (cc)	62.3 $\pm$ 24.9	52.7 $\pm$ 19.6	0.11
TSH (mU/L)	0.002 $\pm$ 0.004	3.58 $\pm$ 2.21	<b>&lt;0.001</b>
Free T4 (ng/dL)	6.87 $\pm$ 2.7	1.25 $\pm$ 0.2	<b>&lt;0.001</b>
Free T3 (pg/mL)	6.53 $\pm$ 0.6	3.21 $\pm$ 0.2	<b>&lt;0.001</b>
IPSS, Total	6.4 $\pm$ 3.6	2.2 $\pm$ 1.4	<b>&lt;0.001</b>
IPSS, voiding	4.5 $\pm$ 2.7	0.9 $\pm$ 0.7	<b>&lt;0.001</b>
IPSS, storage	1.6 $\pm$ 0.8	1.3 $\pm$ 0.8	0.09

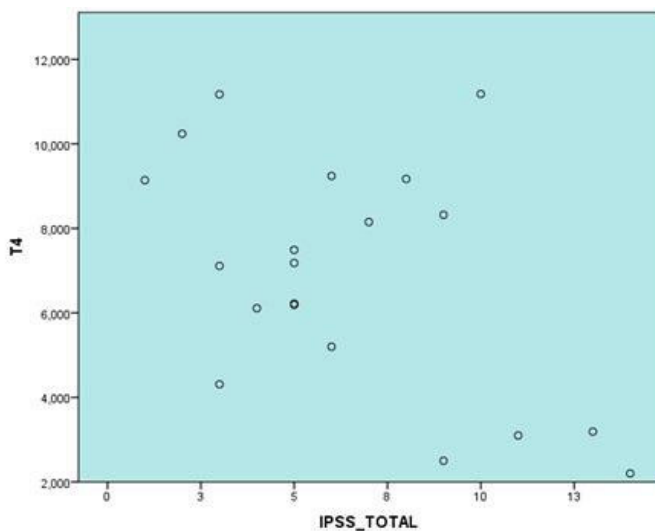
BMI: Body mass index, IPSS: International prostate symptom score, PSA: Prostate-specific antigen, TSH: Thyroid-stimulating hormone

6.87±2.7 ng/dL in the hyperthyroidism group and 1.25±0.2 ng/dL in the control group, respectively ( $p<0.001$ ). The mean free T3 level was found to be 6.53±0.6 pg/mL and 3.21±0.2 pg/mL in the hyperthyroidism and control groups, respectively ( $p<0.001$ ). As expected, a statistically significant difference in the thyroid values was observed between the groups. The mean total IPSS scores of the hyperthyroidism and control group were 6.4±3.6 and 2.2±1.4, respectively ( $p<0.001$ ). Additionally, the mean voiding scores were 4.5±2.7 for the hyperthyroidism group and 0.9±0.7 for the control group ( $p<0.001$ ). The mean storage scores were 1.6±0.8 for the hyperthyroidism group and 1.3±0.8 for the control group ( $p=0.09$ ). The total IPSS and voiding scores were significantly higher in the hyperthyroidism group than in the control group. The positive correlation between free T4 levels and total IPSS scores is presented in Figure 1. We found a significant correlation between free T4 levels and total IPSS scores ( $p=0.024$ ). In other words, in hyperthyroid patients, as the T4 level in the body increases, the IPSS scores also increase accordingly.

## DISCUSSION

Male LUTS is common, and its prevalence increases with age. LUTS can result from prostate-related conditions, urinary tract stones, or infections, as well as other systemic causes. Considering the wide range of symptoms associated with hyperthyroidism, it is plausible that it may be linked to LUTS through certain pathways. In this study, we demonstrated that hyperthyroid patients exhibit more urinary tract symptoms than normal patients, and these symptoms increase as serum T4 levels rise. Patients with hyperthyroidism often experience

increased thirst and fluid intake, which may contribute to frequent urination (7-9). Additionally, hyperthyroidism induces hyperdynamic circulation in the body, leading to increased cardiac output, elevated blood pressure, and reduced peripheral vascular resistance. Consequently, this may result in increased renal blood flow and urine output (10,11). Normal voiding occurs through the coordinated functions of the autonomic and somatic nervous systems. Parasympathetic activation induces detrusor muscle contraction, whereas alpha-adrenergic activity inhibition facilitates bladder neck opening. Simultaneously, relaxation of the external sphincter via somatic nerve input allows for voiding. In addition, increased beta-adrenergic activity can reduce detrusor contractility, potentially impairing voiding function (12-14). Andersen et al. (15) showed that patients with hyperthyroidism experienced increased urinary frequency and nocturia. The same study also showed that these symptoms improved in patients who achieved an euthyroid state after six months of treatment (15). In our study, which evaluated a larger cohort of hyperthyroid patients, an increase in LUTS was observed. However, unlike the study by Andersen et al. (15) we did not have post-treatment data for our patients. Instead, we demonstrated that LUTS was significantly worse in the hyperthyroidism group than in the control group. In another study, Goswami et al. (16) found that 40% of patients with Graves' disease had increased LUTS and urinary frequency. In urodynamic tests conducted on some patients, it was reported that peak and average urine flow rates were low and exhibited a flat plateau pattern during voiding. Furthermore, the symptoms of these patients improved after treatment. Although the main findings of our study are similar to those of Goswami et al. (16) a notable strength of their study is the inclusion of urodynamic tests in some patients to demonstrate LUTS, which is a limitation of our study. On the other hand, the lack of a control group and the failure to use a validated urinary symptom score questionnaire, such as IPSS, can be considered limitations in their study compared with our study. Ho et al. (5) found that female patients with hyperthyroidism had worse LUTS scores and lower urinary flow rates compared with the control group. Additionally, symptom improvement was observed after treatment. This study is similar to ours in terms of both the use of the IPSS questionnaire and the inclusion of a control group. In this study, the total IPSS and voiding and storage scores were calculated separately. The IPSS questionnaire was originally developed to evaluate BPH in men (17). However, it has since been shown that the IPSS questionnaire is not specific to gender or any particular disease (18,19). Therefore, we used the IPSS questionnaire to assess the LUTSs that we suspect are related to hyperthyroidism. There is



**Figure 1.** Correlation between T4 levels and total IPSSs  
IPSS: International prostate symptom score

a correlation between hyperthyroidism symptoms and serum thyroxine levels (20). Ho et al. (5) found no significant difference in thyroxine levels between female patients with hyperthyroidism and those with severe LUTS scores (5). In contrast, we found a statistically significant correlation between total IPSS scores and free T4 levels in male patients. The correlation between LUTS severity and thyroxine levels remains an open area for further research. Our study is not without limitations and has certain shortcomings. First, our study included a relatively small patient population. Second, if we had been able to evaluate symptomatic patients using post-void residual volume, uroflowmetry, or urodynamic studies, we could have gained more insight into the nature of LUTS.

## CONCLUSION

Hyperthyroidism causes LUTS in male patients, particularly during the voiding phase. Increased beta-adrenergic activity in hyperthyroid states may explain impaired voiding function. Future studies are needed that include validated questionnaires, control groups, and posttreatment symptoms of hyperthyroid patients.

## Ethics

**Ethics Committee Approval:** This prospective controlled study was conducted after obtaining approval from the local ethics committee (approval number: 67, date: 22.02.2023).

**Informed Consent:** Informed consent was obtained from all patients included in the study.

## Footnotes

### Authorship Contributions

Surgical and Medical Practices: B.C., Concept: B.C., O.C., Design: B.C., O.C., Data Collection or Processing: B.C., O.C., Analysis or Interpretation: B.C., O.C., Literature Search: B.C., O.C., Writing: B.C.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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