

## Case Report

# Elevated Total Testosterone Level in an Adult with Erectile Dysfunction

Vivek Pant<sup>1</sup>, Devish Pyakurel<sup>2</sup>, Keyoor Gautam<sup>2</sup>, Santosh Pradhan<sup>1</sup>, Aabha Shrestha<sup>2</sup>

<sup>1</sup>Department of Clinical Biochemistry, Samyak Diagnostic, Jawalakhel, Lalitpur, Nepal

<sup>2</sup>Department of Pathology, Samyak Diagnostic, Jawalakhel, Lalitpur, Nepal

## ABSTRACT

Erectile dysfunction affects a growing number of men with a significant impact on social function. The cause may be medical and psychological both. Of many risk factors for erectile dysfunction, Hyperthyroidism can lead to increased total testosterone by an increase in sex hormone-binding globulin secreted from the liver. Here, we present a case of an adult male with a high total testosterone level who complained of erectile dysfunction. On a complete review of medical history and additional laboratory tests, the diagnosis of hyperthyroidism leading to increased total testosterone was made. The complete review of the patient's history before hormonal analysis helps to troubleshoot the mismatch between clinical symptoms and laboratory results.

**Keywords:** Erectile dysfunction; Hyperthyroidism; Sex hormone-binding globulin; Testosterone

### Correspondence:

Dr. Vivek Pant, MD  
Department of Clinical Biochemistry,  
Samyak Diagnostic; Jawalakhel, Lalitpur, Nepal  
Orcid ID: 0000-0002-3967-1851  
Email: drvpant@gmail.com

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## INTRODUCTION

Testosterone is a male sex hormone that is produced by the Leydig cells in testicles and is responsible for male physical characteristics. About two-thirds of testosterone circulating in the blood is bound to sex-hormone-binding globulin (SHBG) and less than one third is bound to albumin. Less than 4% circulates as free testosterone which along with the albumin-bound testosterone is the bioavailable fraction acting on the target tissue.<sup>1</sup> The conditions where SHBG concentration in blood is altered are anorexia nervosa, obesity, thyroid hormone disorder, polycystic ovarian syndrome, Cushing syndrome and acromegaly.<sup>2-6</sup> SHBG is produced and secreted by the liver into the bloodstream where it binds sex steroids and this hepatic production of SHBG is known to be altered by the thyroid hormones.<sup>7</sup> Thyroid hormones increase SHBG production indirectly by increasing hepatocyte nuclear factor 4 alpha (HNF-4A).<sup>8</sup> Thus, in cases of hyperthyroidism, the SHBG is increased leading to an increase in total testosterone.

Measurement of total testosterone provides adequate information in most of the cases. However, testing for total testosterone could

be misleading in conditions known to alter SHBG levels. Thus, a test for free testosterone is performed as it may more accurately reflect the presence of a medical condition. The Endocrine Society clinical practice guideline recommends measuring free testosterone if total testosterone is low on repeat testing and SHBG is abnormal in the initial screen for testosterone deficiency.<sup>9</sup> We present a case of elevated total testosterone in an adult male with erectile dysfunction who was later found to have hyperthyroidism with increased SHBG.

### # CASE REPORT

A 46-year-old man was recommended by the general physician for laboratory testing of total testosterone level, as he complained of erectile dysfunction for 3 months. The physician ordered ultrasonography (USG) of the abdomen and pelvis when the laboratory result of total testosterone was very high (Table 1). His imaging test was normal. The consulting physician approached us to find the reason behind the elevated total testosterone which

did not seem consistent with the clinical symptom of the patient. Repeat test for total testosterone was done which was consistent with the previous report. On reviewing patient clinical history, no other significant problem was identified, except for a weight loss of 7 kg during the last 8 months. He regularly consumes alcohol and is an occasional smoker. No deviations from physical normal status were found. Upon reviewing his medical records, it was found that he was diagnosed with hyperthyroidism four months ago. However, the patient was noncompliant with the treatment. The thyroid function test was done and he was found to have an undetectable TSH level (Table 1).

**Table 1: Laboratory finding of TFT and total testosterone**

Test	Result	Reference range	Unit
Testosterone total	1334.16	86-788	ng/dL
Free T4	18.77	2.3-4.2	pg/mL
Free T3	3.96	0.89-1.76	ng/dL
TSH (3 <sup>rd</sup> generation)	<0.01	0.35-5.5	μIU/mL

Hyperthyroidism induced increased total testosterone level in his serum was confirmed when we investigated his serum free testosterone level and sex hormone-binding globulin (SHBG) (Table 2). His erectile dysfunction was possibly due to both alcohol intake and hyperthyroidism, so he was advised to quit alcohol and start the antithyroid drug.

**Table 2: Laboratory finding of free testosterone and SHBG**

Test	Result	Reference range	Unit
Free Testosterone	15.07	12-20	pg/mL
Sex hormone binding globulin (SHBG)	215.20	11.7-135.2	nmol/L

Within four months of therapy by antithyroid drugs, both the levels of thyroid hormones and total testosterone returned to normal. The patient has not quit drinking but has cut down his alcohol limits and claims to have increased libido than it was before treatment.

## DISCUSSION

Increased total testosterone level in an adult male is seen in testicular tumors or adrenal tumors that are producing testosterone. Some drugs such as androgens, anticonvulsants, barbiturates, and

clomiphene can also cause testosterone levels to rise. In the index case, there was the absence of mass in imaging studies of the abdomen and pelvis. The patient was not using any androgens or drugs responsible for rising in total testosterone. Thus, this rise in total testosterone level in the case of erectile dysfunction was of doubtful finding to the physician.

An Electronic medical record of the patient has recently been introduced in a few health centers of Nepal. The majority of a patient have to record their medical documents in handwritten or printed forms at their homes. Documentation in the patient's medical record thus must support the medical necessity of the patient. In follow up cases, the progress note is also mentioned in the patient's medical record. The electronic copy of this medical document is thus helpful to minimize the error related to the preanalytical phase of the testing process. The case presented here had a history of hyperthyroidism which was documented in his medical record book and also in an electronic record system at our laboratory. He was also prescribed with the antithyroid drug. He presented to the general practitioner for his erectile dysfunction and was advised to investigate his serum total testosterone level. Though his past medical documents were reviewed by the physician, the history of hyperthyroidism was not considered the culprit.

An increase in SHBG is a consistent feature associated with hyperthyroidism, which is responsible for the rise in the circulating level of total testosterone. However, the plasma level of free testosterone is usually maintained within the normal range. Hyperthyroidism may also lead to a decrease in metabolic clearance of testosterone and an increase in the peripheral conversion of androstenedione to testosterone.<sup>10</sup> Free testosterone in the index case was in the normal range but SHBG was increased. The cause of erectile dysfunction in our patient was linked to his alcohol intake though thyrotoxic males present with a decrease in libido due to exposure to increased estrogen bioactivity.<sup>11</sup> Patient in the index case had improved symptoms after taking antithyroid drugs and minimizing his alcohol drink limits.

## CONCLUSION

The standard practice of reviewing the medical history of a patient and their compliance with treatment helps to troubleshoot the mismatch between clinical symptoms and laboratory results.

## REFERENCES

- Goldman AL, Bhasin S, Wu FC, Krishna M, Matsumoto AM, Jasuja R. A reappraisal of testosterone's binding in circulation: physiological and clinical implications. *Endocrine reviews*. 2017; 38(4):302-24. [Crossref](#)
- Glass AR, Swerdloff RS, Bray GA, Dahms WT, Atkinson RL. Low serum testosterone and sex-hormone-binding-globulin in massively obese men. *J Clin Endocrinol Metab*. 1977; 45(6):1211-9. [Crossref](#)
- Barbe P, Bennet A, Stebenet M, Perret B, Louvet JP. Sex-hormone-binding globulin and protein-energy malnutrition indexes as indicators of nutritional status in women with anorexia nervosa. *Am J Clin Nutr*. 1993; 57(3):319-22. [Crossref](#)
- Negri P, D'Errico G, Minisci N, Tomasi A. Changes in plasma levels of androgens and SHBG in patients with polycystic ovary syndrome (PCOs) treated with oral contraceptives containing desogestrel. *Minerva ginecologica*. 1988;40(12):699-707. [Crossref](#)
- Manusharova RA. Plasma level of testosterone-estradiol-binding globulin in women with Itsenko-Cushing disease. *Problemy endokrinologii*. 1986;32(6):11-3. [Crossref](#)
- Holly JM, Cotterill AM, Jemmott RC, Shears D, Al-Othman S, Chard T et al. Inter-relations between growth hormone, insulin, insulin-like growth factor-1 (IGF-1), IGF-binding protein-1 (IGFBP-1) and sex hormone-binding globulin in acromegaly. *Clinical endocrinology*. 1991; 34(4):275-80. [Crossref](#)

7. Anderson DC. Sex-hormone-binding globulin. Clinical endocrinology. 1974; 3(1):69-96. [Crossref](#)
8. Selva DM, Hammond GL. Thyroid hormones act indirectly to increase sex hormone-binding globulin production by liver via hepatocyte nuclear factor-4 $\alpha$ . J. Mol. Endocrinol. 2009; 43(1):19-27. [Crossref](#)
9. Bhasin S, Brito JP, Cunningham GR, Hayes FJ, Hodis HN, Matsumoto AM et al. Testosterone therapy in men with hypogonadism: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2018; 103(5):1715-44. [Crossref](#)
10. Patel N, Kashanian JA. Thyroid dysfunction and male reproductive physiology. In Seminars in reproductive medicine 2016; 34(06):356-60. [Crossref](#)
11. Kidd GS, Glass AR, Vigersky RA. The hypothalamic-pituitary-testicular axis in thyrotoxicosis. J Clin Endocrinol Metab. 1979; 48(5):798-802. [Crossref](#)