CLINICAL THYROIDOLOGY **FOR PATIENTS**

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AMERICAN THYROID ASSOCIATION
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THYROID HORMONES

Both age and sex affects the relationship between blood levels of T_4 and TSH

BACKGROUND

The main thyroid hormone that is produced by the thyroid gland is thyroxine (T_4). The production of T_4 is regulated by thyroid stimulating hormone (TSH) which is secreted by the pituitary gland. T_4 is measured in the blood as free T_4 (FT_4). In general, there is a direct relationship between blood levels of FT_4 and TSH. However, there is little information as to whether age or sex has any influence on this FT_4:TSH relationship. This is important, since management of the treatment of hypothyroidism or hyperthyroidism relies on getting both FT_4 and TSH in the normal range. The aim of this study was to examine the effect of age and sex on the relationship between blood measurements of FT_4 and TSH.

THE FULL ARTICLE TITLE

Hadlow NC et al. The relationship between TSH and free T_4 in a large population is complex, non-linear and differs by age and gender. J Clin Endocrinol Metab. May 13, 2013 [Epub ahead of print].

SUMMARY OF THE STUDY

The authors of this study examined the general relationship between TSH and FT_4, as well as differences according to age and sex, using blood samples from 152,261 individuals that had been collected in a single laboratory in Australia over 12 years. The study excluded blood specimens from individuals who were in hospital, pregnant, younger than 1 year of age, since these factors can alter both FT_4 and TSH levels. Approximately 21% of the blood specimens in the study were from individuals who were taking thyroid hormone. The authors performed complex statistical analyses and graphed the results, determining that the relationship between TSH and FT_4 levels was complex. For FT_4 measurements that were within the normal range, men tended to have slightly higher TSH values than women and TSH values tended to be higher with older age. However, in hypothyroid patients with low FT_4 levels below normal range, TSH values tended not to be as high in older individuals as compared to younger individuals. In general, when FT_4 levels were normal, the relationship between TSH measurements and FT_4 was not significantly different between individuals treated with thyroid hormone, as compared to those not treated with thyroid hormone.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

This study shows that the relationship between TSH and FT_4 blood measurements is more complex than originally thought. In patients with normal thyroid function, men appear to have higher TSH levels than women. The degree of TSH elevation in hypothyroidism is less in the older patient than in the younger one. Thus, this study suggests that both age and sex need to be taken in consideration when interpreting blood levels of FT_4 and TSH.

— Anna Sawka, MD

ATA THYROID BROCHURE LINKS

Hypothyroidism: http://www.thyroid.org/what-is-hypothyroidism

Hyperthyroidism: http://www.thyroid.org/what-is-hyperthyroidism

Thyroid Hormone Treatment: http://www.thyroid.org/thyroid-hormone-treatment

ABBREVIATIONS & DEFINITIONS

Hypothyroidism: a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

Hyperthyroidism: a condition where the thyroid gland is overactive and produces too much thyroid hormone. Hyperthyroidism may be treated with antithyroid meds (Methimazole, Propylthiouracil), radioactive iodine or surgery.

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THYROID HORMONES, continued

Thyroid hormone therapy: patients with hypothyroidism are most often treated with Levothyroxine in order to return their thyroid hormone levels to normal. Replacement therapy means the goal is a TSH in the normal range and is the usual therapy. Suppressive therapy means that the goal is a TSH below the normal range and is used in thyroid cancer patients to prevent growth of any remaining cancer cells.

Thyroxine (T_4): the major hormone produced by the thyroid gland. T_4 gets converted to the active hormone T_3 in various tissues in the body.

TSH: thyroid stimulating hormone — produced by the pituitary gland that regulates thyroid function; also the best screening test to determine if the thyroid is functioning normally.