

Free Androgen Index (FAI)

MDL Test Number: 696

Methodology: Calculated
(from total testosterone and SHBG)

CPT Codes: 84403, 84270



Specimen Collection Platform:

Serum in Serum Separator Tube (SST)

Turnaround Time:

24 - 72 hours

Stability:

Room temperature

Test Additions*:

30 days to add tests

Specimen Collection:



1. Immediately after blood collection, invert the tube(s) gently 5 times to ensure mixing of clot activator.



2. Allow the tube to rest upright for at least 30 minutes after collection to ensure proper clotting.



3. Centrifuge for at least 15 minutes at 2200-2500 RPM within one hour of collection.



4. Do not remove the stopper or pour off serum.



What is Free Androgen Index (FAI)?

Most of the testosterone circulating in the blood is held by proteins and cannot act. The one that holds it most tightly is sex hormone-binding globulin, or SHBG. The free androgen index is a simple way of estimating how

much testosterone is available despite that binding: it compares the total amount of testosterone with the amount of SHBG available to hold it.

The index is calculated rather than measured. It is the total testosterone divided by the SHBG measured on the same sample, and because it compares two amounts, it is a plain number with no units. What it mostly reflects is SHBG. When SHBG falls — as it commonly does with excess weight and insulin resistance — the index rises even if testosterone production has not changed at all. That is precisely the situation in which a total testosterone result can look reassuring and be misleading.

Why test for Free Androgen Index (FAI)?

The free androgen index is used in women, where the total testosterone result alone can be misleading. It is commonly ordered to:

- **Investigate signs of androgen excess**, including unwanted hair growth in a male pattern, acne persisting into adult life, thinning of the scalp hair, and irregular or absent periods.
- **Support the diagnosis of polycystic ovary syndrome**, also called polyendocrine metabolic ovarian syndrome (PMOS/PCOS). The 2023 international guideline accepts a calculated index of this kind in place of a total testosterone, because SHBG is often low in the condition, and the total result understates the problem.
- **Look for nonclassical congenital adrenal hyperplasia (nonclassical CAH)**, a milder form of an adrenal enzyme problem that presents in adult women as androgen excess and can closely resemble PCOS/PMOS.
- **Assess androgen status where SHBG is expected to be abnormal**, including in obesity, insulin resistance, and thyroid disease, in either direction.
- **Investigate androgen excess appearing for the first time after menopause**, where the pattern and the speed of onset matter.



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Special Instructions:

- **Both parts must come from the same sample:** This result cannot be produced without a total testosterone and an SHBG measured on the same draw. If either is missing or if the two come from samples taken at different times, the index is not valid.
- **When the sample should be drawn:** Testosterone is highest in the morning and falls throughout the day, so a morning sample is preferred. In women who are still having periods, the day of the cycle should be recorded on the request.
- **Medicines and hormone treatments:** Anything that changes SHBG changes this index, and it changes it more than it changes total testosterone. Estrogen taken by mouth, thyroid hormone, and some anticonvulsants raise SHBG; androgens, steroids, and insulin resistance lower it. Current medicines, including contraception and menopausal hormone therapy, should be listed on the request.
- **When very low levels are expected:** This index is built on a total testosterone result. That test is designed for the range typically seen in adult men, and its lowest reportable value is 20 ng/dL; results below that point are reported as less than 20 ng/dL. Levels in women, and particularly after menopause, often fall below this point.
- **Comparing results over time:** Laboratories use different testosterone and SHBG methods, and because this index compares one against the other, a value from one laboratory cannot be compared with a value from another. Repeat testing should be done at the same laboratory whenever possible.

Limitations:

Every laboratory test has limits. For the free androgen index, the main ones are:

- This value is calculated, not measured. It carries every limitation of both tests it is built from, and anything that affects either the total testosterone or the SHBG result passes straight through into the index.
- The index is not suitable for men and should not be used by them. It was developed and validated in women, and in men, the relationship between the two measurements it compares does not reflect the available testosterone usefully.
- The index becomes unreliable when SHBG is very low. Because SHBG is the figure being divided by, a small difference in it produces a large difference in the index, and the result can overstate androgen excess. This matters because a low SHBG is common in exactly the conditions the index is used to investigate.
- The total testosterone measurement behind this index has a lowest reportable value of 20 ng/dL. Testosterone levels in women, and particularly after menopause, are often below this point, so those results are reported as less than 20 ng/dL rather than as an exact number, and an index calculated from them carries the same limit.
- A free androgen index is one piece of a larger picture. It is meant to be read together with the patient's symptoms, medical history, and other test results — never on its own.

Reference Range(s):

The free androgen index is a ratio, so it is reported as a plain number with no units. Because it compares two measured results against each other, its expected range depends entirely on the particular testosterone and SHBG methods used to produce it. An index from another laboratory is therefore not the same quantity rather than merely a slightly different one. The range below is established by this laboratory against its own two methods. No separate range is given for men, because the index is not used in them.

• Adult females: PENDING LABORATORY VERIFICATION

A result outside this range is not automatically a problem, and a result inside it does not rule one out. Only the ordering provider can interpret what a given number means for a given patient. Patients should always go by the reference range printed on their own laboratory report.

Analyte	Disorder	Expected Value*
FAI	PCOS / PMOS	↑↑
FAI	Nonclassical CAH	↑
FAI	Obesity	↑
FAI	Graves' disease	↓
FAI	Underactive thyroid (Hashimoto)	↑

*↓ – Decreased, ↑ – Increased, ↑↑ – Markedly Increased.

What are some references that discuss the medical necessity of testing Free Androgen Index (FAI)?

1. Vermeulen, A. et al. A critical evaluation of simple methods for the estimation of free testosterone in serum. *J Clin Endocrinol Metab*, **84**, 3666–3672 (1999).
2. Teede, H. J. et al. Recommendations from the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome. *J Clin Endocrinol Metab*, **108**, 2447–2469 (2023).
3. Martin, K. A. et al. Evaluation and treatment of hirsutism in premenopausal women: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*, **103**, 1233–1257 (2018).
4. Speiser, P. W. et al. Congenital adrenal hyperplasia due to steroid 21-hydroxylase deficiency: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*, **103**, 4043–4088 (2018).
5. Thaler, M. A. et al. The biomarker sex hormone-binding globulin – from established applications to emerging trends in clinical medicine. *Best Pract Res Clin Endocrinol Metab*, **29**, 749–760 (2015).
6. Krassas, G. E. et al. Thyroid function and human reproductive health. *Endocr Rev*, **31**, 702–755 (2010).



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