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# Diagnosis and Integrative Preventative Approaches for Healthy Thyroid Function in Women

**Gary Null PhD*, Richard Gale**

Nutrition Institute of America, 247 West 35th Street, 6th Floor, New York, NY 10001

*editor.elixir@gmail.com

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## ABSTRACT

Thyroid disorders are among the most prevalent endocrine conditions affecting women, yet they remain frequently underdiagnosed due to nonspecific symptoms and limitations in standard laboratory assessment. This review synthesizes current medical literature on the epidemiology, pathophysiology, diagnosis and integrative natural prevention of thyroid dysfunction in women, with particular emphasis on hypothyroidism and autoimmune thyroiditis. Conventional diagnostic strategies rely primarily on serum thyroid-stimulating hormone (TSH), free thyroxine (T4), and thyroid antibody measurements. However, evidence suggests these markers may not fully reflect tissue-level thyroid activity or the early presence of subclinical disease. The review highlights the complex interplay between hormonal transitions, immune dysregulation, environmental exposures, and the gut–thyroid axis in the development and progression of thyroid disorders. Nutritional status has been identified as a critical determinant of thyroid health, with key roles for iodine, selenium, zinc, iron, and vitamin D in hormone synthesis, conversion, and immune modulation. Integrative approaches such as diet, targeted supplementation, stress reduction and physical activity have been shown to improve biochemical markers and reduce autoimmune activity. Current evidence now supports a more comprehensive clinical model that combines standard diagnostic testing with individualized lifestyle and nutritional strategies to improve long-term management of thyroid dysfunction in women.

Millions of women quietly navigate their lives with a thyroid disease that often goes undiagnosed. Thyroid disorders are among the most common endocrine conditions affecting women and occur approximately eight times more often than men. Current estimates are one in seven women will experience a thyroid disorder at some point during her lifetime. Unfortunately, our medical system devotes far more resources and funding on public awareness campaigns for other major illness, such as diabetes, cardiovascular disease and cancer, while overlooking thyroid dysfunction as potential underlying causes to the symptoms women present. Consequently up to 60 percent of cases, an estimated 20 million Americans, go undiagnosed[1]. Roughly one third of autoimmune thyroid disease, which affects 7.7 percent of American woman (2.5 million women) remain undiagnosed[2]. This diagnostic bias persists due to a tendency to attribute thyroid symptoms to other causes. Since thyroid disorders frequently develop gradually, common symptoms such fatigue, mood changes, depression, weight fluctuation, hair loss and menstrual irregularities are commonly dismissed as normal features of pregnancy, perimenopause, and menopause or ruled out as psychosomatic.

This paper highlights thyroid disorders as a significant and largely ignored public health issue. The disproportionate focus on other diseases, and a systemic failure to investigate thyroid dysfunction as a hidden culprit behind many nonspecific symptoms presents not only diagnostic challenges to this silent epidemic but also simple therapeutic measures women can adopt for relief. Here we summarize the challenges and offer practical, evidence-based and natural integrative recommendations that can easily be incorporated into clinical practice.

In particular, hypothyroidism is one of the most under diagnosed health problems in women. Recent analyses estimate that hypothyroidism affects roughly 9.5 to 11.7 percent of American adults, or roughly 30 million people. Rates are now rising upwards to 17 percent among women. In a comprehensive review combining the National Health and Nutrition Examination Survey (NHANES) and insurance claims data from 2009 to 2019, hypothyroidism among women has been increasing steadily, which highlights the need for medical practitioners to become more vigilant in their diagnosis, monitoring and preventative advice[3]. On the other hand hyperthyroidism affects approximately 1.2 percent of the population. Thyroid disease rates also rise modestly in postmenopausal women. Globally, women between the ages of 30 and 60 are at the highest risk[4].

The thyroid gland affects every organ and cell in the body. This is particularly relevant for women, whose hormonal transitions place additional stress on the thyroid. It plays a central role in regulating metabolism, energy production, thermoregulation, and reproductive function. The thyroid hormones thyroxine (T4) and triiodothyronine (T3) also influence nearly every tissue in the body. In women, this includes the critical interactions occurring along the hypothalamic–pituitary–ovarian axis. These hormones have a role in regulating gene expression, protein synthesis, lipid metabolism and cardiovascular function. Consequently, even subtle dysfunction in the thyroid gland can potentially disrupt not only regularity of menstrual cycles and affect fertility and pregnancy but other organ functions as well.

Hypothyroidism occurs when the thyroid system is underactive in one of two ways. 1) the thyroid gland fails to produce sufficient T4 hormone, or 2) the liver, the kidneys and other tissues don't convert the thyroid gland's active T4 efficiently. Today, the most common thyroid dysfunction in developed countries is autoimmune thyroiditis, such as Hashimoto's disease, in which the immune system mistakenly attacks the thyroid gland. Various causes include certain medications (e.g., lithium, amiodarone, etc.), iodine imbalance, thyroid surgery, toxic chemical overload, and radiation exposure. Emerging research points to the gut-thyroid axis; women with Hashimoto's often have reduced gut bacterial diversity, which correlates with higher autoimmune antibody titers and may contribute to disease progression.

Hypothyroidism significantly increases women's risk of cardiovascular disease. An underproduction of thyroid hormones can raise t "bad" cholesterol (LDL) and lower the "good" type (HDL). Despite some fears, there is lack of reliable evidence that hypothyroidism itself accelerates bone loss or increases osteoporosis risks. In fact, slower bone turnover in untreated cases may preserve bone density in some women. On the other hand, overtreatment with thyroid hormone replacement

 

therapy can increase fracture risks. When weighing the potential consequences, the failure to detect and treat hypothyroidism in many women is troubling.

Subclinical hypothyroidism, which is defined as elevated thyroid-stimulating hormone (TSH) with normal levels of free T4, is particularly common. It affects approximately 10–12 percent of women depending upon the population and age group. Research also shows that subclinical hypothyroidism can signal increased cardiovascular risk, particularly in younger women or in those with other cardiovascular risk factors[5].

Autoimmune thyroid disease, especially Hashimoto's thyroiditis, is now recognized as the leading cause of hypothyroidism in developed countries. Hormonal transitions unique to women -- such as pregnancy, postpartum immune shifts, and menopause -- significantly increase susceptibility. Research also shows that thyroid dysfunction is closely linked to reproductive health, including infertility and adverse pregnancy outcomes. Research indicates that while genetics may represent 70 percent of women's susceptibility to autoimmune thyroid disease, environmental factors such as persistent exposure to organic pollutants and pesticides are critical triggers in genetically susceptible individuals[6].

A wide variety of factors can lead to a low thyroid condition. These include excessive physical and emotional stress, mineral and vitamin deficiencies, exposure to environmental chemical toxins, prolonged illness, and other autoimmune disorders. Many cases of women's thyroid dysfunction occur because the immune system is over vigilant and mistakenly attacks the thyroid gland. Nutritional deficiencies, notably iodine, selenium, zinc and iron, are also crucial, because these nutrients support the conversion of T4 to its active T3 form. Adequate iron and selenium levels are required for this conversion. Deficiencies in these minerals are a widespread problem[7]. Zinc in particular plays an essential role in thyroid hormone synthesis and in converting T4 into T3. Zinc deficiency can worsen hypothyroid symptoms such as hair loss and fatigue. Women who supplement with zinc, along with selenium, experience improved hormone balance and physical energy[8]. In addition, chronic stress, diets high in refined carbohydrates, and chemical endocrine disruptors further suppress the thyroid gland.

## Diagnosis

Why do most thyroid conditions remain unrecognized in women?

Diagnosing hypothyroidism has improved substantially over the past two decades. The conventional protocol tests thyroid functioning by measuring the blood levels of thyroid-stimulating hormone (TSH), free T4 and T3. Today, the American Thyroid Association's current guidelines emphasize testing for thyroid peroxidase antibodies (TPOAb) and thyroglobulin antibodies (TgAb) in order to detect early indications of autoimmune thyroiditis[9].

Hypothyroidism is frequently difficult to diagnose because it develops so subtly and can remain largely asymptomatic for years. Subclinical hypothyroidism usually accompanies milder symptoms such as decreased energy and depressed mood even though hormone blood levels appear normal. Physicians may diagnose hypothyroidism when hormone levels are out of range or when a goiter or nodule is present, but millions of women have suboptimal thyroid function that falls short of the conventional standard.

Low thyroid conditions are often diagnosed when the TSH level is above the normal reference range and free T4 is below it. TSH is the primary screening target and the most sensitive measure; an elevated TSH means the pituitary gland is directing the thyroid to produce more hormone, however, the thyroid is not responding effectively. Elevated TSH with normal free T4 defines subclinical hypothyroidism. Most laboratories set the upper limit of normal TSH at about 4.0 to 4.5 mU/L. But some experts are now advocating for narrower ranges in order to measure optimal function in women. Giving consideration to a narrower range may be more crucial during a woman's reproductive years or while pregnant. For example, during pregnancy tighter TSH control is necessary because of the hormone's role in fetal brain development.

Recent research has also explored thyroid hormone resistance and peripheral deiodinase dysfunction, which might explain why some women experience hypothyroid symptoms despite normal lab results[10]. It should be noted that these lab tests aren't flawless. They miss tissue-level signals when T3 lags despite normal results. This might lead to women's

frustrating experience of being told "it's all in your head" and being prescribed antidepressants or diet pills without taking a deeper look.

The problem with relying solely on these conventional measures is that a woman's blood levels can test within the normal reference range despite her thyroid system as a whole being underactive. This is why it is important to evaluate the complete clinical picture, including age, symptoms, antibody levels, comorbidities, medications and, in certain cases, additional biomarkers[11]. While the body converts T4 to the active T3 form in tissues such as the liver and kidneys, current guidelines emphasize TSH and free T4 as the primary tests. In general, contrary to earlier claims, the "T3 uptake" test is now largely obsolete. In addition, a diagnosis of "Wilson's syndrome" is no longer recognized in evidence-based medicine. Furthermore, while free T3 may provide additional supportive data in select cases, it is not recommended as a primary diagnostic tool in routine hypothyroidism evaluation.

Functional medicine practitioners continue to use adjunctive approaches such as basal body temperature and symptom correlation, however, current evidence supports combining biochemical tests with clinical assessment. The *ATA Guidelines* recommend that women with unexplained fatigue, weight change, infertility, or menstrual irregularities receive a comprehensive panel of thyroid tests.

Dr. Raphael Kellman, a thyroid specialist and clinician in New York City, recommends heavy metal screening and nutrient profiles. He has used the thyrotropin-releasing hormone (TRH) stimulation test to diagnose thousands of his patients. TRH, which stimulates the pituitary gland to release TSH, is injected into the body and the blood is tested twenty-five minutes later. If the thyroid is low, the pituitary will start producing a lot of TSH and that in turn accumulates in the pituitary gland.

Finally, the European Thyroid Association guidelines emphasize genetic testing for rare metabolism glitches in difficult cases to diagnose[12].

## Natural Prevention for Hypothyroidism

Supporting an underactive thyroid naturally involves more than medication and hormone replacement. It is also about nourishing the body, reducing stress, being physically active and restoring hormonal balance. By adopting a gentle lifestyle and a nutrient-rich diet, women can enable their thyroid to regain its natural rhythm and function.

The thyroid depends on several nutrients to function properly. Iodine is particularly essential for thyroid hormone production. Although iodine deficiency is now rare in the U.S. because of iodized salt, women who avoid salt or follow low-sodium diets are at higher risk of lower levels[13]. On the other hand, in some women, excessive iodine can also be harmful; it may trigger or worsen autoimmune thyroiditis. The U.S. Institute of Medicine sets the upper safe limit for adults at 1,100 mcg daily. Women who supplement beyond this should monitor their thyroid levels regularly[14].

Inositol is a naturally occurring compound found in whole grains and vegetables that help regulate the way thyroid cells use iodine in the production of thyroid hormones. When inositol is combined with selenium, it has been shown to lower thyroid antibodies and TSH levels in women with Hashimoto's thyroiditis[15]. Recent evidence also suggests that pairing inositol with vitamin D enhances thyroid hormone production and antibody reduction in women with autoimmune hypothyroidism[16].

Foods such as cruciferous vegetables, millet, soy, and cassava contain goitrogens, which are natural compounds that potentially interfere with the body's utilization of iodine. In practice, goitrogen content in these foods is low, and cooking generally normalizes its adverse effects. For the majority of women with hypothyroidism, they can safely enjoy these foods provided they are properly cooked.

There is debate over the association between soy consumption and thyroid conditions. Recent evidence is reassuring. One meta-analysis found that while soy might slightly raise TSH, it minimally affects free T3 or free T4 levels[17]. For most women, moderate soy intake from whole foods is safe; however, consuming large amounts of soy is perhaps best avoided.

Stress reduction, adequate sleep, and avoiding excess alcohol, caffeine and refined sugar contributes to chronic stress and cortisol spikes that can block thyroid hormone conversion and exacerbate adverse thyroidal symptoms. Finally, a diet rich in fiber, probiotics and prebiotics, along with reduced processed foods and environmental toxins, can improve thyroid-related fatigue and mood.

Besides iodine and inositol, other nutrients can help women protect and stimulate thyroid hormone production.

Selenium is critical for converting inactive T4 into active T3 and protecting thyroid tissue from oxidative stress. Women with autoimmune thyroid disease often have low selenium levels, and supplementation can reduce TSH and thyroid peroxidase antibody levels and improve well-being[18,19].

Zinc plays an essential role in thyroid hormone synthesis and in converting T4 into T3. Zinc deficiency worsens hypothyroid symptoms such as hair loss and fatigue. Women who supplement with zinc, along with selenium, experience improved hormone balance and increased physical energy[20].

Vitamin A deficiency has been shown to disrupt thyroid signaling, particularly in women of reproductive age or with an increased risk of subclinical hypothyroidism[21]. It helps regulate communication between the brain and thyroid gland along the hypothalamic-pituitary-thyroid axis. Ensuring adequate vitamin A levels through diet or beta-carotene supplementation promotes optimal hormone balance without the toxicity risk of high-dose retinol.

L-tyrosine is an amino acid involved in manufacturing thyroid hormones by combining with iodine to form T4. Although tyrosine deficiency is rare, adequate levels are vital for hormone synthesis and energy metabolism[22]. Maintaining sufficient tyrosine levels is especially important for healthy thyroid function in women under excessive stress[23].

Tumeric's bioactive biomolecule curcumin is an antioxidant and anti-inflammatory compound shown to protect thyroid tissue from oxidative damage[24]. Animal and population studies suggest it reduces the risk of goiter and may improve thyroid function by decreasing inflammation[25].

Regular physical activity plays an important role in improving energy and metabolic emotional health in women with hypothyroidism. Recent research also shows exercise improves quality of life in subclinical hypothyroidism. In particular, moderate aerobic activity several times weekly can lower arterial stiffness and improve vascular function in hypothyroid and subclinical hypothyroid adults[26].

## Natural Therapies for Hyperthyroidism

When the thyroid is overactive, the body can feel like it's running on overdrive. Natural approaches focus on calming the system to lessen stress and reducing inflammation. A healthy diet, specific nutrients, restorative habits, and physical exercise can all help reduce the risks of hyperthyroidism.

In a large North American study of over 65,000 Seventh-day Adventists, those who followed vegetarian and especially vegan diets had a significantly lower risk of hyperthyroidism compared with omnivores[27]. Plant-based diets are naturally rich in antioxidants and anti-inflammatory compounds that protect against autoimmune diseases such as Graves' disease, which is the leading cause of hyperthyroidism. Omnivorous diets showed the highest hyperthyroid risk.

Balancing iodine levels is essential because both iodine deficiency and excess can worsen thyroid dysfunction. Although iodine deficiency is well known to cause hypothyroidism, mild hyperthyroidism has also been paradoxically linked to low iodine. Conversely, too much iodine, especially from supplements or frequent consumption of kelp or seaweed, can over stimulate the thyroid gland. For this reason, women who are prescribed radioactive iodine therapy are encouraged to follow a low-iodine diet[28].

For women with hyperthyroidism, especially Graves' disease, selenium can help reduce thyroidal inflammation by protecting from oxidative damage and protect eye health, which is serious risk in Graves' ophthalmopathy[29,30].

When the thyroid is over active, it depletes vital nutrients and exerts unnecessary strain on the body's natural reserves. Replenishing these key nutrients helps protect the heart and bones and will help manage thyroid gland activity.

Low vitamin D levels are common in Graves' disease and associated with greater disease progression and relapse risks[31]. Vitamin D supplementation in Graves' disease patients has been demonstrated to significantly improve immune markers and reductions in thyroid antibody levels[32]. Many women with Graves' disease have also been observed to have insufficient magnesium, which can increase fatigue, anxiety and sleep disturbances. Taking magnesium and selenium together can improve thyroid hormone balance and reduce inflammatory markers.

The amino acid derivative L-carnitine may help to reduce hyperthyroid symptoms. L-carnitine helps ease symptoms such as heart palpitations, blood pressure swings, fatigue and muscle weakness by limiting the uptake of thyroid hormones[33]. Together L-carnitine and selenium has been shown to improve the overall quality of life in women with Graves' disease[34].

In traditional European herbal medicine, *Lycopus europaeus* (bugleweed) has long been used to calm an overactive thyroid. There is some evidence that it may also help to slow thyroid hormone production and reduce symptoms such as rapid heart palpitations and heat intolerance[35]. Clinical and animal research have also found that bugleweed extract may safely reduce thyroid hormone levels and improve women's mood stability in subclinical hyperthyroidism[36].

Finally, hyperthyroidism places excessive stress on the cardiovascular system, which potentially leads to atrial fibrillation. This overstimulation impairs the heart's ability to respond to physical exertion. Studies show that even mild or subclinical hyperthyroidism can reduce the capacity of cardiac exercise; however, appropriate treatment can restore the body's energy reserves within months[37].

Once thyroid hormone levels normalize, regular moderate exercise can be very important for full recovery. Structured aerobic and resistance training has been shown to improve heart rate variability and the quality of life in women recovering from hyperthyroidism[38]. Women should begin gently and progress as stamina increases. Walking, yoga, tai chi, or light cycling are ideal.

## Natural Prevention of Hashimoto Thyroiditis

Thyroiditis refers to the inflammation of the thyroid gland. It is most often caused by an autoimmune reaction whereby the immune system mistakenly attacks thyroid tissue. The most common form, **Hashimoto's thyroiditis**, primarily affects women during pregnancy, peri- and post-partum, and menopause. This chronic condition can lead to both **hypothyroid** and transient **hyperthyroid** symptoms. Hashimoto disease depletes the body's energy reserves, and impairs women's quality of sleep, emotional states, and carbohydrate, fat and protein metabolism.

Hashimoto's thyroiditis is often a biomarker indicating broader immune dysfunction, which can be linked to stress, poor diets and nutrient deficiencies, environmental toxins, and disturbances in the gut microbiome. Evidence indicates that thyroiditis arises from a combination of **genetic susceptibility, weakened immunity, toxic environmental triggers – such as endocrine disruptors like bisphenol A (BPA) and** perfluorinated compounds **-- and gut dysbiosis**[39]**.** This suggests that lifestyle and diet likely plays a far greater role than was once thought.

**Selenium and vitamin D deficiencies, chronic viral infections including Epstein-Barr virus**, and **intestinal permeability or "leaky gut"** are also significant risk factors for thyroiditis in women[40,41]. In addition, estrogen hormonal fluctuations, especially during pregnancy or menopause, often amplify immune reactivity thereby making women more vulnerable to thyroid inflammations. Thyroid hormone imbalances are now recognized to affect women's estrogen metabolism, libido and menstrual regularity[42].

Thyroiditis is not simply a glandular condition but a systemic and emotional condition requiring a **whole-woman approach**, which addresses the immune system, hormones, stress, and nutrition together.

Dietary interventions, such as an **anti-inflammatory Mediterranean diet, can** significantly reduce thyroid peroxidase antibody levels and improve mood and women's energy in Hashimoto's thyroiditis[43]. Some women may benefit by eliminating gluten from their diet.

Nutrient therapy is a cornerstone for natural prevention. **Selenium and myo-inositol** supplementation have repeatedly been shown to lower TSH and thyroid antibodies while improving thyroid function. Vitamin D repletion is equally crucial, and **zinc**, **magnesium** and **omega-3 fatty acids** each have the potential to modulate immune activity and reduce inflammation. **Nigella sativa** or black seed oil possesses anti-inflammatory and antioxidant properties that can also significantly reduce TPO antibodies and improve in thyroid function[44].

## Conclusion

Recognizing the complete scope of women's thyroid's hormonal system, including its central control, peripheral hormonal conversion, immune factors, and environmental and toxic stressors,

women will better serve women with more comprehensive clinical evaluations and personalized care. Modern integrative strategies are increasingly combining accurate testing with special attention to diet and nutrition, gut health, liver support, stress reduction modalities, and lifestyle behaviors. An integrative approach addresses the root causal contributors such as vitamin and mineral deficiencies, estrogen-progesterone imbalance, unhealthy microbiota, and chemical toxin exposure, thereby helping to restore physical energy, mood, metabolism, fertility, and overall emotional well-being across every stage of a woman's life.

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## References:


1. American Thyroid Association. General Information Press Room. www.thyroid.org/media-main/press-room. Accessed April 2026.

2. Dillon CF, et al. Autoimmune Thyroid Disease in the United States: Population Prevalence, Diagnosis Rates, and Trends. J Endocrine Society. 2025;9(10): bvaf120.

3. Khan Z, et al. Prevalence of Hypothyroidism in Women Presenting with Menstrual Irregularities. Euro J Cardiovascular Med. 2025;15(8): 585-589.

4. Taylor PN. et al. Global epidemiology of hyperthyroidism and hypothyroidism. Nature Reviews Endocrinol, 2018;14(5), 301-316.

5. Wang P, et al. Research status of subclinical hypothyroidism promoting cardiovascular disease. Front Cardiovasc Med. 2025 Apr;4(12): 1527271.

6. Brent, G, Environmental exposures and autoimmune thyroid disease. Thyroid, 2010 Jul;20(7): 755-761. doi: 10.1089/thy.2010.1636

7. O'Kane SM, et al. Micronutrieints, iodine sttus and concentrations of thyroid hormones; a systematic review. Nutr Rev, 2018 Jun176(6): 418-431.

8. Mahmoodianfard S, et al. Effects of Zinc and Selenium Supplementation on Thyroid Function in Overweight and Obese Hypothyroid Female Patients: A Randomized Double-Blind Controlled Trial. J Am Coll Nutr. 2015;34(5): 391-399.

9. Ross DS, et al. ATA guidelines for the diagnosis and management of hypothyroidism and other causes of thyrotoxicosis. Thyroid, 2016 Oct;26(10): 1343-1421.

10. Peeters RP. Reduced Activation and Increased Inactivation of Thyroid Hormone in Tissues of Critically Ill Patients. J Clin Endocrinol Metabol, 2003 Jul;88(7): 320203211.

11. Jasim S, Papaleontiou M. Considerations in the diagnosis and management of thyroid dysfunction in older adults. Thyroid. 2025 Jun;35 (6): 624-632. doi: 10.1089/thy.2025.0128.

12. Persani L, et al. 2024 European Thyroid Association Guidelines on Diagnosis and Management of Genetic Disorders of Thyroid Hormone Transport, Metabolism, and Action. European Thyroid Journal. 2024;13(4): e240125).

13. Krajcovicova-Kudlackova M, et al. Iodine deficiency in vegetarians and vegans. Ann Nutr Metab. 2003;47(5): 183-185.

14. Farebrother J, et al. Excess iodine intake: sources, assessment, and effects on thyroid function. Ann N Y Acad Sci. 2019 Jun;1446(1): 44-65.

15. Farebrother J, et al. Combined treatment with Myo-inositol and selenium ensures euthyroidism in subclinical hypothyroidism patients with autoimmune thyroiditis. Ann N Y Acad Sci. 2013:2013: 424163.

16. Krysiak R, et al. The impact of vitamin D on thyroid autoimmunity and hypothalamic-pituitary-thyroid axis activity in myo-inositol-treated and myo-inositol-naïve women with autoimmune thyroiditis: A pilot study. J Clin Pharm Ther. Jun 30 2022.

17. Otun J, et al. Systematic Review and Meta-analysis on the Effect of Soy on Thyroid Function. Scientific reports. 2019 Mar 8;9(1): 3964-3964.

18. Gartner R, et al. Selenium supplementation in patients with autoimmune thyroiditis decreases thyroid peroxidase antibodies concentrations. J Clin Endocrinol Metab. 2002;87(4): 1687-1691.

19. Kong X-Q, et al. Efficacy of selenium supplementation in patients with Hashimoto's thyroiditis: A systematic review and meta-analysis. Medicine (Baltimore), 2023 May 19;102(20: e33791.

20. Mahmoodianfard S, et al. Effects of Zinc and Selenium Supplementation on Thyroid Function in Overweight and Obese Hypothyroid Female Patients: A Randomized Double-Blind Controlled Trial. J Am Coll Nutr. 2015;34(5): 391-399.

21. Farhangi MA, et al. The effect of vitamin A supplementation on thyroid function in premenopausal women. J Am Coll Nutr, 2012 Aug31(4): 268-74.

22. Jonklaas J, et al. Guidelines for the treatment of hypothyroidism: prepared by the american thyroid association task force on thyroid hormone replacement. Thyroid. 2014;24(12): 1670-1751.

23. Krishnamurthy HK, et al. Effect of micronutrients on thyroid parameters. J Thyroid Res, 2021 Sep 28;2021: 1865483.

24. Bourbour F, et al. The Combined Effects of an Anti-Inflammatory Diet and Curcumin Supplementation on Thyroid Function and Lipid Profile in Patients With Hashimoto's Thyroiditis: A Double Blind Randomised Clinical Trial. Endocrinol Diabetes Metab. 2026 Jan;9(1): e70138.

25. Jawa A, et al. Turmeric use is associated with reduced goitrogenesis: Thyroid disorder prevalence in Pakistan (THYPAK) study. Indian J Endocrinol Metab. 2015 May;19(3): 347-350.


 

26. Dunabeitia I, et al. Effect of physical exercise in people with hypothyroidism: systematic review and meta-analysis. Scand J Clin Lab Invest. 2023 Dec;83(8): 523-532.

27. Tonstad S, et al. Prevalence of hyperthyroidism according to type of vegetarian diet. Public Health Nutrition. 2015;18(8): 1482-1487.

28. Leung AM, Braverman LE. Consequences of excess iodine. Nature Endocrinol. 2014;10(3):136-142.

29. Ventura M, et al. Selenium and Thyroid Disease: From Pathophysiology to Treatment. Int J Endocrinol. 2017;2017: 1297658.

30. Ahn HY, et al. Selenium vs Control for Graves Ophthalmopathy in a Selenium-Sufficient Area: A Randomized Clinical Trial. JAMA Ophthalmol, 2025 Feb;143(4) 287-294.

31. Xu MY, et al. Vitamin D and Graves' disease: a meta-analysis update. Nutrients. 2015 May 21;7(5): 3813-3827.

32. Grove-Laugesen D, et al. Effect of Vitamin D Supplementation on Graves' Disease: The DAGMAR Trial. Thyroid. 2023 Sep;33(9): 1110-1118.

33. Benvenga S, et al. Carnitine is a naturally occurring inhibitor of thyroid hormone nuclear uptake. Thyroid. 2000;10(12): 1043-1050.

34. Rossi M, et al. Adding L-Carnitine and Selenium to Methimazole in Graves' Disease: A Prospective Randomized Trial on Thyroid Markers and Quality of Life. Nutrients, 2025 Aug;17(16), 2693.

35. Auf'mkolk M, et al. Extracts and auto-oxidized constituents of certain plants inhibit the receptor-binding and the biological activity of Graves' immunoglobulins. Endocrinology. 1985 May;116 (5): 1687-1693.

36. Elling R, et al. [Improvements of symptoms in mild hyperthyroidism with extract of Lycopus europaeus (Thyreogutt mono)]. Wien Med Wochenschr, 2013 Feb;163(3-4): 95-101.

37. Kaminski G, et al. Electrocardiographic and scintigraphic evaluation of patients with subclinical hyperthyroidism during workout. Endocrine. 2016; 53(2): 512-519.

38. Werneck FZ. et al. Exercise training improves quality of life in women with subclinical hypothyroidism a randomized clinical trial. J Endocrinol Metab, 2018 Oct 1;62(5): 530-536.

39. Cyna Wojciech, et al. The impact of environmental factors on the development of autoimmune thyroiditis. Biomedicines, 2024;12(8): 1788.

40. Fang Y, et al. Gut microbiota and autoimmune thyroid diseases: a bidirectional Mendelian randomization study and mediation analysis. Front Microbiol, 2024 Sep 16;15: 1443643.

41. Li YT, Li WY. Viral infection and thyroid disorders: a narrative review. Front Microbiol, 2025 Jun 13;16 1625179.

42. Salari N, et al. The sexual dysfunction in women with thyroid disorders: a meta-analysis. BMC Endocr Disord, 2024 Dec 27;24: 279.

43. Ulker MT, et al. Evaluation o the effect of gluten-free diet and Mediterranean diet on autoimmune system in patients with Hashimoto's thyroiditis. Food Sci Nutr, 2023 Nov 20;12(2): 1180-1188.

44. Farhangi MA, et al. The effects of Nigella sativa on thyroid function, serum Vascular Endothelial Growth Factor (VEGF) – 1, Nesfatin-1 and anthropometric features in patients with Hashimoto's thyroiditis: a randomized controlled trial. BMC Complement Altern Med, 2016 Nov16;16: 471.

 