Hypothyroidism

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Hypothyroidism is a common condition with an insidious onset and often vague symptomatology. In the US, hypothyroidism affects an estimated 4% of women aged 18-24 years and 21% of women older than 70 years; respective values in men are 3% and 16%.[1] Laboratory tests show it is 5-8 times more common in women. The probability of developing hypothyroidism increases with age. Subclinical hypothyroidism is similar in frequency (normal serum free T4 levels with slightly elevated serum TSH concentration). Subclinical hypothyroidism can occur in up to 4-10% of adults. These numbers of prevelance would lead one to believe that routine screening is useful, common, and supported.[2,3,4]

Epidemiological evidence suggested that exposure to insecticides including organochlorines, organophosphates, and pyrethroids increased risk of hypothyroidism. Exposure to herbicides also increased risk of hypothyroidism.[5] Data analysis shows that thyroid hormone levels are lower in patients with Iodine deficiency (ID) and, in particular, pregnant women.[6] Current evidence suggests an increased type 2 diabetes risk in people with hypothyroidism.[7]

Routine screening for thyroid disease in adults where there are no relevant findings or obvious symptoms is controversial. No clinical trials were found evaluating the effectiveness of wide routine screening for hypothyroidism. Some professional groups, such as the American Academy of Family Physicians (AAFP), the American Association of Clinical Endocrinologists (AACE), and the American College of Physicians (ACP), recommend periodic assessment in older women. The American Thyroid Association's (ATA) guidelines recommend measuring TSH starting at age 35 (in both men and women) and then every 5 years thereafter. The United States Preventive Services Task Force (USPSTF) and the Institute of Medicine (IOM) do not recommend routine screening for thyroid disease in children or adults. A clinical consensus group also recommends against screening except in "aggressive" clinical cases in women 60 years or older and other high-risk populations for thyroid dysfunction (those with a personal history of type 1 diabetes or other autoimmune disease, or a family history of thyroid disease).[8,9,10,11,12]

There is a broad clinical spectrum of classifications of hypothyroidism. Causes may be autoimmune in nature, secondary to malignancy, iodine deficiency, trauma, drug-induced, or due to genetic inheritance. Drugs that are thought to cause hypothyroidism include:[13]

- Iodinated contrast dyes
- Amiodarone
- Interferon alpha
- Thalidomide
- Lithium
- Stavudine
- Oral tyrosine kinase inhibitors – Sunitinib, imatinib[14]
- Bexarotene[15]
- Perchlorate
- Interleukin (IL)-2
- Ethionamide
- Rifampin
- Phenytoin
- Carbamazepine
- Phenobarbital

Many of the common symptoms of thyroid hormone deficiency, such as fatigue, cold intolerance, weight gain, constipation, myalgia, and menstrual irregularities, are also prevalent among those without thyroid dysfunction. The lethargic, myxedematous patient with severe hypothyroidism is a familiar inhabitant of medical textbooks but is rarely seen in today's clinics. In contrast, physicians frequently encounter patients with a milder thyroid dysfunction. Unlike patients with overt hypothyroidism, these patients can have normal serum levels of thyroxine (T4) and triiodothyronine (T3) and only mildly elevated serum thyrotropin (TSH) levels. They may also have a normal TSH with some changes in free T4 and/or T3, or elevated levels of reverse T3. Such patients are often identified through routine screening or in the course of an evaluation of common nonspecific symptoms such as hypercholesterolemia.

Many of the manifestations of hypothyroidism reflect one of two changes induced by lack of thyroid hormone:[16]

- A generalized slowing of metabolic processes. This can lead to abnormalities such as fatigue, slow movement and slow speech, cold intolerance, constipation, weight gain (but not class III obesity), delayed relaxation of deep tendon reflexes, and bradycardia.
- Accumulation of matrix glycosaminoglycans in the interstitial spaces of many tissues. This can lead to coarse hair and skin, puffy facies, enlargement of the tongue, and hoarseness. These changes are often more easily recognized in young patients, and they may be attributed to aging in older patients.

Surveys indicate that many patients with thyroid disease use Integrated Healthcare (IH).[17] Many patients use IH to treat side effects of hypothyroidism (e.g., weight gain, constipation, fatigue, dry skin).[18]

Pathophysiology

Environmental iodine deficiency is the most common cause of thyroid disorders, including hypothyroidism, worldwide,[19] while in areas of iodine sufficiency, the most common cause of primary hypothyroidism is autoimmune thyroiditis (Hashimoto's disease).[20,21,22] Hypothyroidism is characterized by deficiency in the T4 and T3 hormones.[23] T4 is the main hormone produced by the thyroid gland, which only produces a small amount of T3. Only 20% or less of T3 in peripheral tissue originates in the thyroid gland [24,25]; the rest is derived from the enzymatic conversion of T4 to T3 within the target tissues. Failure of the thyroid to produce T4 and T3 stimulates the pituitary to increase production of a thyroid-stimulating hormone (TSH) through a negative feedback mechanism.[15]

Primary hypothyroidism occurs in over 95% of the cases and is caused by a failure of the thyroid gland to produce thyroid hormones.[26] Secondary and tertiary hypothyroidism should be suspected when there is known hypothalamic or pituitary disease, a mass lesion is present in the pituitary and when symptoms and signs of hypothyroidism are associated with other hormonal deficiencies.[22]

All metabolically active cells require thyroid hormone, so deficiency of the thyroid hormone has a wide range of effects on the body due to either derangements in metabolic processes or direct effects by myxedematous infiltration (i.e., accumulation of glucosaminoglycans in the tissues). These changes range from decreased contractility of the heart to infertility, to insulin resistance.

Differential Diagnoses (DDX)

A partial list includes Addison's disease, Depression, Fibromyalgia, Infectious Mononucleosis, Iodine Deficiency, Chronic Fatigue Syndrome, Menopause, Pituitary Macroadenomas.

Subjective Findings and History

History may include the past treatment of hyperthyroidism with radioiodine or thyroidectomy, the use of drugs that affect thyroid hormone synthesis, or prior cranial irradiation suggesting a central cause of hypothyroidism. Women with a recent history of pregnancy may also be at a higher risk. Hypothyroidism during pregnancy should be referred to an experienced endocrinologist or OB/GYN.

Subjective complaints are varied and can occur concomitantly: fatigue, low body temperature, menstrual disorders, depression, brain fog, forgetfulness, lack of focus, dull or puffy facies, hoarseness, edema, cold intolerance, coarse dry or thinning hair, scaly, dry thick skin, brittle fingernails, enlarged thyroid gland, muscle weakness, swollen limbs, weight gain, paresthesia's, constipation, intellectual impairment in earlier stages, dysphagia.[27] The patient may develop into frank psychosis, bradycardia, macroglossia, pleural or abdominal effusion, anemia, and

myxedema coma in rare cases. Onset is slow and insidious in most cases, and symptoms are variable. If secondary or tertiary hypothyroidism exists, you may see symptoms of other hormone deficiencies or symptoms of hypothalamic or pituitary disease. Further testing or referral is warranted. Many who are hypothyroid have a goiter, but not all who have a goiter and circulating antithyroid antibodies have hypothyroidism.

Objective Findings

- Reflexes often show brisk contraction time and slow relaxation time.
- Skin and hair may be coarse and dry. Thinning hair. Decreased sweating.
- Low basal body temperature and bradycardia may be present.
- Objective findings in early cases are often non-specific.

Examination

Full physical examination (PE), including cardiovascular (CV) assessment, vitals, skin and hair exam, deep tendon reflexes (DTRs), pulmonary assessment, abdominal exam, basal body temperature, and thyroid palpation. Neck ultrasound and fine needle aspiration (biopsy) to examine nodules as needed.

Labs

- Thyroid studies: TSH and free T4 initially; consider thyroid antibody testing if Hashimoto's is suspected (antithyroid peroxidase (anti-TPO) antibodies. Hashimoto's thyroiditis (autoimmune thyroiditis) is a specific form of hypothyroidism and may include symptoms of a feeling of fullness in the throat, painless thyroid enlargement, sore throat, neck pain, and a low-grade fever. Consider free and reverse T3 if symptoms persist, and no other cause is found.
- TSH can differentiate primary from secondary (primary thyroid disease accounts for over 95 percent of cases of hypothyroidism): most sensitive test.
- The American Association of Clinical Endocrinologists (AACE) and the American Thyroid Association (ATA) suggest the reference range for TSH is 0.45-4.12 mIU/L.[42] The National Academy of Clinical Biochemistry argues that the upper limit of normal of the euthyroid reference range should be reduced to 2.5 mU/L.[28] This is an ongoing discussion amongst the experts for over a decade. Most laboratories use normal values of about 4.5 to 5.0 mU/L and the new AACE guidelines refer to the individual labs for reference.
- Consider referral for TRH or TSH stimulation testing if unable to rule out tertiary hypothyroidism.
- Consider radioactive iodine (RAI) testing referral with nodular goiter.
- Consider reverse T3 testing with subclinical hypothyroidism features and normal thyroid studies.
- Lipid panel/profile. Hyperlipidemia occurs with increased frequency in hypothyroidism and if this is picked up on routine lab testing, the patient should be tested for thyroid dysfunction.

- Comprehensive metabolic panel (CMP) to check for hyponatremia, which can result from inappropriate production of antidiuretic hormone (ADH).

Plan

- Normalize thyroid function (restoration to euthyroid state) and reduce symptoms. In most patients, hypothyroidism is a permanent condition requiring lifelong treatment. In patients with a goiter, a goal is also to reduce the size of the goiter.
- Supplement with thyroid hormone when indicated (T3, T4, or combination) on an empty stomach and away from other medications. The ATA 2014 updated guidelines recommend levothyroxine (T4) as the preparation of choice.[29] Use individualized factors when determining which therapy to use. A meta-analysis of randomized, controlled trials of T4-triiodothyronine (T3) combination therapy versus T4 monotherapy for treatment of clinical hypothyroidism found no difference in effectiveness between combination therapy and monotherapy with respect to side effects (body pain, depression, fatigue, body weight, anxiety, quality of life, total low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol, and triglyceride levels).[30] A 2022 study of using only T3 therapeutically indicated that patients can benefit from T3 alone when T4 or a T3/T4 combination does not effectively reduce symptoms.[31] Dosing needs to be monitored daily to prevent development of hyperthyroidism, which can increase risk of atrial fibrillation and accelerated bone loss. Patients should self-assess for symptoms of tachycardia, palpitations, atrial fibrillation, nervousness, tiredness, headache, increased excitability, sleeplessness, tremors, and possible angina.
- The diagnosis and management of thyroid nodules.[32]
- Reduction in the size of goiter (if present).
- Avoidance of overtreatment (iatrogenic thyrotoxicosis).

Pharmaceuticals (Prescription):

- Levothyroxine (Synthroid, Levoxyl, Levothroid, Unithroid, Tirosint) (T4)
- Liothyronine (Cytomel, Triostat) (T3)
- Thyroid desiccated USP (Armour Thyroid, Nature-Throid, Westhroid)

Supplements and Nutrients:

- Assess diet, avoiding goitrogens
- Consider iodine supplementation (kelp), omega fatty acids
- Limit soy isoflavones in patients who are not euthyroid[33]
- Limit gluten and other food sensitivities
- Liver support to increase thyroid deiodination
- Vitamins to support thyroid function: selenium,[34] zinc, folate, tyrosine, vitamin B complex, vitamin C, vitamin E, iodine, zinc, selenium, copper, manganese, lecithin.
- Vitamin D therapy for symptoms.[35,36]
- Patients with hypothyroidism had lower levels of vitamin B12 than healthy participants.[37]

Physical Modalities (Western):

- Exercise training.[38]

Herbal Medicine (Western):

- Appropriate botanicals to support thyroid function and restore trace minerals.
- To reduce swelling of a goiter if present consider *Withania somnifera* (Ashwagandha).
- Plant sterols for autoimmune disease (Hashimoto's).
- Coleus forskohlii
- Aromatherapy for fatigue[39]
- Brown seaweed, kelp, Rumex, Schisandra berry, Commiphora, Bacopa, Black Walnut, Fucus, Bugleweed, Eleutherococcus, and lemon balm.
- Some commercially available thyroid supplements contain unregulated doses of hormones. Doses should be monitored to avoid unintended iatrogenic thyrotoxicosis.[40]

Herbal Medicine (Traditional East Asian Medicine):

- Chinese herbal medicine.[41]

Homeopathy:

- Appropriate homeopathic remedy.

Manual Adjustments/Manipulation:

- Hydrotherapy
- Diathermy
- Manipulation

Length of Treatment

Patient and condition dependent. Once hormone replacement is instituted it is often lifelong. Evaluation of therapy performed annually once the dose is established.

Referral Criteria

Consultation with an endocrinologist is recommended in the following situations:[42]

- Children and infants.
- Patients in whom it is difficult to render and maintain a euthyroid state.
- Pregnancy and postpartum patients.
- Women planning conception.
- Cardiac disease.
- Presence of goiter, nodule, or other structural changes in the thyroid gland.
- Presence of other endocrine diseases such as adrenal and pituitary disorders.
- Unusual constellation of thyroid function test results.
- Unusual causes of hypothyroidism such as those induced by toxic agents.

Resources for Clinicians

American Thyroid Association (ATA). Guidelines for the treatment of hypothyroidism. Prepared by the American Thyroid Association Task Force on Thyroid Hormone Replacement http://www.thyroid.org/professionals/ata-professional-guidelines/

Chaker L, Bianco AC, Jonklaas J, Peeters RP. Hypothyroidism. *Lancet.* 2017; Sep 23;390 (10101): 1550-1562.

Resources for Patients

The American Thyroid Association is a professional society of physicians and scientists who specialize in thyroid diseases. The Association is dedicated to promoting scientific and public understanding of the thyroid gland and its disorders, to improve methods for prevention, diagnosis, and management. http://www.thyroid.org/patients/

MedlinePlus will direct you to information to help answer health questions. MedlinePlus brings together authoritative information from NLM, the National Institutes of Health (NIH), and other government agencies and health-related organizations.
http://www.nlm.nih.gov/medlineplus/ency/article/000353.htm

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[1] Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado thyroid disease prevalence study. Arch Intern Med. 2000;160:526–534.
[2] Tunbridge WM, Evered DC, Hall R, et al. The spectrum of thyroid disease in a community: the Whickham survey. *Clin Endocrinol* (Oxf) 1977; 7:481.
[3] Vanderpump MPJ, Tunbridge WMG, French JM, et al. The incidence of thyroid disorders in the community: a twenty-year follow-up of the Whickham survey. *Clin Endocrinol* 1995; 43:55.
[4] Vanderpump MP, Tunbridge WM. The epidemiology of thyroid diseases. In: The Thyroid: A Fundamental and Clinical Text, 8th ed, Braverman, LE, Utiger, RD (Eds). Lippincott Williams and Wilkins, Philadelphia, 2000. p. 467.
[5] Sirikul W, Sapbamrer R, Exposure to pesticides and the risk of hypothyroidism: a systematic review and meta-analysis. BMC Public Health. 2023 Sep 26;23(1):1867. doi: 10.1186/s12889-023-16721-5.
[6] Garofalo V, Condorelli R A, Cannarella R, Aversa A, Calogero A E, La Vignera A, Relationship between Iron Deficiency and Thyroid Function: A Systematic Review and Meta-Analysis. Nutrients. 2023 Nov 15;15(22):4790. doi: 10.3390/nu15224790.
[7] Oscar H Roa Dueñas, Anna C Van der Burgh, Till Ittermann, Symen Ligthart, M Arfan Ikram, Robin Peeters, Layal Chaker, Thyroid Function and the Risk of Prediabetes and Type 2 Diabetes. J Clin Endocrinol Metab. 2022 May 17;107(6):1789-1798. doi: 10.1210/clinem/dgac006.
[8] Ladenson PW, Singer PA, Ain KB, et al. American Thyroid Association guidelines for detection of thyroid dysfunction. *Arch Intern Med* 2000; 160:1573.
[9] Screening for thyroid disease: recommendation statement. *Ann Intern Med* 2004; 140:125.
[10] Helfand M. Screening for subclinical thyroid dysfunction in nonpregnant adults: a summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2004; 140:128.
[11] Medicare Coverage of Routine Screening for Thyroid Dysfunction. Stone, MB, Wallace, RB, Editors. Committee on Medicare Coverage of Routine Thyroid Screening. Board on Health Care Services. 2003 The National Academies Press, Washington, D.C.
[12] Surks MI, Ortiz E, Daniels GH, et al. Subclinical thyroid disease: scientific review and guidelines for diagnosis and management. *JAMA* 2004; 291:228.
[13] Medpage Updated: May 25, 2022. Author: Philip R Orlander, MD, FACP; Chief Editor: George T Griffing, MD
[14] Hawkins J, Hires CY, Dunne EW, Keenan LA. Aromatherapy reduces fatigue among women with hypothyroidism: A randomized placebo-controlled clinical trial. Journal of Complementary and Integrative Medicine. 2019;17(1).
[15] Garber JR, Cobin RH, Gharib H, et al. Clinical practice guidelines for hypothyroidism in adults: cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association. Endocr Pract. 2012;18(6):988-1028
[16] Smith TJ, Bahn RS, Gorman CA. Connective tissue, glycosaminoglycans, and diseases of the thyroid. Endocr Rev 1989; 10:366.
[17] Brake MK, Bartlett C, Hart RD, Trites JR, Taylor SM. Complementary and alternative medicine use in the thyroid patients of a head and neck practice. *Otolaryngol Head Neck Surg*. 2011;145(2):208-12.
[18] Rosen JE, Gardiner P, Lee SL. Complementary and integrative treatments: thyroid disease. *Otolaryngol Clin North Am*. 2013;46(3):423-35.
[19] Vanderpump MP. The epidemiology of thyroid disease. Br Med Bull. 2011;99:39–51.
[20] . Malaty W. Primary hypothyroidism. 2017. https://bestpractice.bmj.com/topics/en-us/535/pdf/535.pdf. Accessed 4 Jan 2017
[21] Vanderpump MP. The epidemiology of thyroid disease. Br Med Bull. 2011;99:39–51.
[22] . Carle A, Laurberg P, Pedersen IB, et al. Epidemiology of subtypes of hypothyroidism in Denmark. Eur J Endocrinol. 2006;154:21–28.
[23] Guglielmi R, Grimaldi F, Negro R, et al. Shift from levothyroxine tablets to liquid formulation at breakfast improves quality of life of hypothyroid patients. Endocr Metab Immune Disord Drug Targets. 2018;18:235–240.
[24] Abdalla SM, Bianco AC. Defending plasma T3 is a biological priority. Clin Endocrinol. 2014;81:633–641.
[25] . Larsen PR, Silva JE, Kaplan MM. Relationships between circulating and intracellular thyroid hormones: physiological and clinical implications. Endocr Rev. 1981;2:87–102.

[26] Kronenberg H, Melmed S, Polonsky K, Larsen PR. Principles of endocrinology. In: Kronenberg H, Melmed S, Polonsky K, Larsen PR, editors. Williams textbook of endocrinology. 11. Philadelphia: Saunders Elsevier; 2007. pp. 3–11
[27] Spencer,CA. Clinical utility and cost-effectiveness of sensitive thyrotropin assays in ambulatory and hospitalized patients. *Mayo Clin Proc* 1988; 63:1214.
[28] Baloch Z, Carayon P, Conte-devolx B, et al. Laboratory medicine practice guidelines. Laboratory support for the diagnosis and monitoring of thyroid disease. *Thyroid*. 2003;13(1):3-126.
[29] Jonklaas J, Bianco AC, Bauer AJ, et al. Guidelines for the treatment of hypothyroidism: prepared by the american thyroid association task force on thyroid hormone replacement. *Thyroid.* 2014;24(12):1670-751.
[30] Grozinsky-glasberg S, Fraser A, Nahshoni E, Weizman A, Leibovici L. Thyroxine-triiodothyronine combination therapy versus thyroxine monotherapy for clinical hypothyroidism: meta-analysis of randomized controlled trials. *J Clin Endocrinol Metab*. 2006;91(7):2592-9.
[31] Effect of Liothyronine Treatment on Quality of Life in Female Hypothyroid Patients With Residual Symptoms on Levothyroxine Therapy: A Randomized Crossover Study. Betty Ann Bjerkreim, Sara Salehi Hammerstad, Hanne Løvdal Gulseth, Tore Julsrud Berg, Lars Johan Omdal, Sindre Lee-Ødegård , Erik Fink Eriksen. Randomized Controlled Trial. 2022 Feb 22;13:816566.doi: 10.3389/fendo.2022.816566. eCollection 2022.PMCID: 35273566PMCID: PMC8902821DOI: 10.3389/fendo.2022.816566
[32] Gharib H, Papini E, Garber JR, et al. American association of clinical endocrinologists, american college of endocrinology, and associazione medici endocrinologi medical guidelines for clinical practice for the diagnosis and management of thyroid nodules – 2016 update: appendix. *Endocrine Practice*. 2016;22(Supplement 1):1-60. https://journals.aace.com/doi/pdf/10.4158/EP161208.GL
[33] Messina M, Redmond G. Effects of soy protein and soybean isoflavones on thyroid function in healthy adults and hypothyroid patients: a review of the relevant literature. *Thyroid.* 2006 Mar;16(3):249-58.
[34] Huwiler V V, Maissen-Abgottspon S, Stanga Z, Mühlebach S, Trepp R, Bally L, Bano A, Selenium Supplementation in Patients with Hashimoto Thyroiditis: A Systematic Review and Meta-Analysis of Randomized Clinical Trials. Thyroid. 2024 Mar;34(3):295-313. doi: 10.1089/thy.2023.0556. Epub 2024 Feb 16.
[35] Chahardoli R, Saboor-Yaraghi A-A, Amouzegar A, Khalili D, Vakili A, Azizi F. Can supplementation with vitamin d modify thyroid autoantibodies (Anti-tpo ab, anti-tg ab) and thyroid profile (T3, t4, tsh) in hashimoto's thyroiditis? A double blind, randomized clinical trial. *Horm Metab Res*. 2019;51(05):296-301.
[36] Tang J, Shan S, Li F, Yun F, Effects of vitamin D supplementation on autoantibodies and thyroid function in patients with Hashimoto's thyroiditis: A systematic review and meta-analysis. Medicine (Baltimore). 2023 Dec 29;102(52):e36759. doi: 10.1097/MD.0000000000036759.
[37] Vicente A Benites-Zapata et al, Vitamin B12 levels in thyroid disorders: A systematic review and meta-analysis. Front Endocrinol (Lausanne). 2023 Feb 22:14:1070592. doi: 10.3389/fendo.2023.1070592. eCollection 2023.
[38] Werneck FZ, Coelho EF, Almas SP, et al. Exercise training improves quality of life in women with subclinical hypothyroidism: a randomized clinical trial. *Arch Endocrinol Metab*. 2018;62(5):530-536.
[39] Hawkins J, Hires CY, Dunne EW, Keenan LA. Aromatherapy reduces fatigue among women with hypothyroidism: A randomized placebo-controlled clinical trial. Journal of Complementary and Integrative Medicine. 2019;17(1).
[40] Kang GY, Parks JR, Fileta B, et al. Thyroxine and triiodothyronine content in commercially available thyroid health supplements. *Thyroid*. 2013;23(10):1233-7.
[41] Luo H, Lü M, Pei X, Xia Z. Chinese herbal medicine for subacute thyroiditis: a systematic review of randomized controlled trials. J Tradit Chin Med. 2014;34(3):243-53.
[42] Garber JR, Cobin RH, Gharib H, et al. Clinical practice guidelines for hypothyroidism in adults: cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association. *Endocr Pract.* 2012;18(6):988-1028.