

Central Lancashire Online Knowledge (CLOK)

Title	Effect Of Obesity On Thyroid Function & Its Treatment-a Review
Type	Article
URL	https://clock.uclan.ac.uk/id/eprint/55509/
DOI	
Date	2025
Citation	Sabir, Sadia, Hafeez, Muhammad Adnan and Shah, Noor-ul-ain (2025) Effect Of Obesity On Thyroid Function & Its Treatment-a Review. Pakistan Journal of Health, 55 (1).
Creators	Sabir, Sadia, Hafeez, Muhammad Adnan and Shah, Noor-ul-ain

It is advisable to refer to the publisher's version if you intend to cite from the work.

For information about Research at UCLan please go to <http://www.uclan.ac.uk/research/>

All outputs in CLOK are protected by Intellectual Property Rights law, including Copyright law. Copyright, IPR and Moral Rights for the works on this site are retained by the individual authors and/or other copyright owners. Terms and conditions for use of this material are defined in the <http://clock.uclan.ac.uk/policies/>

EFFECT OF OBESITY ON THYROID FUNCTION & ITS TREATMENT-A REVIEW

Sadia Sabir*¹, Muhammad Adnan Hafeez¹, Noor Ul Ain Shah²

1. Department of Human Nutrition & Food Technology, Faculty of Allied Health Sciences, Superior University Lahore.
2. School of Health, Social Work and Sport) University of central Lancashire, UK

Corresponding Author:

Sadia Sabir

Email: sadia.sabir@superior.edu.pk

Abstract

The most prevalent endocrine disorders with obesity are hypothyroidism, and secondary endocrine changes, such as impaired thyroid function, are widespread. It is unclear if increased adiposity results from reduced thyroid function or whether it is the cause of it. Additionally, there are questions about the optimal manner to provide levothyroxine to individuals who have both hypothyroidism and obesity. Nutritional aspects are near to relate to thyroid dysfunction due to deviation from normal physiology of the gland. Iodine deficiency is one of the most prevalent causes of hypothyroidism in both children and adults across the world. Iodine is a key component of thyroid hormones (T3 and T4). Thyroid problems has also been linked to other micronutrients, including cruciferous vegetables, pearl millet, soy products, and cassava. In some endemic places, environmental variables, including goitrogen-contaminated water, may potentially play a role in the etiology of goiter. Dietary recommendations and avoiding the overuse of goitrogens in the diet are part of the nutritional safety guidelines that must be set, especially in endemic regions .According to many researches there is a high prevalence's of hypothyroidism and alternation of thyroid function and structure of body with obesity are reversible after weight gain. Future recommendation on this study should evolve work on hormonal changes in body and cure that impact on initial stages and relevant use of micronutrients.

Key Words: Goitrogens, Hypothyroidism, obesity, weight Management Thyroid Hormones, Iodine, Micronutrients.

Introduction

The thyroid is part of an endocrine gland that secretes several hormones. The thyroid is located below the laryngeal prominence in the neck portion under your skin (1) The basic motive of the thyroid gland is to speed up or slow down metabolism in short words it can maintain the metabolic rate of our body (2) Recent studies revealed the prevalence of Thyroidism that in between year of 2021-2022 265,605 more at-risk people under 18 years of age. Prevalence of Thyroidism also shows that over 99% of affected patients suffer from Thyroidism. Pregnancy is a stressful condition for the thyroid gland almost 50% of women get suffered every year one out of every 4,000-5,000 newborns had a disorder of Thyroidism (3) Hypothyroidism and Hyperthyroidism are two types caused by Thyroid gland inability. Hypothyroidism happens when the thyroid gland doesn't release sufficient hormones while the word hyper is responsible for the excess of hormonal levels through the thyroid gland (4) Hormones T4 thyroxine & T3 triiodothyronine in the thyroid involves to playing a critical role in growth and development, and in adults it circulates the metabolic processes affecting almost every organ system (5) Several diseases can cause by Thyroid gland fluctuation in the form of hyperthyroidism and hypothyroidism. The excess amount of thyroid Hashimoto's, Graves disease, Thyroiditis due to viral infection or most commonly after pregnancy, growth of noncancerous throat in the form of goiter, obesity, and many other unconscious disturbance can be caused (6) Hypothyroidism has achieved through the Activity of hormonal growth through the thyroid gland. Autoimmune disorder. The body immune system attack the body own cell and organ confront in the case of hypothyroidism (7) Obesity is seen as a wider challenge to under-constructive countries worldwide. Thyroid dysfunction can show obesity and obesity-related diseases such as metabolic syndrome, hypertension, hyperglycaemia, and dyslipidemia. Modest changes in thyroid hormone levels are widely extracted among obese people (8) The thyroid Body shape was different type of fat together. The weight is deposit all over the person body its not fat but more of waste like substance that accumulates between cells. This condition is known as myxoedema or it can be linked to sponge that holds liquid and will not released it (5, 8) Iodine is a major micronutrient that involves in thyroid hormone therapy it can make to treat or converse thyroid dysfunction. Commonly, there is reasonable corroboration that sufficient but not excessive iodine intake is beneficial for thyroid health same as intake of selenium supplementation is also helpful (6, 9)

In regions of the world where iodine is abundant, autoimmune (Hashimoto's), thyroiditis is the main cause of hypo-thyroidism in the majority of peoples especially womens. Iodine deficiency has historically been the primary cause of hypothyroidism worldwide (7) Additional reasons include congenital thyroid absence or inbred faults in thyroid hormone production (dyshormonogenesis), radio-iodine therapy for hyperthyroidism, thyroid surgery, numerous medications that impair thyroid function or result in thyroid inflammation, and a number of other uncommon causes (1) Although most auto-immune thyroiditis causes hypothyroidism, in individuals with moderate TSH increases, this condition is frequently temporary rather than permanent. A relatively uncommon cause of hypothyroidism, accounting for less than 1% of cases, is central or secondary hypothyroidism brought on by hypothalamic or pituitary illness (10)

Hyperthyroidism

The biochemicals which depict the degree of the disease rather than active thyroid functions can be used to distinguish between overt and subclinical hyperthyroidism. Thyrotropin (TSH) levels that are considerably below normal and triiodothyronine (T3) and thyroxine (T4) levels that are increased in blood are common indicators of overt hyperthyroidism.(1) Low or undiscovered TSH levels are typically associated with subclinical hyperthyroidism, as are normal blood T3 and T4 levels. Yet, despite subclinical hyperthyroidism often being milder, both overt and subclinical hyperthyroidism exhibit the classic signs and symptoms of hyperthyroidism(5) Symptoms that are clinically significant are more likely to emerge when there is subclinical hyperthyroidism. The two most prevalent types of hyperthyroidism are Thyroxine overload (exogenous causes) leading in hyperthyroidism (11)Excessive use of thyroxine will treat hypothyroidism nontoxic multi nodular goitre and thyroid cancer results in endogenous hyperthyroidism ,Excessive thyroid hormones synthesis and release causes domestic hyperthyroidism (6).The syndrome that results from hyperthyroidism is often curable with thyroxine dosage decrease and is more frequently brought on by exogenous sources than endogenous ones(5) Yet, endogenous hyperthyroidism's pathogenic components are intricate while hyperthyroidism affects all populations, it has a greater impact on people in nations with adequate iodine diet. The prevalences rate of hyperthyroidism is 0.3% in Australia 0.5% and 0.7% clinical in the US, and 0.2% to 1.3% in other iodines sufficient nation (11) The causes and processes of hyperthyroidism are summarised in detail below. Grave disease account for 70 to 80% of cases of hyper-thyroidism in iodine sufficient nation and around 50% of cases in iodine deficient nations.(12) Patients with Grave diseases frequently experiences wide spread goitre hyper-thyroidism ophthalmo pathy 20–30% of individuals experience this and thyroid acropachy (13). Even though the pathophysiology of Grave disease is not fully understood key pathogenic mechanisms mostly consist of increases of thyroid hormones synthesis & the emergence of diffuse goitre brought on by the thyro-tropin receptor antibody(8) .Induced stimulation of thyroid hormones synthesis and the onset of a diffuse goitre, auto immune mediated deaths of the thyroid gland and invasion of thyroid antigen-specific T-lymphocytes into tissues expressing the thyroid stimulating hormones receptor TSH-R (14)According to reports from throughout the globe, women between the ages of 30 and 50 are more commonly affected with Graves' illness the ages of on-set of (GD) has dropped since 2016 possibly as a result of earlier diagnosis and treatment(15). The prevalence of thyroid related eye illness is dropping which may be attributable to fewer smokers and more specialised medical care provided to patients in the early stages of thyroid disease.(16) The over secretion of thyroid hormones is the primary cause of thyroidotoxicosis. Toxic nodular goitre is one of the most prevalent pathogenic causes of thyrotoxicosis in older people in iodine-deficient environments (12)According to a research, toxic multinodular goitre is mostly caused due to iodine deficiency 3.6 v 1.6 / 100,000 per year(17) . While solitary toxic nodules are primarily affected by women and frequently occur in the released of preformed thyroid hormone from thyroid that is inflamed causes hyperthyroidism associated with thyroiditis.(18) This kind of hyperthyroidism is often transient and self-limited, with a typical hypothyroid period afterward before resuming thyroid(19) condition 10–20% of thyroiditis-related permanent hypothyroidism is caused by

thyroiditis and the frequency of these situations varies according to the root reason . Thyroiditis is significantly more common in girls than in males (about 1.5:1 .A Minnesota research found that there were 4.9 instances per 100,000 people annually, and 15% of individuals went on to acquire lifelong hypothyroidism. So, it is crucial to continuously check thyroid function. (12)Amiodarone, IFN lithium tyrosine kinase inhibitor highly active anti retroviral treatment immunological checkpoint mediator and humanised mono clonal antibodies are used to treat multiple sclerosis can all cause hyperthyroidism(20) . Since the 1960s, an iodine-rich substance called amiodarone has been utilised to treat refractory atrial and ventricular tachyarrhythmias. Pathophysiology of thyrotoxicosis brought on by amiodarones. hyperthyroidism caused due to iodine owing to amiodarone high iodine content which account for roughly 37% of the molecular weight(21). Thyroiditis caused by amiodarone's direct toxicity on follicular cell and induction of thyrocytes death. In iodine deficient parts of the world the prevalence of amiodarone induced thyrotoxicosis might reach 6% yet in iodine deficient parts of Europe this percentage can reach 10%, and it appears to impact males more than women(22). Although amiodarone has a negative effect on the thyroid, it is necessary in the different situation. Amiodarone is only antiarrhythmic medication that is extensively used in clinical practice and has considerable curative benefits. Amiodarone have T3 antagonist properties effect on heart and may block T4 to T3 conversion in the heart, raising the risk of cardiac thyrotoxicosis or death from ventricular fibrillation(23). As a result, some thyroidologists advise initiating combination therapy with antithyroid medications and corticosteroids as soon as AIT is diagnosed. Some medicines that produce hyperthyroidism can promote Graves' disease by activating the immune system, although the mechanisms are unknown. The Jod Basedow phenomenon refers to iodine-induced hyperthyroidism (24) Thyroid hormones are mostly made up of iodine. Excessive iodine consumption or iodization programmes temporarily increase the risk of iodine-induced hyperthyroidism particularly in elderly people with nodular goitre and chronic iodine insufficiency(25). Furthermore, in patients with a history of multi-nodular goitre or persons with chronic iodine insufficiency the risk of hyperthyroidism is considerably enhanced following the administration of radio-graphic agent.(12)Hyperthyroidism in pregnancy is a benign, temporary illness that commonly occurs in the first trimester, especially when caused by Grave disease and thyro-toxicosis.(26) During pregnancy, maternal hyperthyroidism and foetal damage induced by trans-placental transfers of maternal antibodies and thiamine medications must be considered According to a survey conducted in the United States 31% & 9% of women who are underwent methimazole and or propylthiouracil therapy, respectively terminated their pregnancy preferentially because to concern about the teratogenicity of anti-thyroxine medicines.(12)Estimating prevalences of sub clinical hyperthyroidism is challenge due to the use of varied diagnostic criteria in epidemiological research. According to NHANES III, those aged 20-39 and above 80, particularly women, were more likely to have subclinical hyperthyroidism(27) also, ethnicity impacted the likelihood of developing subclinical hyperthyroidism. Subclinical hyperthyroidism was found in 0.4% of black American 0.3% of Mexican American and 0.1% of white Americans as well as 0.43% to 3.9% of Asians apart from levo-thyroxine which is known to cause subclinical hyperthyroidism, iodine insufficiency is the most significant risk factors for sub-clinical hyperthyroidism(28) According to some studies, the prevalence of subclinical

hyperthyroidism rises from roughly 3% in iodine sufficient nations high for 6% to 10% in iodine deficient countries (12)

Hypothyroidism

Primary hypothyroidism is as common in Australia as it is in the United States (4.6% of the population), with 0.3% symptomatic and 4.3% subclinical cases. Moreover, thyroid autoimmunity affects 10 to 20% of the Australians population but the frequency varies with ages gender and ethnicity (29).The great majority of instances of primary hypothyroidism are caused by iodine deficiency and autoimmune (Hashimoto thyroiditis) illness. Depending on the populations studied, the incidence of overt hypothyroidism ranges from 0.2% to 5.3% in Europe and from 0.3% to 3.7% in the United States (12)Hypothyroidism affects between 1% and 2% of the population. Hypothyroidism affects up to 7% of people aged 85 to 89 years. As a result, the ageing population may be more susceptible to hypothyroidism and women ten times more likely to be afflicted(6). According to the NHA NES III survey the overall prevalence of hypothyroidism 4.6%. which was consistent with the incidence in white people but much higher than the rate among Afro-Caribbean people1.7%. Iodine sufficiency has grown in recent decades, leading in an increases in the incidence of the subclinical hypothyroidism from 3.22% to 16.7% in China(30). A cross-sectional research in India found that inland areas had much higher incidence of hypothyroidism (10%) than coastal areas. Despite increasing iodizing salt consumption hypothyroidism remain a serious public health issue in India (12).Hypothyroidism is readily recognised and treated, but if left untreated, it can cause major health problems and even death. Hypothyroidism is largely characterised by biochemical indicators due to its vague clinical presentation(4). Serum (TSH) concentration is the most sensitive and specific marker, and it is routinely used for thyroid function monitoring TSH levels clearly above the guideline range (0.4 to 4.0 mIU/l and free thyroxine concentrations below the reference ranges identify overt and subclinical primary hypothyroidism (31) TSH values above the reference range accompanied by free thyroxine concentrations within the normal range constitute mild or subclinical hypothyroidism, which is widely seen as a symptom of early thyroid failure. Nonetheless, the TSH and free thyroxine reference ranges have been contentious in recent years (32).Adults the upper limit of TSH range normally increase with age and age specific references range were linked with contradictory outcomes among young people in the UK and Australia.(11) Because few statistical assessments of the world population have been conducted, the present reference ranges are contentious. The causes and processes of hypothyroidism are discussed in length here (32).Regions with varying iodine status will have a direct impact on the occurrence of hypothyroidism. Populations with low iodine diet and those with too much iodine consumption have greater incidence of hypothyroidism(33) The establishment of mandated salt iodization programmes in any country has resulted in a reduction in worldwide iodine deficiency (34).According to studies, the frequency of autoimmune thyroiditis rose when forced iodization programmes were implemented. The mechanism is complicated but it might be related to the iodization impact of thyroglobulin via alter epitope expression and improved immunogenicity (mostly high levels of thyroid peroxidase antibodies and anti-thyroglobulin antibodies(35)According to a polish research, the prevalence of hypothyroidism increased

from 1.4% to 2.1% when obligatory iodine prophylaxis was implemented. Research has revealed that hypothyroidism primarily affects women, the elderly (>65 years), and white people, while studies comparing ethnic groups have not been conducted (27). Excessive iodization has led to an increase in the prevalence of thyrotoxicosis, as indicated by an increase in iodine-induced thyrotoxicosis cases in Tasmania, Australia. While eliminating iodine shortage is vital, iodization initiatives should be properly supervised to avoid iodine overexposure (36). Amino-darone, an iodine-rich medication, may limit thyroid hormone production due to iodine excess. Wolff-Chaikoff effect results in thyroid hormone synthesis suppression. According to a comprehensive study and meta-analysis, around 14% of individuals treated with amiodarone developed hypothyroidism (37). Lithium is a popular bipolar illness therapy. Lithium suppresses thyroxine production and release, leading to hypothyroidism. Throughout the course of 18 months of lithium prescription, around 6% of patients required thyroxine replacement therapy, according to a large cohort study (21). Tyrosine kinase inhibitors are often used to treat a variety of malignancies. US Food and Drug Administration Adverse Event Reporting System, sunitinib caused hypothyroidism, which led to an increase in the number of patients requiring sorafenib therapy (24). Other medicines, interferon, thalidomide, certain monoclonal antibodies, antiepileptic pharmaceuticals, and second-line therapy for multi-drug resistant TB can also induce hypothyroidism (38). Manifestations of hypothyroidism can range from sign or symptom to life-threatening symptom, myxedema coma, as a result of prolonged, untreatable, and severe hypothyroidism (39). Since myxedema coma has a high death rate (about 40%), early identification and treatment are crucial. Myxedema coma is characterized by altered mental state, hypothermia, increasing lethargy, and bradycardia, as well as multiple organ dysfunction syndrome and death. As a result, early thyroid hormone replacement treatment and other supporting measures are crucial (40). Hypothyroidism affects almost all organs, but the cardiovascular system suffers the most. Hypothyroidism is frequently associated with increased vascular resistance, lower cardiac output, diminished left ventricular function, and alterations in cardiovascular contractility indices. Additionally, hypothyroid individuals have a greater frequency of myocardial injuries, pericardial effusions, and cardiovascular risk factors as well as metabolic syndrome traits such as hypertension and dyslipidemia. Total cholesterol, low-density lipoprotein, and homocysteine levels were elevated in hypothyroid individuals. Reversible dementia is prevalent in hypothyroid individuals, although the prevalence of dementia and percentages of instances that were reversible remain unknown (12).

Diagnoses of Hypothyroidism

True hyperthyroidism is indicated by a high 24-hour radioactive iodine uptake, which indicates that the thyroid gland of the patient is overproducing either T₄ & T₃. The presence of peripheral hyper-metabolism, diffuse thyroid gland enlargement, elevated free thyroid hormone levels, and elevated serum immune-reactive TSH concentrations are indicators of TSH-induced hyperthyroidism. [29] Lack of TSH response to stimulation with thyrotropin-releasing hormone is used to identify TSH-secreting pituitary adenomas. The rate of hormone synthesis generally escalates in thyrotoxic Graves' illness, with a disproportionately higher

level of T3 than T4 (9) The majority of symptoms of hypothyroidism, especially in moderate instances, are unclear and frequently ascribed to other conditions or ageing itself, making it challenging to diagnose. This is a problem in especially for the elderly since many symptoms, such as fatigue, lack of concentration, dry skin, and many more, are accepted—correctly or incorrectly—as normal components of the ageing process. There are three main clinical anaemias, each of which is a frequent illness in elderly adults and has general symptoms (41). Anaemia, as defined by the World Health Organisation, occurs more frequently than 10% of the time in people 65 and older who live in communities and is commonly associated with other clinical problems. Depressive symptoms or even depression affect elderly persons regularly, especially when they simultaneously have serious health issues. In this circumstance, it is crucial to do a differential diagnosis of these three illnesses. The initial symptom of primary hypothyroidism is an increased TSH level (39). Although free T4 levels are frequently within the normal range in people with compensated hypothyroidism, they eventually fall below the normal range as the condition progresses. Frequently, despite a low T4, the T3 content is kept within the usual range. Pituitary failures should be suspected in patients with reduced T4 level and abnormally normal or low TSH values (42)

Initial preterm infant dysfunction

A typical thyroid malfunction, which includes a muted TSH surges and a delay in the timing and amplitude of blood T4 and T3 concentrations that correspond with gestational age, is linked to prematurity. The mechanism behind this "hypothyroxinaemia of prematurity" is complex, but in the majority of preterm infants, blood T4 levels progressively increase until they reach levels comparable to those of term infants by 4 to 8 weeks of age (19) However, a greater percentage of preterm infants exhibit CH with delayed TSH elevation, especially those with very low or extremely low birth weight. The majority of the anecdotal tales of well-described instances or small case series provide as support for the determinants of TCH. The pathophysiology of TCH has been linked to both hereditary and environmental factors, and the majority of them have an impact on the system that produces thyroid hormones (40)

Effect on body weight

Although the majority of individuals with hyperthyroidism lose weight, 10% of them actually gain weight as a result of the condition. Most investigations have shown that the weight gained during therapy is excessive. There is, however, a great deal of inter-individual variation and a differential impact of various therapies on body weight, with some studies claiming that radioiodine and maybe surgery cause weight gain that is greater than that caused by anti-thyroid medications (43) Hypothyroidism brought on by therapy may be related to the extra weight gain. Additionally, some individuals' propensity for obesity may become apparent or get worse as their hyperthyroidism progresses to euthyroidism. The severity of the thyrotoxicosis at presentation and the presence of underlying Graves' disease are two additional risk factors frequently connected to such weight gain (44). It is important to clarify the conflicting findings about whether post-therapy increases in lean body mass, fat mass, or both occur concurrently or sequentially. In any case, at presentation, professionals must advise patients on this matter. The little research on dietary interventions' impact on

weight changes during hyperthyroidism therapy is encouraging since it shows that they result in much less weight gain than conventional medication (45). It is recommended that more study be done on the effects of hyperthyroidism therapy on several anthropometric indices and the risk factors for any excessive weight gain. pertaining to the results of food modification or other. There is a need for well planned and, preferably, controlled intervention trials to examine the effects of food management or other weight reduction therapies (44). Hypothyroidism induces a decreased basal metabolism and thermogenesis, and the renal flow is also decreased, all of which contribute to water retention. A clinical picture called as myxoedema, which is caused by severe hypothyroidism, can give the patient a misleading impression of being overweight because to facial edoema and hyperkeratosis of the skin. Patients with hypothyroidism also experience sluggish peristalsis, which can lead to persistent constipation and weight gain. Water retention is the major cause of this weight gain; a rise in fat mass is unrelated to it. Additionally, several investigations have discovered that obese persons had a greater frequency of subclinical hypothyroidism (33)

Thyroid dysfunction can cause obesity or obesity-related illnesses such the metabolic syndrome, hypertension, hyperglycaemia, and dys-lipidemia. Obese adults frequently experience slight changes in thyroid hormone levels. Recent investigations have identified links between thyroid hormones and associated obesity-related factors. A variety of metabolic problems are brought on by central obesity, the accumulation of fat in the center of obese individuals. Thyroid hormone biosynthesis depends on iodine, a necessary trace mineral substrate. Iodine deficiency or excess can lead to TCH.

Role of micronutrients

Iodine is a non-metallic micronutrients are essential for synthesis of thyroid hormone(32).In addition to iodine, a number of dietary components have been proven to have an impact on the thyroid. A class of micronutrients known as goitrogens can result in thyroid gland hypertrophy. Cruciferous vegetables and soy products are two of its primary subgroups. Numerous animal research and human case reports emphasised the impact of these micronutrients and their potential contribution to improved thyroid disease treatment, despite the dearth of significant clinical investigations in this field(32)

Iodine

Iodine is a frequent nutritional item found in iodized salt, seafood (including fish and seaweed), certain cereal or bread(46) Patients frequently ask about dietary adjustments they might make to cure or reverse their thyroid dysfunction during ordinary clinical practise. In general, there is solid evidence to support the benefits of selenium supplementation for Graves' disease patients and appropriate but not excessive iodine consumption for thyroid function. In addition to these, there is a paucity of scientific evidence demonstrating how dietary modifications might considerably improve hypo- or hyperthyroidism (47)

Cruciferous vegetables

The Brassicaceae family of crops, which includes kale, turnips, cauliflower, and others, are known as cruciferous vegetables because they are high in indole glucosinolate (48). This substance was discovered to break down in animal tests into the goitrogen metabolite thiocyanate, which prevents the thyroid cell from absorbing iodine. It functions by limiting thyroid hormone production by competitively inhibiting the sodium/iodide symporter (49). Although cruciferous vegetables are frequently touted for their anti-carcinogenic properties, same advantages might also increase the risk of hypothyroidism, especially if iodine deficit is present. Heating might be advantageous since it transforms the goitrogenic substance into a less dangerous metabolite (48).

Soy Products

Goitrogens have been discovered in soy-based goods. Several investigations on isoflavone, the most prevalent phytoestrogen in soy, have discovered that it suppresses thyroid hormones in patients with iodine shortage but is unlikely to have an impact on those who are euthyroid (50).

Other nutrients

Selenium is a different micronutrient that has an impact on thyroid function (47). A meta-analysis examined how selenium affected patients with Graves' illness. At a 6-month follow-up, patients who got selenium supplements shown a transient improvement in thyroid function. In contrast to those who received a placebo, this improvement, however, did not sustain for 9 months. Even if adjuvant selenium supplementation has some advantages for patients with graves disease, it cannot be included in the recommended course of treatment until more convincing data are available (35). Another previously reported goitrogen is cassava, a starchy tuberous root of a tropical tree that is a staple food in certain African nations. Iron, vitamin D, vitamin B12, and other minerals are also crucial for the production of thyroid hormones. The structure and function of the thyroid can vary as a result of dietary changes in certain substances. However, by utilising the appropriate nutritional supplements, we can reduce the signs and symptoms of hormonal illnesses even if they are typically incurable (51).

Conclusion

Studies have shown thyroid is endocrine gland with imperative role in hormone imbalancing various metabolic processes in foetal, childhood and adult life. Hormone thyroxine T4 and triiodothyronine T3 in thyroid, involve in playing critical role in growth and development and in adults its circulates the metabolic processes effecting on every organ. Thyroid gland present in neck portion. There are two types of thyroidism Hyperthyroidism and Hypothyroidism. Hyperthyroidism happens when the thyroid gland makes too much thyroid hormone, overactivation cause in speed up of body metabolism and cause weight lose. When the thyroid gland begins producing excess hormones, your metabolic rate increases. This means your body starts burning more calories than it needs. This can lead to weight loss. Metabolism is measured by the amount of oxygen your body uses over a certain period. Hypothyroidism happens when the thyroid gland doesn't make enough thyroid hormone. This condition also is called underactive thyroid. Hypothyroidism is associated

with decreased metabolic rate, and has also been shown to correlate with a higher body mass index (BMI) and a higher prevalence of obesity. There is clinical evidence suggesting that even mild thyroid dysfunction in the form of subclinical hypothyroidism is linked to significant changes in body weight and represents a risk factor for overweight and obesity. Transient Congenital Hypothyroidism TCH is a short-term deficiency of thyroid hormone recognise after birth with low T4 and elevated thyrotropin TSH. Transient occur under condition of prematurity, maternal thyrotropin receptor blocking antibodies. Both hypo and hyperthyroidism could be caused by different mechanisms, The main motive of this study will be review the basics of thyroid hormone therapy, nutritional factors pay an important role in normalising the circulation of thyroid hormone with the respect of these factors many micronutrients involve. Children and adolescents can under control multiple disciplinary treatment based on diet, physical activity, and behavioural strategies. Iodine is major micronutrient that involve in thyroid hormone therapy it can make to treat or converse their thyroid dysfunction. Commonly, there is reasonable corroboration that sufficient but not excessive iodine intake is beneficial for thyroid health same as intake of selenium supplementation is also helpful.

Primary Sources

Secondary Sources

Uncategorized References

1. Gulwani D, Upadhyay P, Goel R, Sarangthem V, Singh TD. Unfolding of Imminent Bio-Signatures in the Prognosis of Thyroid Cancer; The Emergence of Estrogen Related Receptor Gamma (ERRγ) as a Hurricane. *Asian Pacific Journal of Cancer Prevention: APJCP*. 2023;24(2):375.
2. Dabravolski SA, Nikiforov NG, Zhuravlev AD, Orekhov NA, Mikhaleva LM, Orekhov AN. The Role of Altered Mitochondrial Metabolism in Thyroid Cancer Development and Mitochondria-Targeted Thyroid Cancer Treatment. *International Journal of Molecular Sciences*. 2022;23(1):460.
3. Sonowal T, Sarmah J, Sarma PK, Deka M. Iodine status, thyroid disorder and feto-maternal outcome among the tribal pregnant women of Eastern Himalayas. *Indian Journal of Endocrinology and Metabolism*. 2023;27(1):66.
4. Hegedüs L, Bianco AC, Jonklaas J, Pearce SH, Weetman AP, Perros P. Primary hypothyroidism and quality of life. *Nature Reviews Endocrinology*. 2022;18(4):230-42.
5. Mikulska AA, Karaźniewicz-Łada M, Filipowicz D, Ruchała M, Głowska FK. Metabolic Characteristics of Hashimoto's Thyroiditis Patients and the Role of Microelements and Diet in the Disease Management—An Overview. *International Journal of Molecular Sciences*. 2022;23(12):6580.
6. Cordido M, Juiz-Valiña P, Urones P, Sangiao-Alvarellos S, Cordido F. Thyroid function alteration in obesity and the effect of bariatric surgery. *Journal of Clinical Medicine*. 2022;11(5):1340.
7. Adamska A, Raczowski A, Stachurska Z, Kondraciuk M, Krętowski AJ, Adamski M, et al. Body composition and serum concentration of thyroid hormones in euthyroid men and women from general population. *Journal of Clinical Medicine*. 2022;11(8):2118.
8. Bouazza A, Favier R, Fontaine E, Leverve X, Koceir E-A. Potential Applications of Thyroid Hormone Derivatives in Obesity and Type 2 Diabetes: Focus on 3, 5-Diiodothyronine (3, 5-T₂) in Psammomys obesus (Fat Sand Rat) Model. *Nutrients*. 2022;14(15):3044.
9. Akhtar W, Moghal FA, Ishaq M, Naseem A, Rana AH, Nadeem H, et al. Hypothyroidism and Levothyroxine, Review Article. *Pakistan Journal of Medical & Health Sciences*. 2022;16(04):630-.

10. Ríos-Prego M, Anibarro L, Sánchez-Sobrino P. Relationship between thyroid dysfunction and body weight: a not so evident paradigm. *International journal of general medicine*. 2019;299-304.
11. Wang Y, Fang S, Zhou H. Pathogenic role of Th17 cells in autoimmune thyroid disease and their underlying mechanisms. *Best Practice & Research Clinical Endocrinology & Metabolism*. 2023;37(2):101743.
12. Lane LC, Wood CL, Cheetham T. Graves' disease: moving forwards. *Archives of Disease in Childhood*. 2023;108(4):276-81.
13. Lopes L, Tavares BC, Cunha C, Antunes C, Limbert C, Manuel SDJ, editors. Weight Variability with the Treatment of Graves. *Endocrine Abstracts*; 2023: Bioscientifica.
14. Wang Y, Sun Y, Yang B, Wang Q, Kuang H. The management and metabolic characterization: hyperthyroidism and hypothyroidism. *Neuropeptides*. 2022:102308.
15. Chiovato L, Pinchera A. Stressful life events and Graves' disease. *European Journal of Endocrinology*. 1996;134(6):680-2.
16. McLeod DS, Cooper DS. The incidence and prevalence of thyroid autoimmunity. *Endocrine*. 2012;42:252-65.
17. Amriddinova M. DIFFUSE TOXIC GOITER (GRAVES'DISEASE). *Journal the Coryphaeus of Science*. 2023;5(3):118-23.
18. Saboo K, Gemnani RR, Manuja N, Kumar S, Acharya S, Gemnani Jr RR. Propylthiouracil-Induced Neonatal Goiter: An Avoidable Problem. *Cureus*. 2023;15(6).
19. Peters C, Schoenmakers N. Mechanisms in endocrinology: the pathophysiology of transient congenital hypothyroidism. *European Journal of Endocrinology*. 2022;187(2):R1-R16.
20. Perros P, Hegedüs L, Nagy EV, Papini E, Hay HA, Abad-Madroñero J, et al. The Impact of Hypothyroidism on Satisfaction with Care and Treatment and Everyday Living: Results from E-Mode Patient Self-Assessment of Thyroid Therapy, a Cross-Sectional, International Online Patient Survey. *Thyroid*. 2022;32(10):1158-68.
21. Shen M, Wu M, Gu J. Nutrition Based on the Traditional Chinese Medicine and Complications of Subclinical Gestational Hypothyroidism. *Current Topics in Nutraceutical Research*. 2023;21(2).
22. Mirghani H, Alquayr SM, Alanazi T, Alwakeel AA, Al Madshush AM, Alali HA, et al. Knowledge Assessment Regarding the Differences Between Hypothyroidism and Hyperthyroidism Among Saudi Arabia's Adult Population. *Cureus*. 2023;15(4).
23. Urgatz B, Razvi S. Subclinical hypothyroidism, outcomes and management guidelines: a narrative review and update of recent literature. *Current Medical Research and Opinion*. 2023(just-accepted):1-47.
24. Slobodeaniuc A-M, editor Management of patients with hypothyroidism. *MedEspera: The 9th International Medical Congress for Students and Young Doctors, May 12-14, 2022, Chisinau, Republic of Moldova*; 2022: Nicolae Testemitanu State University of Medicine and Pharmacy of the
25. Verdictt S, Van Nes F, Moyson C, Maes T, Van Crombrugge P, Van den Bruel A, et al. TPO antibody status prior to first radioactive iodine therapy as a predictive parameter for hypothyroidism in Graves' disease. *European Thyroid Journal*. 2022;11(4).
26. Knøsgaard L, Andersen S, Hansen AB, Vestergaard P, Andersen SL. Maternal hypothyroidism and adverse outcomes of pregnancy. *Clinical Endocrinology*. 2023;98(5):719-29.
27. Mohammadi K, Shafie D, Vakhshoori M, Bondariyan N, Rezvanian H, Heidarpour M. Prevalence of amiodarone-induced hypothyroidism; A systematic review and meta-analysis. *Trends in Cardiovascular Medicine*. 2022.
28. Li Z, Qiu Y, Fei Y, Xing Z, Zhu J, Su A. Prevalence of and risk factors for hypothyroidism after hemithyroidectomy: a systematic review and meta-analysis. *Endocrine*. 2020;70:243-55.
29. Baruah MP, Duttachoudhury S, Saikia M, Saikia UK, Bhuyan SB, Bhowmick A, et al. Guwahati thyroid epidemiology study: High prevalence of primary hypothyroidism among the adult population of Guwahati city. *Thyroid Research and Practice*. 2019;16(1):12-9.

30. Nielsen JL, Karmisholt J, Pedersen IB, Carlé A. Prevalence and predictors of adequate treatment of overt hypothyroidism—a population-based study. *EXCLI journal*. 2022;21:104.
31. Fan H, Liu Z, Zhang X, Wu S, Shi T, Zhang P, et al. Thyroid stimulating hormone levels are associated with genetically predicted nonalcoholic fatty liver disease. *The Journal of Clinical Endocrinology & Metabolism*. 2022;107(9):2522-9.
32. Nedić O. Iodine: Physiological importance and food sources. *eFood*. 2023;4(1):e63.
33. Karbownik-Lewińska M, Stępiak J, Iwan P, Lewiński A. Iodine as a potential endocrine disruptor—a role of oxidative stress. *Endocrine*. 2022;78(2):219-40.
34. Sani B, Abdullahi J, Sani Z, Sulaiman R. Determination of the Composition of Iodine in Selected Brands of Table Salts Sold in Different Sokoto State Markets.
35. Santos LR, Bessa IV, da Rocha AG, Neves C, Freitas C, Soares P. Survey on selenium clinical supplementation in autoimmune thyroid disease. *European Thyroid Journal*. 2023;12(2).
36. Chung YK, Wong LM. Lithium as an alternative option in thionamide-resistant Graves' disease. *Clinical Pediatric Endocrinology*. 2023:2022-0070.
37. Persani L, dell'Acqua M, Ioachim S, Campi I, editors. Factitious thyrotoxicosis and thyroid hormone misuse or abuse. *Annales d'Endocrinologie*; 2023: Elsevier.
38. Alzahrani HS, Alshabnan RA, Mokhtar FM, Aleisa AI, AlHedaithi NA, Alotaibi GK, et al., editors. Assessment of Saudi Society's Knowledge Regarding Hypothyroidism and Its Neuropsychiatric Clinical Manifestations. *Healthcare*; 2023: MDPI.
39. Bereda G. Definition, Causes, Pathophysiology, and Management of Hypothyroidism. *Mathews Journal of Pharmaceutical Science*. 2023;7(1):1-5.
40. Bereda G. *Journal of Biomedical and Biological Sciences* Hyperthyroidism: Definition, Causes, Pathophysiology and Management.
41. Stafie CS, Sufaru I-G, Ghiciuc CM, Stafie I-I, Sufaru E-C, Solomon SM, et al. Exploring the Intersection of Artificial Intelligence and Clinical Healthcare: A Multidisciplinary Review. *Diagnostics*. 2023;13(12):1995.
42. Varsavsky M, Ortiz MI, Lovazzano S, Scheinfeld G, Rubino C, Kozak A. Factitious hyperthyroidism due to intake of herbal supplements for weight reduction. *Medicina*. 2022;82(6):974-7.
43. Oh J, Weng S, Felton SK, Bhandare S, Riek A, Butler B, et al. 1, 25 (OH) 2 vitamin D inhibits foam cell formation and suppresses macrophage cholesterol uptake in patients with type 2 diabetes mellitus. *Circulation*. 2009;120(8):687-98.
44. Okamura K, Sato K, Fujikawa M, Bandai S, Ikenoue H, Kitazono T. Painless thyroiditis mimicking relapse of hyperthyroidism during or after potassium iodide or thionamide therapy for Graves' disease resulting in remission. *Endocrine Journal*. 2023;70(2):207-22.
45. Golinelli S, Tardo AM, Vecchiato CG, Guido EA, Perfetti S, Diana A, et al. Evaluation of weight gain, clinicopathological and radiographic changes after early diagnosis and treatment of congenital hypothyroidism in cats. *Veterinary Sciences*. 2022;9(3):140.
46. Li N, Wu X, Zhuang W, Wu C, Rao Z, Du L, et al. Cruciferous vegetable and isothiocyanate intake and multiple health outcomes. *Food Chemistry*. 2022;375:131816.
47. Gallo D, Mortara L, Veronesi G, Cattaneo SA, Genoni A, Gallazzi M, et al. Add-on effect of selenium and vitamin D combined supplementation in early control of Graves' disease hyperthyroidism during methimazole treatment. *Frontiers in endocrinology*. 2022;13.
48. Mavlonovich BM. ANTI-CANCER PROPERTIES OF CRUCIFEROUS VEGETABLES. *Asian journal of pharmaceutical and biological research*. 2022;11(2).
49. Jiao X-F, Zhang M, Chen J, Wei Q, Zeng L, Liu D, et al. The impact of levothyroxine therapy on the pregnancy, neonatal and childhood outcomes of subclinical hypothyroidism during pregnancy: An updated systematic review, meta-analysis and trial sequential analysis. *Frontiers in Endocrinology*. 2022;13:964084.

50. Morán-Serradilla C, Angulo-Elizari E, Henriquez-Figueroa A, Sanmartín C, Sharma AK, Plano D. Seleno-metabolites and their precursors: a new dawn for several illnesses? *Metabolites*. 2022;12(9):874.
51. Urrea CR, Pedroso AP, Thomazini F, do Carmo ACF, Telles MM, Sawaya AL, et al. Thyroid hormone axis and anthropometric recovery of children/adolescents with overweight/obesity: a scoping review. *medRxiv*. 2022:2022.01. 17.22269437.