Project On

A survey on Prevalence and Risk Factors of Thyroid Disorders: A Community-Based Survey

Submitted To

The Department of Pharmacy,

Faculty of Health & Life Sciences,

Daffodil International University

In the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy

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October 2024

APPROVAL

This project, **A survey on Prevalence and Risk Factors of Thyroid Disorders: A Community-Based Survey**, submitted to the Department of Pharmacy, Faculty of Health & Life Sciences, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy and approved as to its style and contents.

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DECLARATION

I, at this moment, announce that I am carrying out this project study under the supervision of **"Mr. Subrato Kumar Barman, Lecturer (Senior Scale),** Department of Pharmacy, Faculty of Health & Life Sciences, Daffodil International University, Impartial Compliance with the Bachelor of Pharmacy Degree Requirement (B. Pharm). This project, I declare, is my original work. I also state that neither this project nor any part thereof has been submitted for the Bachelor's award or any degree elsewhere.

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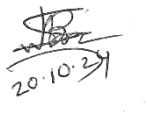

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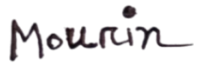

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Abstract

Thyroid disorders are a growing global health concern, affecting metabolic functions and overall well-being. This community-based survey aimed to assess the prevalence of thyroid disorders and identify key risk factors within a specific population. A total of 123 participants were surveyed, focusing on the prevalence of conditions such as hypothyroidism, hyperthyroidism, and autoimmune thyroid diseases. The study also examined risk factors like age, gender, family history, iodine intake, lifestyle habits, and awareness of thyroid-related health issues. The results revealed a significant prevalence of thyroid dysfunction, particularly among women and older individuals. Hypothyroidism was the most commonly reported condition, with family history and inadequate iodine intake emerging as prominent risk factors. Furthermore, the survey highlighted a lack of awareness regarding thyroid health and the importance of early diagnosis. These findings underscore the need for targeted public health initiatives to improve education, promote routine thyroid screening, and address modifiable risk factors, with the aim of enhancing early detection and management of thyroid disorders in the community.

Keywords: Thyroid disorders, Hypothyroidism, Hyperthyroidism, Prevalence, Risk factors, Iodine deficiency, Autoimmune thyroid disease, Community-based survey, Thyroid screening, Thyroid health awareness, Gender differences, Family history, Public health initiatives, Early detection.

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Chapter One: Introduction

1.1. Thyroid

The thyroid gland, a small, butterfly-shaped gland situated at the front of the neck, is the site of a wide range of disorders that impact its function, which is essential for the regulation of numerous metabolic processes [1]. These hormones have an impact on the metabolic rate of nearly every organ system in the body, as well as the pulse rate and body temperature. Hypothyroidism and hyperthyroidism are conditions that are typically the consequence of either underproduction or overproduction of thyroid hormones, respectively [2].

Hypothyroidism, which is defined by inadequate thyroid hormone production, is frequently linked to symptoms including depression, weight gain, cold intolerance, and fatigue. Iodine deficiency is the most prevalent cause of hypothyroidism globally, while Hashimoto's thyroiditis, an autoimmune disorder, is the primary cause in iodine-sufficient regions [3]. In contrast, hyperthyroidism, which is the result of an overproduction of thyroid hormones, manifests as symptoms such as anxiety, heat intolerance, weight loss, and an elevated pulse rate. Hyperthyroidism is most frequently caused by Graves' disease, an additional autoimmune disorder [4].

Fig 01: Thyroid Disease.

Globally, thyroid disorders are prevalent, with an estimated 200 million individuals afflicted. Women, particularly those over the age of 50, are more susceptible to these conditions than males [5]. Thyroid disease that remains untreated can lead to severe complications, such as infertility,

cardiovascular disease, and developmental defects in children. Early diagnosis and treatment are essential for the prevention of long-term consequences and the management of symptoms [6].

1.2. Background History of Thyroid

The earliest recorded observations of thyroid-related conditions can be traced back to ancient civilizations, where goiters (enlarged thyroid organs) were frequently observed. In ancient Chinese medicine, seaweed, a natural source of iodine, was employed to treat goiters, suggesting an early recognition of the connection between iodine deficiency and thyroid enlargement, which occurred around 1600 BC [7]. Detailed anatomical descriptions of the thyroid did not begin to emerge in Europe until the Renaissance period. The term "thyroid" is derived from the Greek word thyreos, which means "shield," in reference to the gland's resemblance to a shield. The anatomist Thomas Wharton officially designated the organ as "thyroid" in his work Adenographia in 1656 [8-9].

In the 19th century, the correlation between thyroid function and iodine became more apparent. Bernard Courtois discovered iodine in 1811, and it was associated with the treatment of goiters by the 1820s. Jean-François Coindet, a Swiss physician, was among the first to employ iodine therapy to treat thyroid enlargement, thereby establishing the critical function of iodine in thyroid health [10]. This finding ultimately resulted in the pervasive use of iodized salt and iodine supplements to prevent iodine deficiency in populations, thereby substantially reducing the incidence of goiters.

The 20th century saw significant progress in the comprehension of the biochemistry of thyroid hormones and the pathology of diseases. The thyroid gland produces one of the primary hormones, thyroxine (T4), which was isolated by American biochemist Edward Calvin Kendall in 1914 [11]. The chemical structure of triiodothyronine (T3), the more active thyroid hormone, was elucidated in the 1950s, a few decades later. The development of hormone replacement therapies for hypothyroidism was significantly influenced by these discoveries.

Furthermore, during this period, the autoimmune nature of numerous thyroid diseases was acknowledged. In 1912, Japanese physician Hakaru Hashimoto first described Hashimoto's thyroiditis, an autoimmune form of hypothyroidism. This was one of the first documented

autoimmune diseases. Graves' disease, an additional autoimmune disorder, was later identified as the most prevalent cause of hyperthyroidism in the 1930s [12].

1.3. Pathogenesis of Thyroid Disorders

The primary cause of thyroid disorders is the abnormal functioning of the thyroid gland, which results in the production of thyroid hormones that are either insufficient or excessive. Hypothyroidism, hyperthyroidism, thyroiditis, and thyroid nodules or malignancy comprise the most prevalent thyroid disorders. The pathogenesis of these disorders can be classified into autoimmune, genetic, environmental, and dietary factors, each of which contributes to altered thyroid function [13].

1.3.1. Hypothyroidism

Hypothyroidism is a condition in which the thyroid gland is unable to generate sufficient quantities metabolic activity throughout the body. There are several primary causes of hypothyroidism, including:

- **Autoimmune Destruction (Hashimoto's Thyroiditis):** In regions with sufficient iodine, Hashimoto's thyroiditis is the most prevalent cause of hypothyroidism. Anti-thyroid antibodies, including anti-thyroglobulin and anti-thyroid peroxidase (anti-TPO), are produced in this autoimmune disorder. Chronic inflammation and progressive glandular destruction are the results of these antibodies, which target and eliminate thyroid follicular cells. The insufficient production of hormones is the consequence of the reduced number of functional thyroid cells over time.
- **Iodine Deficiency:** The synthesis of thyroid hormones is contingent upon the presence of iodine. In regions with inadequate hormone production, hypothyroidism may manifest as a consequence of inadequate dietary iodine intake. Increased secretion of thyroid-

stimulating hormone (TSH) is the consequence of iodine deficiency, which leads to compensatory enlargement of the thyroid gland (goiter).

- **Thyroidectomy or Radioactive Iodine Therapy:** If hormone production is insufficient, hypothyroidism may result from surgical removal of the thyroid gland (thyroidectomy) or annihilation of thyroid tissue through radioactive iodine treatment (frequently employed for hyperthyroidism) [14].

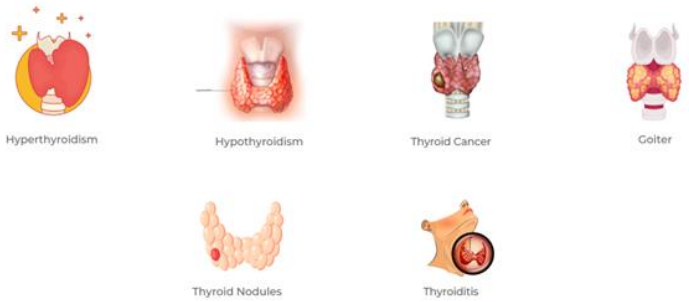

Fig 02: Types of Thyroids.

1.3.2. Hyperthyroidism

Hyperthyroidism is the consequence of an overactive metabolism, which is caused by the excessive production of thyroid hormones. The primary pathogenesis mechanisms are as follows:

- **Graves' Disease:** Graves' disease is the most prevalent cause of hyperthyroidism. It is an autoimmune disorder in which the body produces thyroid-stimulating immunoglobulins (TSI). These antibodies replicate the effects of TSH by binding to the TSH receptor on thyroid cells and inducing an overabundance of hormone production. This results in an overactive thyroid, which is characterized by elevated levels of T4 and T3 hormones [15].
- **Toxic Multinodular Goiter and Toxic Adenoma:** In these conditions, hyperfunctioning nodules in the thyroid produce thyroid hormones independently of TSH regulation. This may result in persistent hyperthyroidism. The nodules are the consequence of genetic

mutations in the TSH receptor or G-protein signaling pathway, which leads to aberrant hormone production.

- **Thyroiditis:** The release of preformed thyroid hormones into the circulation (thyroiditis) can temporarily cause hyperthyroidism as a consequence of inflammation of the thyroid gland. Subacute thyroiditis, postpartum thyroiditis, and silent thyroiditis are prevalent manifestations of this condition. Nevertheless, these conditions are frequently transient and are followed by a hypothyroid phase.

1.3.3. Thyroiditis

Thyroiditis is a condition characterized by the inflammation of the thyroid gland, which can lead to both hypothyroidism and hyperthyroidism, contingent upon the severity of the condition. The primary forms of thyroiditis are as follows:

- **Hashimoto's Thyroiditis:** As previously mentioned, this autoimmune condition results in hypothyroidism by causing chronic inflammation and the progressive destruction of thyroid tissue [16].
- **Subacute thyroiditis:** Subacute thyroiditis is frequently precipitated by viral infections and is distinguished by transient hyperthyroidism and excruciating thyroid enlargement, which are the result of the release of stored thyroid hormones from damaged follicular cells. A hypothyroid phase frequently ensues as the inflammation subsides, and it persists until the body's normal functions are restored.
- **Postpartum Thyroiditis:** This type of thyroiditis is believed to be autoimmune in nature and affects women after childbirth. The initial hyperthyroid phase is followed by hypothyroidism, a pattern that is analogous to subacute thyroiditis [17].

1.3.4. Thyroid Nodules and Thyroid Cancer

Thyroid nodules are benign or malignant masses that develop within the thyroid gland. There are numerous factors that contribute to the pathogenesis:

- **Benign Nodules:** Genetic mutations that result in uncontrolled cellular proliferation are the primary cause of benign thyroid nodules, including adenomas and colloid nodules. If these nodules produce thyroid hormones independently, they may occasionally lead to hyperthyroidism (toxic nodules).
- **Thyroid cancer:** Papillary and follicular thyroid carcinoma are the most prevalent forms of thyroid cancer. Genetic mutations in oncogenes (such as BRAF or RET mutations) and tumor suppressor genes that promote uncontrolled cell proliferation are involved in the pathogenesis. The risk of thyroid malignancy can be elevated by radiation exposure, family history, and specific genetic syndromes [18].

1.4. Prognosis of Thyroid Disorders

The prognosis of thyroid disorders is contingent upon the specific condition, its severity, the timeliness of diagnosis, and the efficacy of treatment. The majority of thyroid disorders can be effectively managed through the use of appropriate therapy, which enables patients to maintain a normal quality of life. Nevertheless, thyroid conditions that are not addressed or are not managed adequately can result in severe complications.

1.4.1. Hypothyroidism

The prognosis for hypothyroidism is generally favorable, particularly when diagnosed early and treated appropriately with thyroid hormone replacement therapy (typically levothyroxine). The prognosis is characterized by the following key points:

- **Treatment:** Patients who are administered levothyroxine can anticipate attaining normal thyroid hormone levels (euthyroidism) and leading healthful lives. Management of hypothyroidism is straightforward once it has been stabilized, and effective administration is guaranteed by consistent surveillance of thyroid-stimulating hormone (TSH) levels [19].

With treatment, the majority of individuals reestablish their normal metabolism, energy levels, and overall well-being.

- **Without Treatment:** Life-threatening complications, such as myxedema coma, can result from untreated hypothyroidism. This condition is characterized by severe hypothyroidism symptoms, hypothermia, altered mental status, and cardiovascular exhaustion. Heart disease, excessive cholesterol, and cognitive decline are additional long-term consequences.
- **Subclinical Hypothyroidism:** In moderate cases of subclinical hypothyroidism, which are characterized by the absence or minimality of symptoms, the condition may remain stable for years or progress slowly. Monitoring without immediate treatment is frequently advised; however, treatment may be necessary if the condition deteriorates.

1.4.2. Hyperthyroidism

When managed appropriately, hyperthyroidism has a favorable prognosis; however, it may result in severe health complications if left untreated or inadequately controlled. Important factors that influence the prognosis include:

- **Treatment** options include radioactive iodine ablation, surgery (thyroidectomy), and antithyroid medications (such as methimazole or propylthiouracil). The majority of patients can achieve remission or euthyroidism, particularly with radioactive iodine treatment. However, this treatment frequently leads to persistent hypothyroidism, necessitating everlasting hormone replacement therapy. Symptoms typically subside once hormone levels return to normal, and patients are able to resume their regular routines.
- **Without Treatment:** Severe complications, such as thyroid storm, a life-threatening condition characterized by an abrupt exacerbation of symptoms, fever, tachycardia, and organ failure, can result from uncontrolled hyperthyroidism. Furthermore, the risk of cardiovascular complications, including atrial fibrillation, heart failure, and osteoporosis, is elevated by chronic non-treatment of hyperthyroidism.
- **Graves' Disease:** Graves' disease, the most prevalent cause of hyperthyroidism, has a fluctuating course. While some patients may experience spontaneous remission, others

may experience relapses. Due to the long-term consequences of radioactive iodine or surgical excision of thyroid tissue, approximately 20-40% of patients may develop hypothyroidism following treatment [20].

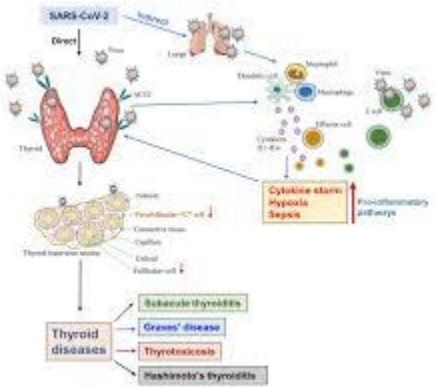

Fig 03: Pathogenesis of Thyroid.

1.4.3. Thyroiditis

The prognosis for thyroiditis is contingent upon the severity and specific form of inflammation. The majority of thyroiditis cases are self-limiting, and patients frequently recover without experiencing any long-term complications. However, a small number of cases may result in permanent hypothyroidism.

- **Subacute Thyroiditis**: Subacute thyroiditis typically resolves spontaneously within a few months. It frequently follows a triphasic course, beginning with an initial hyperthyroid phase, followed by hypothyroidism, and finally a restoration to normal thyroid function. Although full recovery is the norm, a small number of patients may develop permanent hypothyroidism and necessitate long-term hormone replacement therapy.
- **Hashimoto's Thyroiditis:** Hashimoto's thyroiditis is a chronic autoimmune disorder that typically results in permanent hypothyroidism over time. Patients can lead typical lives with the assistance of appropriate hormone replacement therapy. Patients may be

monitored over time to modify treatment as necessary, as the progression to hypothyroidism can be gradual [21].

- **Postpartum Thyroiditis:** While postpartum thyroiditis typically resolves within a year, approximately 20% of women who are afflicted may develop permanent hypothyroidism. The long-term prognosis is generally favorable, provided that appropriate monitoring and treatment are used as necessary.

1.4.4. Thyroid Nodules and Thyroid Cancer

The prognosis for thyroid nodules and thyroid cancer is contingent upon the type and whether the nodule is benign or malignant.

- **Benign Thyroid Nodules:** The majority of thyroid nodules are benign and do not necessitate treatment unless they induce symptoms, such as hyperthyroidism or compressive symptoms. The long-term prognosis is outstanding, and regular monitoring through ultrasound or thyroid function tests is typically adequate [22].
- **Thyroid cancer:** The prognosis for thyroid cancer is contingent upon the type and stage at the time of diagnosis:
  - Papillary Thyroid Carcinoma (PTC): This form of thyroid cancer is the most prevalent and least aggressive, with a highly favorable prognosis. The 10-year survival rate for localized PTC exceeds 95%, and even advanced cases frequently have a favorable prognosis when treated with the appropriate treatment, which includes radioactive iodine therapy and surgery.
  - Follicular Thyroid Carcinoma (FTC): An excellent prognosis is also associated with FTC, particularly when detected early. The long-term survival rate is high, albeit marginally lower than that of PTC. Favorable outcomes necessitate appropriate surgical management.
  - Anaplastic Thyroid Carcinoma (ATC): This rare and highly aggressive form of thyroid cancer has a poor prognosis. The disease's rapid dissemination frequently results in low survival rates, and treatment options are frequently restricted.

- Medullary Thyroid Carcinoma (MTC): The prognosis of MTC is contingent upon the stage at the time of diagnosis and whether it is associated with a genetic syndrome (e.g., Multiple Endocrine Neoplasia type 2). Survival rates are enhanced by early detection; however, advanced cases may prove more difficult to manage [23].

1.5. Symptoms of Different Types of Thyroids

The symptoms of thyroid disorders are contingent upon whether the thyroid gland is underactive (hypothyroidism), overactive (hyperthyroidism), or impacted by other conditions, such as thyroiditis or thyroid nodules. Various symptoms may be present. These symptoms are primarily the result of fluctuations in the levels of thyroid hormones (T3 and T4), which are essential for the regulation of metabolism, growth, and energy consumption. Thyroid conditions are frequently accompanied by the following symptoms [24].

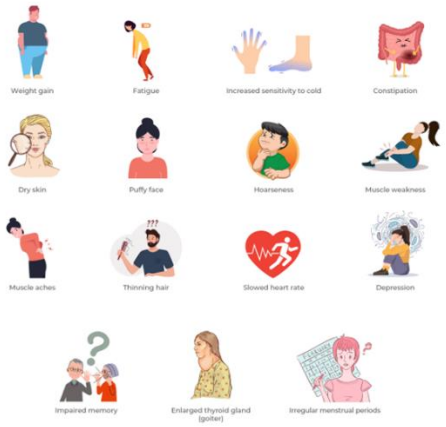

Fig 04: Symptoms of Thyroid.

1.5.1. Hypothyroidism (Underactive Thyroid)

Hypothyroidism is characterized by an insufficient production of thyroid hormones by the thyroid gland, resulting in a reduction in metabolic activity. Symptoms that are frequently encountered include:

- Fatigue is one of the most prevalent and early symptoms, resulting from the reduced energy metabolism that is a consequence of low thyroid hormone levels.
- Weight Gain: It is not uncommon for individuals to experience unexplained weight gain in the absence of any dietary or physical activity modifications, as a slowed metabolism results in a decrease in calorie consumption.
- Cold Intolerance: Hypothyroid individuals frequently experience coldness as a result of a decrease in body heat production.
- Dry Skin and Hair: Hypothyroidism can result in dry, gritty, and scaly skin, as well as fragile or falling hair.
- Constipation: A slowed metabolism can result in a reduction in digestive activity, which can contribute to constipation.
- Depression and Memory Issues: Cognitive functions may be impacted by hypothyroidism, resulting in depression, delayed thinking, or memory difficulties.
- Muscle Weakness and Joint Pain: Hypothyroid patients frequently experience muscle spasms, rigidity, or weakness as a result of a diminished energy supply to their muscles.
- Bradycardia (Slow Heart Rate): The force of heart contractions can be reduced and the heart rate can be slowed by low thyroid hormone levels.
- Menstrual Irregularities: Women with hypothyroidism may experience periods that are heavier or more frequent, or their cycles may become irregular [25].

1.5.2. Hyperthyroidism (Overactive Thyroid)

Hyperthyroidism is a condition in which the thyroid gland generates an excessive amount of thyroid hormone, which leads to an acceleration of metabolic functions. Symptoms that are frequently encountered include

- Weight Loss: Weight loss is a common occurrence as a result of an elevated metabolic rate, despite an increased appetite and food intake.
- Heat Intolerance: Hyperthyroid patients frequently experience excessive heat or warmth as a result of the body's increased heat production.
- Tachycardia (increased heart rate): Overstimulation of the cardiovascular system frequently results in an elevated heart rate, palpitations, and occasionally arrhythmias.
- Anxiety and Nervousness: The nervous system can be overstimulated by excess thyroid hormones, resulting in irritability, anxiety, restlessness, and insomnia.
- Tremors: Hyperthyroidism is frequently characterized by fine tremors, particularly in the hands, which are a result of increased nerve activity.
- Excessive perspiration and oily skin are potential consequences of hyperthyroidism, which is characterized by an overactive metabolism.
- Diarrhea: An overactive thyroid can result in an increase in bowel movements, which frequently results in diarrhea.
- Menstrual Changes: Hyperthyroidism can result in milder, less frequent periods or missed cycles in women.
- Exophthalmos (Eye protruding): Graves' disease, a prevalent cause of hyperthyroidism, may result in eye symptoms such as double vision, irritation, or protruding eyes (thyroid eye disease) [26].

1.5.3. Thyroiditis

The symptoms of thyroiditis are contingent upon whether the condition results in hypothyroidism or hyperthyroidism at different stages.

- Subacute Thyroiditis: This condition frequently manifests as hyperthyroidism symptoms, such as fatigue, weight loss, and heat intolerance, which are subsequently replaced by hypothyroid symptoms as a result of the thyroid's insufficient hormone production as a result of the inflammation. Also prevalent in subacute thyroiditis is pain in the neck and thyroid region.
- Hashimoto's Thyroiditis: This autoimmune condition typically leads to hypothyroidism over time. The symptoms consist of depression, chilly intolerance, weight gain, and fatigue. It is frequently asymptomatic; however, it may result in thyroid enlargement (goiter) [27].

1.5.4. Thyroid Nodules

Thyroid nodules are tumors that form within the thyroid gland. If the nodules are small, they may not produce any symptoms; however, larger nodules or those that produce excessive thyroid hormones may result in:

- Challenging Breathing or ingesting: The trachea or esophagus may be compressed by larger nodules, which can result in difficulty breathing or ingesting.
- Voice Changes or Hoarseness: The vocal cords may be compressed by nodules, resulting in changes in voice quality or hoarseness.
- Symptoms of Hyperthyroidism: Hyperthyroidism symptoms, including weight loss, anxiety, and an elevated pulse rate, may be caused by toxic nodules that produce an excess of thyroid hormone.

1.5.5. Thyroid Cancer

The majority of thyroid cancer cases are asymptomatic during the initial phases. Nevertheless, symptoms may develop as the malignancy advances, such as:

- The most prevalent symptom of thyroid cancer is a benign nodule or enlargement in the front of the neck.

- Difficulty Breathing or ingesting: The esophagus or trachea may become compressed as the malignancy advances, resulting in breathing or ingesting difficulties.
- Hoarseness or Vocal Changes: The vocal cords may be affected by the malignancy if it presses on the recurrent laryngeal nerve, resulting in hoarseness [28].

1.6. Risk Factor of Thyroid

Thyroid disorders can impact individuals of all ages and backgrounds; however, certain risk factors render certain individuals more susceptible. These factors contribute to the development of conditions such as hypothyroidism, hyperthyroidism, thyroiditis, and thyroid malignancy. It is imperative to comprehend these risk factors in order to facilitate the early detection, prevention, and management of thyroid diseases. The following are the primary risk factors associated with thyroid disorders:

Gender

- Female Gender: Women are significantly more susceptible to thyroid disorders than males. This is especially apparent in autoimmune thyroid diseases, such as Graves' disease and Hashimoto's thyroiditis. Hormonal fluctuations during puberty, pregnancy, and menopause increase the likelihood of hypothyroidism and hyperthyroidism in women by approximately 5 to 8 times that of males.
- Menstrual and Reproductive History: Women who have had multiple pregnancies or have experienced early menopause may be at a higher risk for thyroid dysfunction.

Age

- Age: The risk of thyroid disorders increases with age, particularly for hypothyroidism and thyroid nodules. An underactive thyroid (hypothyroidism) is substantially more likely to develop after the age of 60.
- Thyroid Nodules: The prevalence of thyroid nodules increases with age, particularly in those over the age of 50. Although the majority of nodules are benign, the likelihood of malignancy increases as one ages.

Family History

- Genetic Predisposition: An individual's risk is elevated by a family history of thyroid disorders. Hashimoto's thyroiditis, Graves' disease, and thyroid malignancy are frequently familial conditions. Family members may be at risk of thyroid dysfunction due to specific genetic mutations and immune system tendencies.
- Autoimmune Diseases: The risk of developing autoimmune thyroid disorders can be elevated by a family history of autoimmune diseases, including lupus, rheumatoid arthritis, or type 1 diabetes.

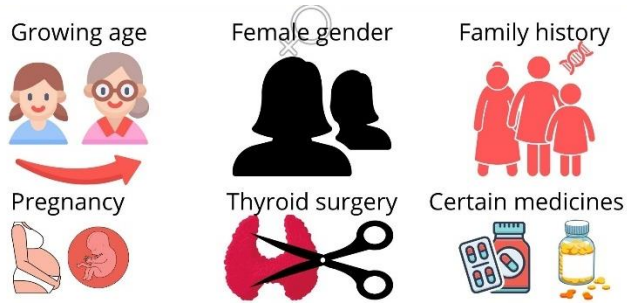

Fig 05: Risk Factor of Thyroid.

Iodine Deficiency or Excess

- Iodine Deficiency: Iodine is a critical nutrient for the synthesis of thyroid hormones (T3 and T4). Individuals are at an increased risk of developing hypothyroidism and goiter in regions where the diet is deficient in iodine. Iodine deficiency is notably prevalent in certain developing regions where iodized salt is not broadly accessible.
- Iodine Overdose: Conversely, thyroid dysfunction, particularly hyperthyroidism or autoimmune thyroiditis, can be exacerbated by an excessive ingestion of iodine, which is frequently derived from dietary supplements or medications (e.g., amiodarone). In susceptible individuals, an excessive ingestion of iodine can overstimulate the thyroid gland.

Autoimmune Diseases

Pre-existing Autoimmune Conditions: Individuals with other autoimmune diseases, such as type 1 diabetes, celiac disease, or rheumatoid arthritis, are at an increased risk of developing autoimmune thyroid diseases, including Graves' disorder and Hashimoto's thyroiditis. As part of a more extensive autoimmune response, the thyroid gland may be inadvertently targeted by the body's immune system [29].

Radiation Exposure

- Radiation Therapy: Thyroid disorders are more likely to develop in individuals who have undergone radiation therapy to the head, neck, or thorax, particularly during childhood. The exposure to radiation can result in thyroid cancer, hypothyroidism, or other thyroid abnormalities.
- Nuclear Accidents: The risk of thyroid cancer is substantially increased in infants, particularly when they are exposed to radioactive iodine from nuclear accidents or debris. For example, the Chernobyl nuclear calamity resulted in an increase in the incidence of thyroid cancer.

Certain Medications: Some medications can have an impact on thyroid function. For instance,

- amiodarone, a medication utilized to alleviate cardiac arrhythmias, contains elevated levels of iodine and has the potential to induce both hyperthyroidism and hypothyroidism.
- Lithium, which is prescribed for bipolar disorder, is linked to an elevated risk of hypothyroidism and goiter.
- Autoimmune thyroiditis may result from the use of immune checkpoint inhibitors and interferon-alpha in cancer therapy.

Pregnancy and Postpartum Period

- Pregnancy: The thyroid gland is stressed significantly during pregnancy as a result of the increased metabolic demands. Gestational hyperthyroidism or postpartum thyroiditis are conditions that may develop in women following childbirth. Temporary hyperthyroidism may result from postpartum thyroiditis, which is subsequently followed by hypothyroidism [30].

- Postpartum Thyroiditis: Within the first year following childbirth, thyroiditis may affect up to 10% of women. Women who have a personal or familial history of thyroid disease or autoimmune disorders are at an increased risk.

Smoking

- Smoking: The tobacco with an elevated risk of thyroid disorders, particularly in individuals who are predisposed to thyroid issues. The iodine absorption by the thyroid gland can be disrupted by the compound thiocyanate in cigarette smoke, which has the potential to result in hypothyroidism or exacerbate autoimmune thyroid diseases such as Graves' disease.
- Graves' Ophthalmopathy: The interaction between smoking and the immune system increases the likelihood of severe eye symptoms (Graves' ophthalmopathy) in smokers with Graves' disease [31].

Dietary Factors

- Goitrogens: Compounds known as goitrogens are present in certain foods, including cruciferous vegetables (e.g., cabbage, broccoli, and cauliflower), and soy products. These compounds can impede the absorption of iodine, thereby interfering with the production of thyroid hormones. In the majority of instances, goitrogenic substances are unlikely to result in thyroid issues unless an iodine deficiency is present.
- Selenium Deficiency: Selenium is a trace element that is crucial for the metabolism of thyroid hormones. An elevated incidence of thyroid dysfunction, particularly autoimmune thyroiditis, has been associated with selenium deficiency [32].

Chronic Stress

Although stress does not directly cause thyroid disorders, it can exacerbate pre-existing thyroid conditions by disrupting hormonal equilibrium and the immune system. Autoimmune thyroid diseases may be initiated or exacerbated by stress, particularly in genetically susceptible individuals.

Obesity

Obesity has been associated with an elevated risk of hypothyroidism, particularly subclinical hypothyroidism. Over time, thyroid dysfunction may result from the alteration of hormone levels

and metabolism caused by excess body obesity. In contrast, hypothyroidism can induce weight gain, thereby initiating a cycle of metabolic disturbances [33].

1.7. Test & Diagnosis of Thyroid Disease

Thyroid disorders are diagnosed through a combination of clinical evaluations, laboratory tests, imaging studies, and, in certain instances, biopsy procedures. The diagnosis of thyroid disorders is frequently based on abnormal hormone levels, which suggest that the thyroid gland is either overactive (hyperthyroidism) or underactive (hypothyroidism). Early diagnosis is essential for the prevention of long-term complications and the management of thyroid diseases. The following are the most frequently employed tests and methods for the diagnosis of thyroid disorders:

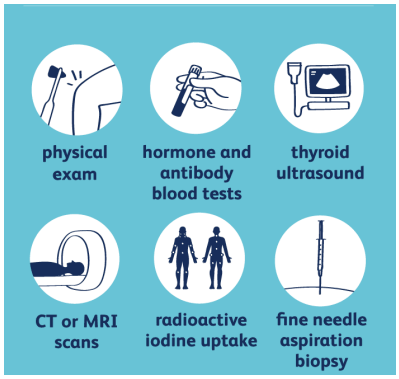

Fig 06: Diagnosis.

1. Thyroid Function Tests (TFTs)

Thyroid function tests are blood assays that quantify the concentrations of thyroid hormones and thyroid-stimulating hormone (TSH). These are the diagnostic instruments that are employed most frequently for thyroid disorders [34].

- TSH (Thyroid-Stimulating Hormone) Test: The pituitary gland produces TSH, which regulates the production of thyroid hormones. It is the most dependable and sensitive indicator of thyroid function.
  - The pituitary gland generates additional TSH to stimulate an underactive thyroid, which is indicative of hypothyroidism and elevated TSH levels.
  - Hyperthyroidism is indicated by low TSH levels, as the pituitary gland decreases TSH production when the thyroid gland is overactive.
- Free T4 (Thyroxine) Test: Free T4 quantifies the biologically active thyroxine in the circulation that is not bound to proteins. It aids in the assessment of the thyroid's production capacity.
  - Hypothyroidism is confirmed by low free T4 levels.
  - Hyperthyroidism is indicated by elevated free T4 levels.
- Free T3 (Triiodothyronine) Test: Free T3 is a test that quantifies the unbound form of thyroid hormone, which is its active form. It is particularly beneficial in the diagnosis of hyperthyroidism, as T3 levels can increase even when T4 levels are considered normal (T3 toxicosis).

2. Thyroid Antibody Tests

The immune system attacks the thyroid gland in autoimmune thyroid disorders, including Graves' disease and Hashimoto's thyroiditis. Thyroid antibody assays are instrumental in the identification of autoimmune causes of thyroid dysfunction [35].

- Anti-thyroid peroxidase antibodies (anti-TPO): Patients with Hashimoto's thyroiditis and, to a lesser extent, Graves' disease exhibit elevated levels of anti-TPO antibodies. This test assists in the confirmation of autoimmune hypothyroidism.
- Thyrotropin receptor antibodies (TRAb) or thyroid-stimulating immunoglobulin (TSI): These antibodies are present in individuals with Graves' disease and stimulate the TSH receptor, causing the thyroid to overproduce hormones.

- Thyroglobulin antibodies (anti-Tg): Anti-Tg antibodies are also associated with Hashimoto's thyroiditis and can be used to support a diagnosis of autoimmune thyroid disease.

3. Imaging Studies

The thyroid gland's size, structure, and function are frequently evaluated through imaging tests, which are also used to identify any abnormalities, including nodules or cancer [36].

- Thyroid Ultrasound: Using sound pulses to generate images of the thyroid gland, ultrasound is a non-invasive imaging test. It is beneficial for the identification of thyroid nodules, cysts, or enlargement (goiter). It can also assist in the differentiation of solid and fluid-filled nodules and the evaluation of whether a biopsy is required.
- Thyroid Scan and Radioactive Iodine Uptake (RAIU): This test assesses thyroid function by quantifying the amount of radioactive iodine absorbed by the thyroid. Abnormal uptake patterns can be indicative of a variety of thyroid disorders, as the thyroid produces hormones using iodine.
  - Hyperthyroidism (e.g., Graves' disease or toxic nodules) is indicated by a high absorption.
  - Thyroiditis or iodine-induced thyroid dysfunction are characterized by low uptake.
- Computed Tomography (CT) or Magnetic Resonance Imaging (MRI): In certain instances, CT or MRI scans may be employed to evaluate the spread of thyroid cancer, large goiters, or tumors. Although these imaging techniques are uncommon, they can yield comprehensive anatomical data.

4. Fine Needle Aspiration (FNA) Biopsy

In order to ascertain whether thyroid nodules or masses are benign or malignant, a fine needle aspiration (FNA) biopsy is used. It entails the insertion of a thin catheter into the thyroid nodule to obtain a sample of cells for microscopic examination [37].

- Reasons for Biopsy: If the nodule is larger than 1 cm, exhibits suspicious characteristics on ultrasound (e.g., irregular shape, calcifications), or if there is a family history of thyroid cancer, a biopsy is generally recommended.

- Thyroid Cancer Diagnosis: FNA is the preferred method for diagnosing thyroid cancer. The nodule is categorized as benign, suspect, or malignant on the basis of the examination of cancerous cells in the sample.

5. Thyroid-Stimulating Hormone (TSH) Receptor Antibody Test

The prevalence of antibodies that adhere to the TSH receptor on the thyroid gland is determined by this test. The receptor can be either stimulated or blocked by these antibodies, which can affect thyroid function. It is especially beneficial in the diagnosis of Graves' disease [38].

- The diagnosis of Graves' disease is confirmed by the production of excess hormones by the thyroid gland in response to TSH receptor-stimulating antibodies (TSI).
- In certain instances of hypothyroidism caused by autoimmune disorders, TSH receptor-blocking antibodies may be detected.

6. Other Diagnostic Tests

Additional specialized tests may be implemented to conduct a more thorough examination of thyroid dysfunction in specific circumstances:

- Thyroglobulin Test: Thyroglobulin is a protein that is produced by the thyroid gland and can be used as a tumor marker in patients with thyroid cancer. Elevated thyroglobulin levels may suggest the presence of residual thyroid tissue or the recurrence of malignancy following thyroidectomy or radioactive iodine treatment.
- Calcitonin Test: The C-cells of the thyroid produce calcitonin, a hormone. This test is employed to diagnose and monitor medullary thyroid carcinoma, an uncommon form of thyroid cancer.
- Erythrocyte Sedimentation Rate (ESR): ESR is a non-specific marker of inflammation that may be elevated in patients with subacute thyroiditis, a painful inflammatory condition of the thyroid gland.

1.8. Causes

Thyroid disorders, such as hypothyroidism (underactive thyroid), hyperthyroidism (overactive thyroid), thyroiditis (inflammation of the thyroid), and thyroid malignancy, are the result of a variety of underlying causes. These factors can be broadly classified as iatrogenic, genetic, environmental, and autoimmune. It is imperative to comprehend the causes of thyroid disorders in order to ensure effective management, diagnosis, and prevention.

☑ Autoimmune Diseases

The most prevalent causes of thyroid dysfunction, specifically hypothyroidism and hyperthyroidism, are autoimmune diseases.

- Hashimoto's Thyroiditis: The most prevalent cause of hypothyroidism. It is a condition in which the thyroid gland is mistakenly attacked by the immune system, resulting in the progressive elimination of thyroid tissue and inflammation. This leads to a drop in the production of thyroid hormones over time.
- Graves' disease: Hyperthyroidism is most frequently caused by Graves' disease. During this condition, the immune system generates thyroid-stimulating immunoglobulins (TSIs) that resemble TSH, resulting in an overproduction of thyroid hormones by the thyroid gland. An enlarged thyroid (goiter) and symptoms of hyperthyroidism are the consequences of the overstimulation.

☑ Iodine Imbalance

Thyroid dysfunction can result from imbalances in iodine ingestion, which is essential for the production of thyroid hormones (T3 and T4) [39].

- Iodine Deficiency: Hypothyroidism and goiter are the results of insufficient iodine intake, which impairs the thyroid gland's capacity to produce sufficient thyroid hormones. Iodine deficiency is prevalent in regions where iodine-fortified salt is unavailable, particularly in developing countries.
- Iodine Overdose: Thyroid dysfunction can also result from an excessive intake of iodine. Hyperthyroidism (e.g., in patients with preexisting thyroid nodules) or autoimmune thyroiditis may result from elevated iodine levels. Thyroid issues may

be precipitated by certain medications, including amiodarone, which contains substantial quantities of iodine.

☑ **Genetic Factors**

Thyroid disorders frequently occur in families, suggesting a genetic predisposition to the development of conditions such as hypothyroidism, hyperthyroidism, and thyroid cancer.

- Inherited Mutations: Individuals may be predisposed to thyroid diseases due to mutations in specific genes. For instance, medullary thyroid carcinoma is associated with mutations in the RET proto-oncogene. A genetic predisposition is also linked to autoimmune thyroid diseases, such as Graves' and Hashimoto's disorder.
- Family History: The probability of developing identical conditions is increased by a family history of thyroid disorders, particularly autoimmune thyroid diseases. Thyroid dysfunction may result from a combination of environmental triggers and genetic susceptibility.

☑ **Thyroiditis**

Thyroiditis is a condition characterized by the inflammation of the thyroid gland, which can be induced by infections, autoimmune responses, or specific medications. Depending on the type and stage of the disease, it can result in either hypothyroidism or hyperthyroidism [40].

- Subacute Thyroiditis: Subacute thyroiditis is frequently the result of viral infections and is characterized by a painful enlargement of the thyroid and transient hyperthyroidism, which is subsequently followed by hypothyroidism. Although the thyroid generally recovers with time, there are instances in which permanent hypothyroidism may occur.
- Postpartum Thyroiditis: This condition is believed to be an autoimmune reaction and affects certain women after childbirth. It frequently manifests as hyperthyroidism initially, followed by hypothyroidism. The majority of women regain their normal thyroid function; however, a small number may develop permanent hypothyroidism.

☑ **Radiation Exposure**

The thyroid gland can be damaged and the risk of thyroid disorders, such as hypothyroidism and thyroid cancer, can be increased by exposure to radiation.

- Therapeutic Radiation: The thyroid can be damaged, resulting in hypothyroidism, by radiation treatments administered to the head, neck, or thorax (e.g., for cancer). Radiation exposure is a substantial risk factor for the development of thyroid cancer in the future, particularly in adolescents who have undergone radiation therapy.
- Nuclear Accidents: The risk of thyroid cancer is substantially elevated, particularly in minors, as a result of exposure to radioactive iodine emitted during nuclear accidents (e.g., Chernobyl). Patients who are exposed to radioactive iodine may develop thyroid nodules or malignancy years after the initial exposure.

☑ **Medications**

Hyperthyroidism or hypothyroidism may result from the interference of specific medications with thyroid function [41].

- Amiodarone: This medication, which is prescribed to alleviate cardiac arrhythmias, contains elevated levels of iodine and has the potential to induce both hyperthyroidism and hypothyroidism. Amiodarone's iodine content and its impact on thyroid hormone metabolism are the primary causes of frequent thyroid dysfunction.
- Lithium, which is employed to treat bipolar disorder, has the potential to impede thyroid function and result in hypothyroidism. It inhibits the production of thyroid hormones and influences the thyroid gland's iodine uptake.
- Immune Checkpoint Inhibitors: Certain cancer treatments, including immune checkpoint inhibitors, can induce autoimmune thyroiditis, resulting in thyroid dysfunction.

☑ **Thyroid Surgery**

Hypothyroidism may result from the surgical removal of a portion or the entire thyroid gland (thyroidectomy). This procedure is frequently implemented in instances of hyperthyroidism that does not respond to other treatments, large goiters, or thyroid malignancy [42].

- Partial Thyroidectomy: The removal of a portion of the thyroid gland may still enable the remaining thyroid tissue to function; however, some patients may still develop hypothyroidism following the surgery.

- Total Thyroidectomy: The body is unable to produce thyroid hormones after the thyroid gland is completely removed, which requires lifelong thyroid hormone replacement therapy.

☑ **Thyroid Nodules and Cancer**

Thyroid nodules are prevalent; however, while the majority are benign, a small number may generate an excessive amount of thyroid hormones or develop into malignancy.

- Benign Nodules: Hyperthyroidism can result from the production of excessive thyroid hormones by certain benign nodules that become "toxic." These nodules are frequently referred to as toxic adenomas or toxic multinodular goiter.
- Thyroid Cancer: The thyroid gland can experience both structural and functional abnormalities as a result of thyroid cancer. Papillary and follicular thyroid carcinoma are the most prevalent forms. Genetic mutations, such as those affecting the RET proto-oncogene, are linked to certain thyroid malignancies, including medullary thyroid carcinoma.

☑ **Stress and Hormonal Changes**

Although stress is not a direct cause of thyroid dysfunction, it can induce or exacerbate autoimmune thyroid diseases, particularly in genetically predisposed individuals. Thyroid function can also be influenced by hormonal changes, particularly those that occur during pregnancy, menopause, and puberty [43].

- Pregnancy and Postpartum: The thyroid gland is subjected to increased demands during pregnancy, and some women may develop hypothyroidism or hyperthyroidism during or after the pregnancy. Postpartum thyroiditis is an illustration of thyroid dysfunction that is precipitated by hormonal fluctuations subsequent to childbirth.
- Menopause: Hormonal fluctuations during menopause can result in hypothyroidism or hyperthyroidism in certain women.

1.9. Prevention of Thyroid Disorders

Although genetic and autoimmune factors cannot completely prevent all thyroid disorders, there are numerous strategies that can mitigate the likelihood of developing thyroid-related complications. Maintaining thyroid health and identifying issues at an early stage necessitates consistent health check-ups, lifestyle modifications, and appropriate nutrition.

1. Adequate Iodine Intake

The production of thyroid hormones is contingent upon the presence of iodine. Proper iodine intake is essential for thyroid health, as both deficiency and excess can result in thyroid dysfunction [44].

- **Iodine Deficiency Prevention:** The consumption of iodine-rich foods, including iodized salt, seafood, dairy products, and eggs, can aid in the prevention of iodine deficiency, a frequent cause of hypothyroidism and goiter in numerous regions of the world. Fortification of salt or food with iodine is a public health strategy that is employed in regions with a deficiency of iodine to mitigate thyroid-related disorders.
- **Limiting Iodine Consumption:** Even though iodine deficiency is a significant issue in certain regions, hyperthyroidism can result from excessive iodine consumption, particularly in those with preexisting thyroid conditions. Unless prescribed by a healthcare provider, individuals should refrain from consuming an inordinate amount of iodine-rich supplements and medications that contain iodine (e.g., amiodarone).

2. Regular Screening and Monitoring

Routine thyroid screening can assist in the early detection of issues, particularly for those at a high risk, such as those residing in iodine-deficient regions or those with a family history of thyroid disorders.

- **Thyroid Function Tests:** The early detection of thyroid imbalances, prior to the deterioration of symptoms, is facilitated by the periodic measurement of thyroid-stimulating hormone (TSH) and thyroid hormone levels (T3 and T4). Individuals who have a history of thyroid issues or are taking medications that may affect thyroid function (e.g., lithium or amiodarone) should undergo regular monitoring.
- **Screening for High-Risk Groups:** Regular thyroid screening is recommended for individuals with autoimmune diseases (e.g., type 1 diabetes), those with a familial history

of thyroid disorders, and women during pregnancy or postpartum, as they are at a heightened risk of developing thyroid dysfunction.

3. Diet and Lifestyle Modifications

A healthful lifestyle and a balanced diet are essential for the prevention of disorders and the maintenance of thyroid health [45].

- **Selenium and zinc** are essential for the correct functioning of the thyroid. Selenium is involved in the conversion of T4 into the active T3 hormone, while zinc is involved in the synthesis and metabolism of thyroid hormones. Lean meats (zinc) and Brazil nuts (selenium) can promote thyroid function.
- **Avoiding the Use of Goitrogens in Excess**: Thyroid hormone production can be disrupted by certain foods, such as cruciferous vegetables such as broccoli, cauliflower, and cabbage, which inhibit iodine assimilation. These foods are referred to as goitrogens. Despite the health benefits of these foods, their excessive consumption, particularly in individuals with iodine deficiency, can lead to thyroid issues. The goitrogenic effects of these substances are mitigated by cooking them.
- **Ensuring a Healthy Weight**: Obesity and thyroid dysfunction frequently exhibit a bidirectional relationship, as both hypothyroidism and hyperthyroidism can influence body weight. Regulating thyroid function and decreasing the likelihood of thyroid disorders can be achieved by adhering to a balanced diet and engaging in regular physical activity.

4. Stress Management

Autoimmune thyroid diseases, including Graves' disease and Hashimoto's thyroiditis, can be precipitated or exacerbated by chronic stress. The likelihood of thyroid dysfunction can be reduced and overall immune function can be supported by stress management [46].

- Meditation, yoga, deep breathing exercises, and mindfulness are stress reduction techniques that have the potential to improve thyroid health and reduce stress levels. Individuals who are susceptible to autoimmune thyroid disorders require particular attention to stress management.

- Sufficient Sleep and Rest: The maintenance of overall hormonal balance, which includes thyroid function, is contingent upon the intake of sufficient sleep and the management of fatigue. The risk of thyroid disorders may be elevated by inadequate sleep, which can exacerbate stress and compromise the immune system.

5. Avoiding Environmental Triggers

The risk of thyroid disorders can be elevated by specific environmental factors, such as exposure to endocrine-disrupting substances and radiation. Exposure to these factors can be mitigated in order to safeguard thyroid health [47].

- **Minimizing Radiation Exposure:** The thyroid can be damaged and the risk of hypothyroidism and thyroid cancer can be increased by exposure to radiation, particularly in the head and neck region. Individuals who are receiving radiation therapy for other conditions should be cognizant of the potential risks and consult with their healthcare provider regarding protective measures.
- **Preventing Endocrine Disruptors:** Thyroid function can be disrupted by chemicals such as bisphenol A (BPA), which are present in plastics and other environmental pollutants. Utilizing BPA-free products, refraining from microwaving plastics, and selecting organic foods can mitigate the risk of thyroid issues.

6. Care During Pregnancy

Untreated thyroid disorders can result in complications for both the mother and the infant, as pregnancy places increased demands on the thyroid gland. It is imperative to regulate thyroid function during pregnancy to ensure the health of both the mother and the fetus.

- **Preconception Screening:** Women who are intending to conceive should undergo thyroid function screening, particularly if they have a history of thyroid issues or are at risk for thyroid disorders. It is also crucial to consume an adequate amount of iodine during pregnancy, as the body's requirements for iodine increase during this period.
- **Monitoring During Pregnancy:** It is imperative to conduct regular monitoring of thyroid hormone levels during pregnancy in order to prevent pregnancy-related thyroid issues, including gestational hyperthyroidism and hypothyroidism. In order to preserve optimal

thyroid function, pregnant women who have preexisting thyroid disorders may require modifications to their medication regimen.

7. Preventing Postpartum Thyroiditis

Postpartum thyroiditis is an autoimmune disorder that impacts certain women following childbirth. If untreated, it can result in long-term thyroid issues, despite the fact that it is frequently temporary [48].

- **Thyroid Screening After Childbirth:** Women who have previously experienced postpartum thyroiditis or have a family history of thyroid disorders should undertake thyroid function tests following childbirth. Monitoring can assist in the early detection of thyroid dysfunction and facilitate the provision of prompt treatment.

8. Avoiding Smoking

An elevated incidence of both hypothyroidism and hyperthyroidism, particularly Graves' disease, has been associated with smoking. Iodine absorption and thyroid hormone synthesis are disrupted by the compounds present in tobacco, including thiocyanate.

- **Smoking cessation:** A reduction in the risk of developing thyroid disorders and an improvement in overall thyroid function can be achieved by quitting smoking. Smoking cessation is especially crucial for those with autoimmune thyroid disease or a familial history of thyroid issues.

1.10. Treatment

The treatment for thyroid disorders is contingent upon the specific condition, including hypothyroidism, hyperthyroidism, thyroiditis, and thyroid malignancy. The primary objective is to manage symptoms, address the underlying cause of the disorder, and restore normal thyroid function (euthyroidism). The primary treatment methods for a variety of thyroid conditions are as follows:

Fig 07: Medicine.

☑ **Hypothyroidism Treatment**

Hormone Replacement Therapy:

• The primary treatment for hypothyroidism is levothyroxine, a synthetic thyroid hormone that effectively replaces thyroxine (T4).

• Levothyroxine alleviates symptoms such as fatigue, excessive weight gain, and depression by restoring normal thyroid hormone levels.

• The dose is typically administered on an empty stomach on a daily basis, and it is altered in accordance with periodic thyroid-stimulating hormone (TSH) tests.

Regular Monitoring:

• Continuous monitoring is necessary to guarantee that the dosage of levothyroxine is suitable. Due to variables such as pregnancy, weight fluctuations, or age, dosage modifications may be required.

☑ **Hyperthyroidism Treatment**

Antithyroid Medications:

- Methimazole and propylthiouracil (PTU) are frequently prescribed to prevent the production of thyroid hormones.

- Methimazole is typically preferred due to its reduced adverse effects; however, PTU may be employed in the early stages of pregnancy. Treatment typically lasts between 12 and 18 months.

Radioactive Iodine Therapy (RAI):

- In conditions such as toxic nodular goiter or Graves' disease, radioactive iodine is employed to eliminate overactive thyroid cells.
- While RAI is a widely used and non-invasive treatment, it frequently results in hypothyroidism, necessitating everlasting thyroid hormone replacement therapy.

Beta-blockers, including propranolol, are used to alleviate symptoms such as palpitations and an accelerated pulse rate. Nevertheless, the thyroid issue that underlies them is not addressed.

Thyroidectomy: In extreme cases of hyperthyroidism, surgery (partial or complete thyroidectomy) may be necessary, particularly when medications are ineffectual or the thyroid gland is enlarged. • Patients frequently require lifelong thyroid hormone replacement therapy following surgery.

☑ **Thyroiditis Treatment**

Subacute Thyroiditis:

- Often viral in origin, **subacute thyroiditis** is usually self-limiting.
- Nonsteroidal anti-inflammatory drugs (NSAIDs), such as **ibuprofen**, help alleviate pain and inflammation. Corticosteroids like **prednisone** may be prescribed in more severe cases.

Hashimoto's Thyroiditis:

- Hashimoto's thyroiditis is treated similarly to hypothyroidism, with **levothyroxine** to replace missing hormones.

Postpartum Thyroiditis:

- Treatment for postpartum thyroiditis often depends on the phase (hyperthyroid or hypothyroid). Beta-blockers may be used for hyperthyroid symptoms, and levothyroxine may be prescribed if hypothyroid symptoms persist.

☑ **Thyroid Nodules and Goiter Treatment**

Observation:

- Benign thyroid nodules that are asymptomatic may simply be monitored with periodic ultrasound and thyroid function tests.

Radioactive Iodine Therapy:

- For large goiters or toxic thyroid nodules causing hyperthyroidism, **radioactive iodine** may be used to shrink the gland.

Surgery (Thyroidectomy):

- Surgery is considered when nodules are large, cause compressive symptoms, or are suspected of being malignant.

☑ **Thyroid Cancer Treatment**

Surgery (Thyroidectomy):

- Surgery is the primary treatment for thyroid cancer, with either partial or total thyroidectomy performed based on the extent of cancer.

Radioactive Iodine Ablation:

- Post-surgery, **radioactive iodine therapy** may be used to destroy any remaining thyroid tissue or cancer cells, particularly for papillary or follicular thyroid cancers.

Thyroid Hormone Suppression Therapy:

- High-dose **levothyroxine** may be used to suppress TSH, reducing the risk of cancer recurrence.

Targeted Therapy and Chemotherapy:

- For advanced thyroid cancers, targeted therapies like **tyrosine kinase inhibitors** may be used, especially when surgery and radioactive iodine are not effective.

☑ **Lifestyle and Supportive Measures**

Diet and Nutrition:

- Ensuring adequate **iodine intake** is essential for thyroid health. Foods rich in **selenium** and **zinc** may also support thyroid function.

Exercise:

- Regular physical activity can help manage symptoms like fatigue and weight gain. Low-impact exercises like yoga and walking are recommended.

Stress Management:

- Stress can exacerbate thyroid symptoms, particularly in autoimmune thyroid disorders. Techniques like meditation and yoga may help manage stress.

Chapter Two:
Literature review

2.1. Mark P. J. Vanderpump "The epidemiology of thyroid disease" Department of Endocrinology, Royal Free Hampstead NHS Trust, Pond Street, London NW3 2QG, UK.

Mark P. J. Vanderpump offers a comprehensive examination of the risk factors, incidence, and prevalence of thyroid diseases in this paper. The survey underscores the global prevalence of thyroid disorders, such as hypothyroidism, hyperthyroidism, and autoimmune conditions such as Graves' disease and Hashimoto's thyroiditis. Vanderpump addresses the critical role of iodine ingestion in the development of thyroid dysfunction, which can result from both deficiency and excess. The paper observes that hypothyroidism is more prevalent, particularly among women and the elderly, and that autoimmune thyroiditis is a significant contributing factor. However, hyperthyroidism is less common, is frequently associated with autoimmune factors, and is more prevalent in younger populations. Vanderpump underscores the significance of comprehending genetic predispositions and environmental factors, such as iodine ingestion, on the epidemiology of thyroid disease.

The review also emphasizes the regional variations in the prevalence of thyroid disorders, which are attributed to dietary and environmental factors. Iodine deficiency remains a significant concern in certain regions of the world. The necessity of public health strategies to address thyroid disease, particularly in populations at risk, is underscored by the author.

2.2. Ernest L. Mazzaferr "Management of a Solitary Thyroid Nodule" Published February 25, 1993 N Engl J Med 1993;328:553-559 DOI: 10.1056/NEJM199302253280807. VOL. 328 NO. 8.

Ernest L. Mazzaferri addresses the clinical approach to managing solitary thyroid nodules, a prevalent condition that impacts a substantial proportion of the population. The paper underscores the significance of delineating benign nodules from malignant ones, as the majority are benign, while a small percentage are indicative of thyroid cancer. Mazzaferri delineates essential diagnostic methods, including fine-needle aspiration biopsy (FNAB), which is essential for

assessing the character of the nodule. FNAB is considered the most effective method for detecting malignancy and determining whether surgical intervention is required. The paper also examines the diagnostic process's utilization of thyroid function tests, ultrasonography, and radionuclide scanning.

The author discusses management strategies, such as thyroid hormone suppression therapy, surgery for nodules with a higher risk of malignancy, and observation for benign nodules. Mazzaferri concludes that the effective management of isolated thyroid nodules necessitates a meticulous, personalized approach, which minimizes superfluous surgery and guarantees that malignant cases are appropriately addressed.

2.3. Gregory A. Brent “Mechanisms of thyroid hormone action” Published September 4, 2012.

Gregory A. Brent investigates the complex mechanisms through which thyroid hormones exert their physiological effects. The paper concentrates on the regulation of metabolism, growth, and development by the two primary thyroid hormones, thyroxine (T4) and triiodothyronine (T3). Brent elucidates the process by which T3, the active form, bonds to nuclear thyroid hormone receptors (TRs). These TRs subsequently interact with thyroid response elements (TREs) on DNA, thereby affecting gene expression and protein synthesis. The paper also emphasizes the importance of thyroid hormone transporters and deiodinases, which are responsible for the conversion of T4 to the more potent T3, thereby ensuring tissue-specific hormone activity. Brent elucidates the importance of the hormone-receptor interaction in a variety of tissues, such as the brain, heart, liver, and musculature, which influences functions such as thermogenesis, metabolic rate, and pulse rate.

Furthermore, the review addresses thyroid hormone resistance syndromes and mutations in TR genes, offering a comprehensive understanding of how disruptions in thyroid hormone signaling can result in clinical disorders. Brent concludes by underscoring the significance of comprehending these molecular mechanisms in order to create targeted therapies for metabolic conditions and thyroid-related diseases.

2.4. Paul W. Ladenson, MD; Peter A. Singer, MD; Kenneth B. Ain, MD "American Thyroid Association Guidelines for Detection of Thyroid Dysfunction" ***Arch Intern Med.*** **2000;160(11):1573-1575. doi:10.1001/archinte.160.11.1573**

The American Thyroid Association (ATA) guidelines for the early detection and management of thyroid dysfunction are presented by Paul W. Ladenson, Peter A. Singer, and Kenneth B. Ain. The guidelines underscore the significance of recognizing thyroid disorders, including hypothyroidism and hyperthyroidism, as these conditions are frequently asymptomatic or subtle in their early stages. The authors suggest screening populations at a higher risk, including the elderly, expectant women, and individuals with a family history of thyroid disease. The most sensitive and specific marker for thyroid dysfunction is the serum thyroid-stimulating hormone (TSH) test, which is capable of identifying both underactive and overactive thyroid conditions.

The paper also addresses the clinical significance of early detection in the prevention of complications such as cardiovascular disease, osteoporosis, and metabolic disorders. The guidelines recommend routine screening in high-risk individuals and establish a framework for physicians to follow when interpreting thyroid function tests. The authors emphasize the necessity of public health strategies to improve the early diagnosis and treatment of thyroid dysfunction in their conclusion.

Chapter Three:
Aim of The Study

3. Aim of The Study

The following objectives were achieved:

- ☑ Estimate the prevalence of thyroid disorders in the community.
- ☑ Identify key risk factors contributing to thyroid dysfunction.
- ☑ Assess the impact of lifestyle and dietary habits on thyroid health.
- ☑ Evaluate the role of iodine levels in thyroid disorders.
- ☑ Measure community awareness about thyroid diseases.
- ☑ Analyze gender and age differences in thyroid disorder prevalence.
- ☑ Investigate healthcare-seeking behavior and diagnosis rates for thyroid conditions.

Chapter Four:
Methodology

4. Methodology

4.1. Introduction

The question commences with review, which is immediately follow by 12 questions that are entirely pertinent to the subject matter. The research involved a total of 123 patients. The Bangabandhu Sheikh Mujib Medical University Hospital in Dhaka was the site of this investigation.

4.2. Research Design

The objective of this survey was to ascertain the perspectives of individuals regarding thyroid disease and the ways in which it affects their lives. The cross-sectional research was conducted at the Bangabandhu Sheikh Mujib Medical University Hospital in Dhaka and was exclusively based on the somatic responses of the participants. Microsoft Word was employed to generate the inquiries.

4.3. Method of Data Analysis

All information was examined for precision and internal consistency to rule out any missing or conflicting data, and any that were found to be inaccurate were discarded. Through Microsoft's most prevalent updated version, information analysis was conducted.

4.4. Ethical Considerations

The investigation members were granted verbal authorization prior to the commencement of the information collection. The respondents' anonymity was maintained, and the study subjects were informed that they had the freedom to withdraw from the program at any time.

4.5. Survey Question

1. Have you ever been diagnosed with a thyroid disorder?

A) Yes, hypothyroidism

B) Yes, hyperthyroidism

C) Yes, other thyroid disorder

D) No

E) Unsure

2.What is your gender?

A) Male

B) Female

C) Other

3.How old are you?

A) 18-29 years

B) 30-39 years

C) 40-49 years

D) 50-59 years

E) 60+ years

4. Do you have a family history of thyroid disorders?

A) Yes

B) No

C) Unsure

5. How frequently do you consume iodized salt in your diet?

A) Always

B) Often

C) Rarely

D) Never

E) Unsure

6. Have you ever experienced symptoms such as unexplained weight gain, fatigue, or cold intolerance?

A) Yes, frequently

B) Yes, occasionally

C) No

D) Unsure

7. How often do you visit a healthcare provider for routine checkups or blood tests?

A) Every 6 months

B) Once a year

C) Every few years

D) Only when symptoms occur

E) Never

8. Do you smoke or consume alcohol?

A) Yes, both

B) Yes, smoke only

C) Yes, alcohol only

D) No, neither

9. How would you rate your knowledge about thyroid disorders?

A) Very knowledgeable

B) Somewhat knowledgeable

C) Minimal knowledge

D) No knowledge

10. Are you aware that thyroid disorders are more common in women than men?

A) Yes

B) No

C) Unsure

11. How often do you experience symptoms like rapid heartbeat, sweating, or anxiety without a clear cause?

A) Frequently

B) Occasionally

C) Rarely

D) Never

12. Have you ever had a thyroid function test (e.g., TSH, T3, T4)?

A) Yes, regularly

B) Yes, once or twice

C) No

D) Unsure

Chapter Five:
Result & Discussion

5. Result and Discussion

5.1. Suffering on types of thyroid disorder

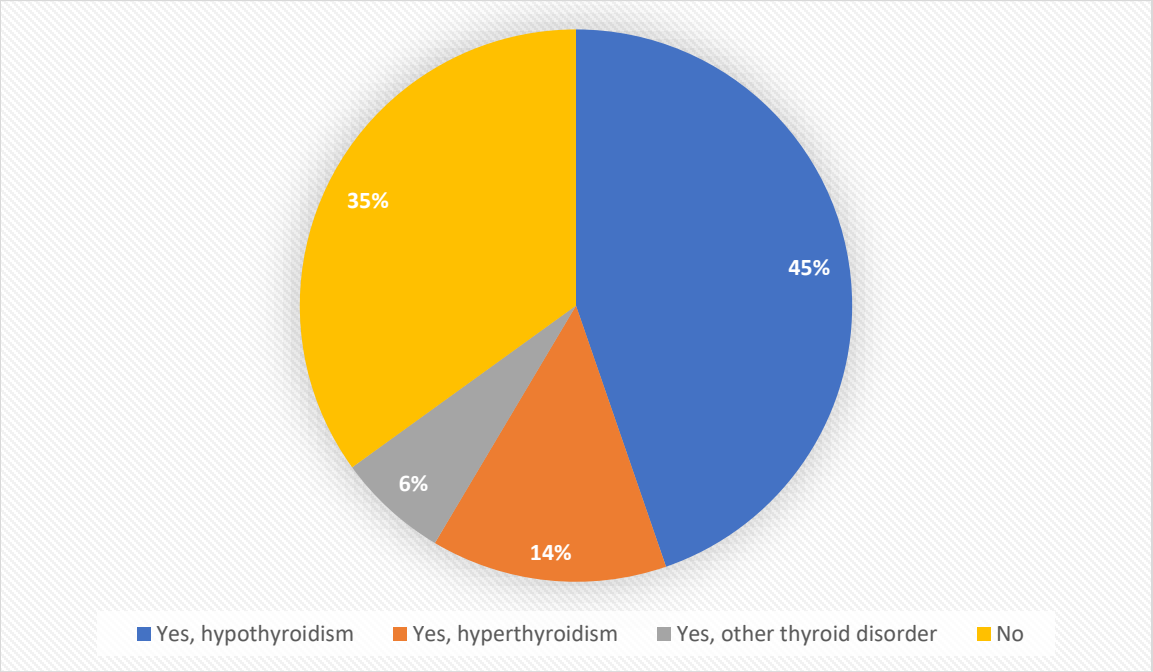

Fig 08: Suffering on Types of Thyroid Disorder

The survey indicates that hypothyroidism affects 45% of individuals, while hyperthyroidism affects 14% of patients. Only 6% of individuals are struggling with other thyroid disorders, while 35% are declining to participate.

5.2. Gender

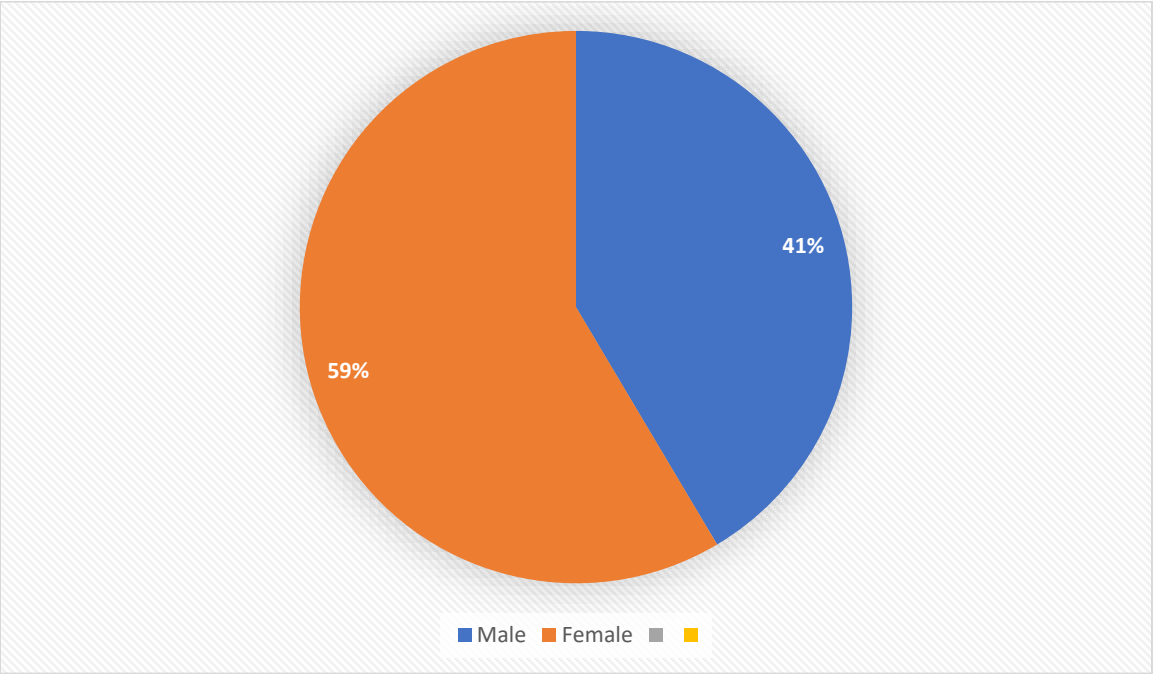

Fig 09: Gender

Represent that 59% of the respondents were female and 41% were male in this survey.

5.3. Age

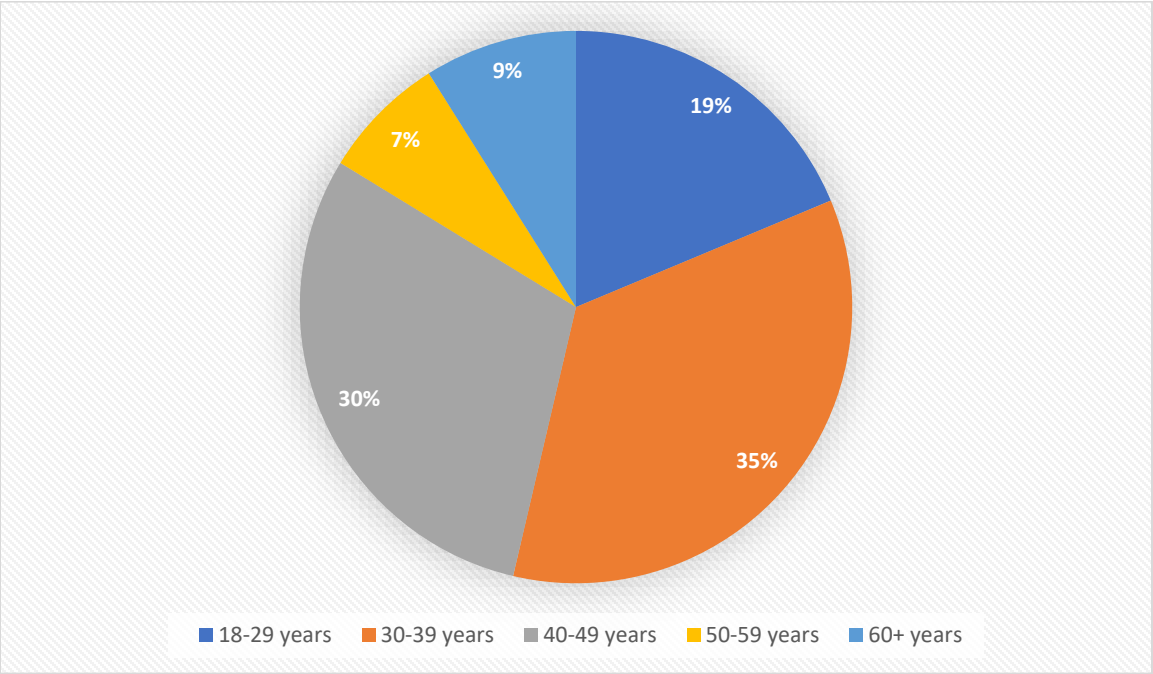

Fig 10: Age

Thirty-five percent of the population falls within the 30-39 age bracket. Additionally, 30% of the population falls within the 40-49 age bracket. Only 9% of the population is over the age of 60.

5.4. Family History

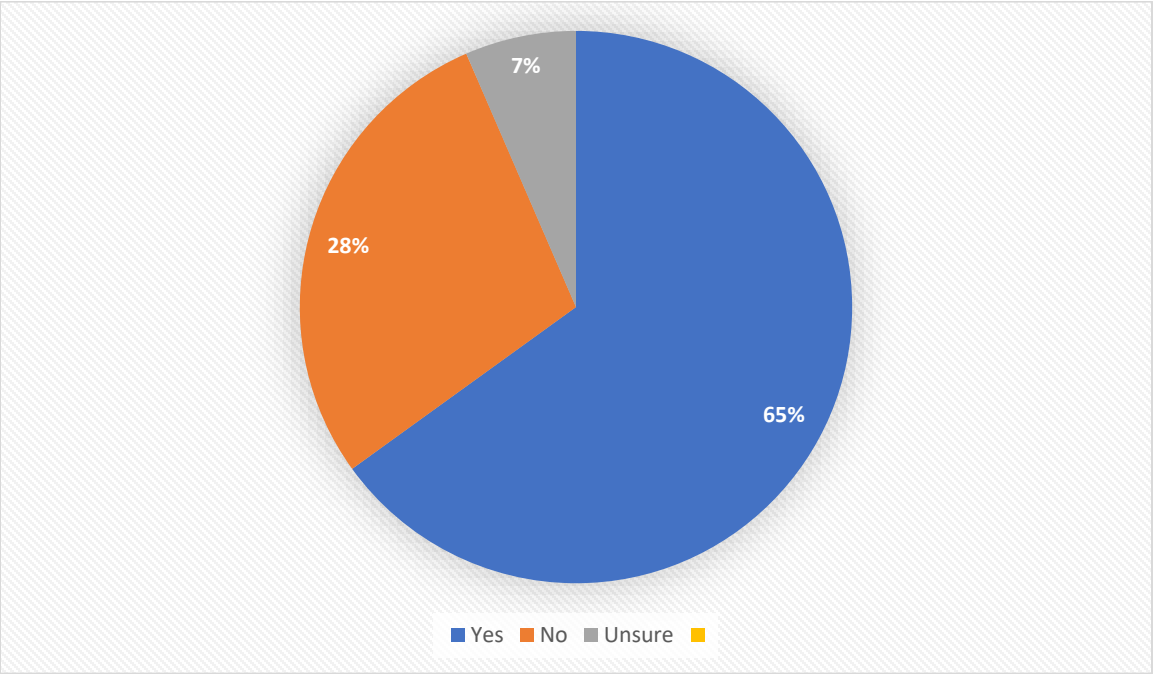

Fig 11: Family History

Approximately 65% of individuals who were diagnosed with thyroid disorders had a family history of the condition. The remaining individuals are uncertain about their family history or have no information.

5.5. Consume Iodized Salt

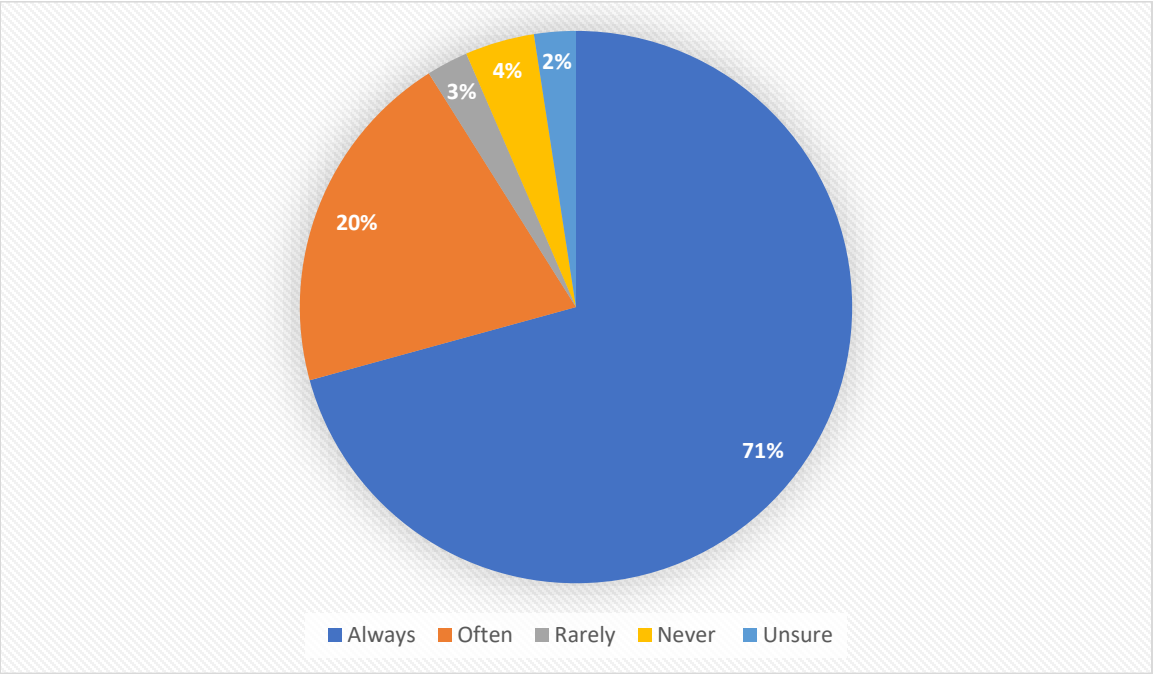

Fig 12: Consume Iodized Salt

The survey indicates that 71% of respondents have consistently ingested iodized salt. Twenty percent of individuals consume salt on a regular basis.

5.6. Ever experienced symptoms such as unexplained weight gain, fatigue, or cold intolerance

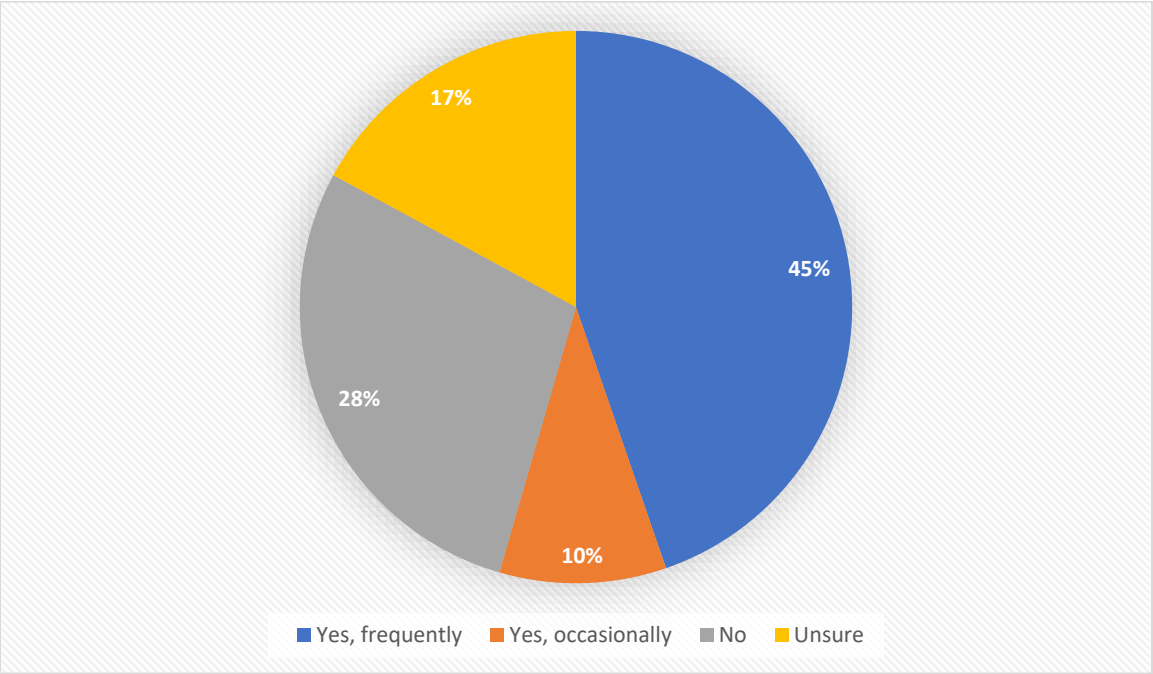

Fig 13: Experienced Symptoms

Symptoms such as fatigue, unknown weight gain, or cold intolerance are frequently experienced by 45% of the population. However, a significant number of individuals, 28%, lack experience.

5.7. Routine checkups or Blood tests

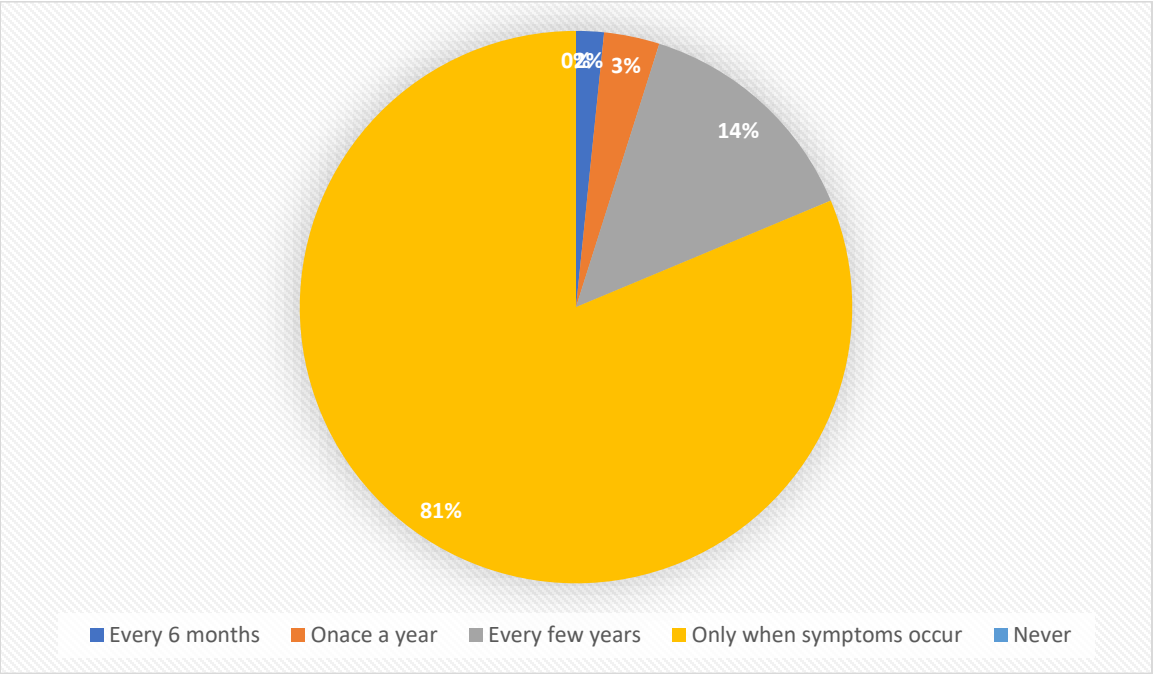

Fig 14: Routine checkups or Blood tests

An overwhelming majority of individuals, 81%, undergo routine exams or blood tests when symptoms manifest. A examination was conducted by 14% of individuals every few years.

5.8. Smock or Consume alcohol

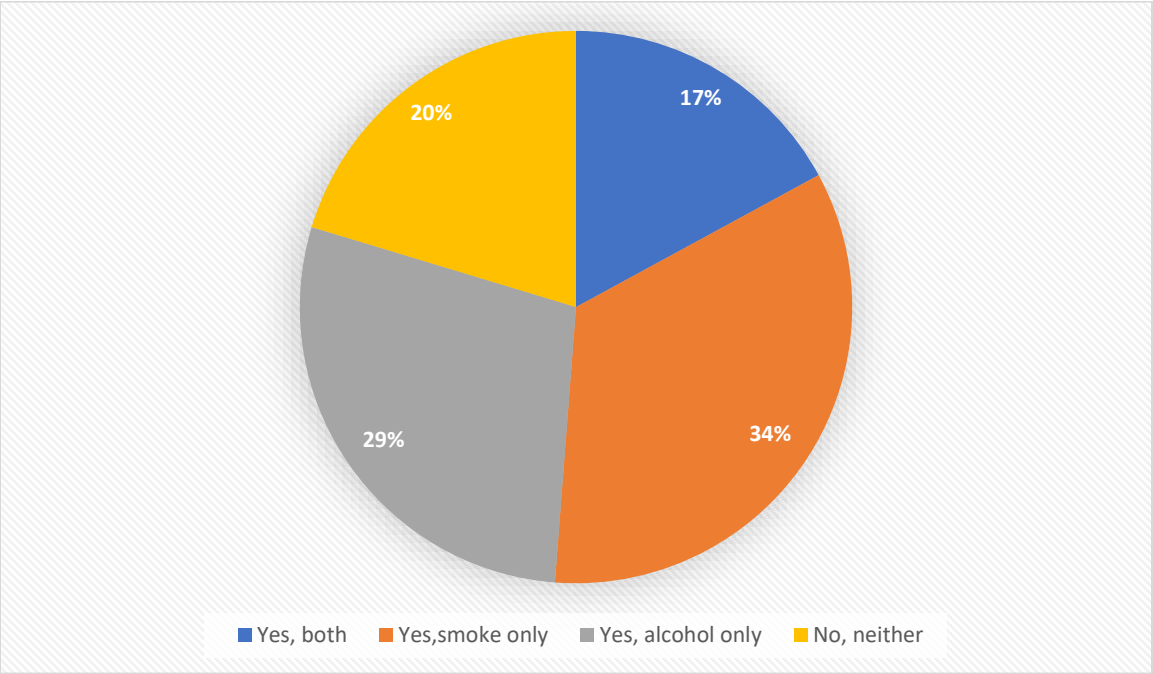

Fig 15: Smock or Consume alcohol

In this survey, 34% of respondents reported using smocks. 29% of individuals consume alcohol exclusively, while 17% smoke and consume alcohol simultaneously.

5.9. Knowledge

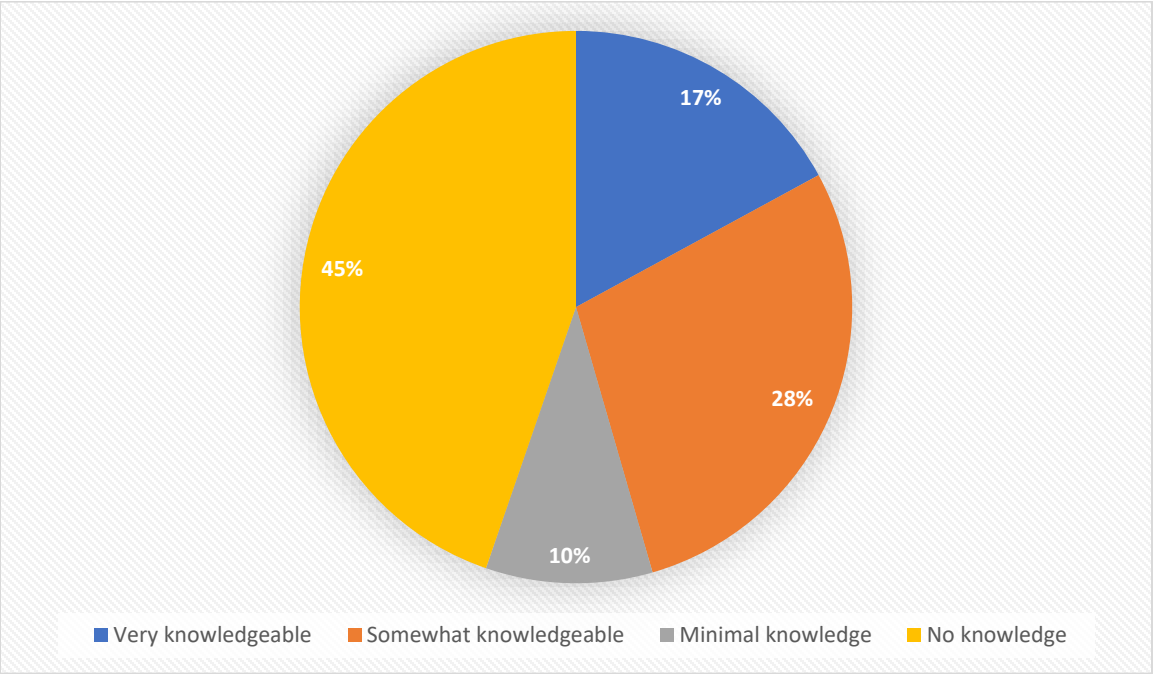

Fig 16: Knowledge

This survey indicates that 45% of the population is unaware of the thyroid. Only 17% of individuals possess a high level of knowledge, while 10% possess minimal knowledge.

5.10. More common in women than men

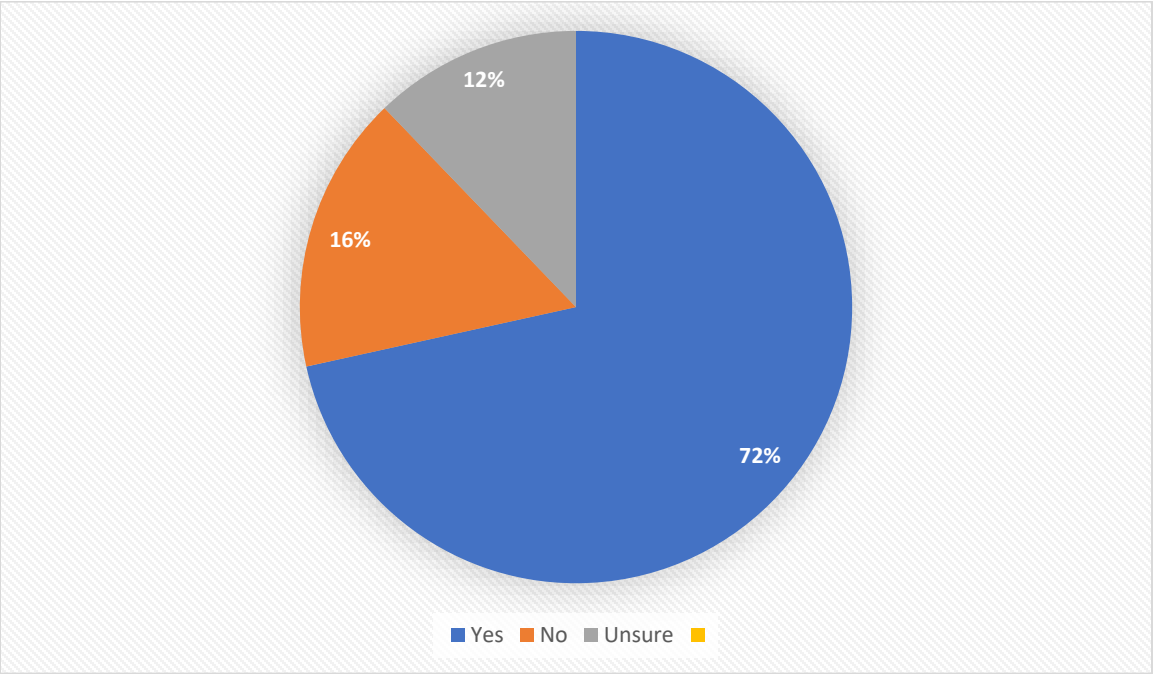

Fig 17: Common in Women than Men

The survey indicates that thyroid disorders are more prevalent in women than in males, with approximately 72% of respondents concurring with this assertion.

5.11. Experience symptoms like rapid heartbeat, sweating, or anxiety without a clear cause

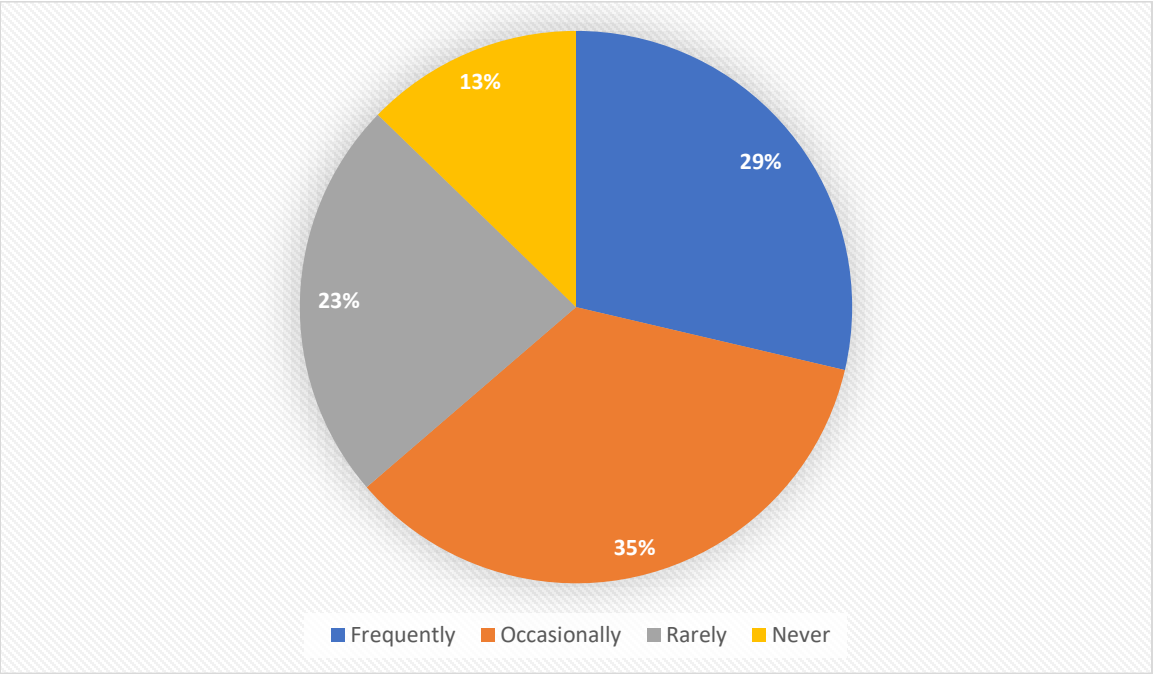

Fig 18: Experience symptoms like rapid heartbeat, sweating, or anxiety without a clear cause

Thirty-five percent of the Infrequently, 29% of individuals experience symptoms such as anxiety, perspiration, or rapid pulse without a distinct cause.

5.12. Have you ever had a thyroid function test (e.g., TSH, T3, T4)

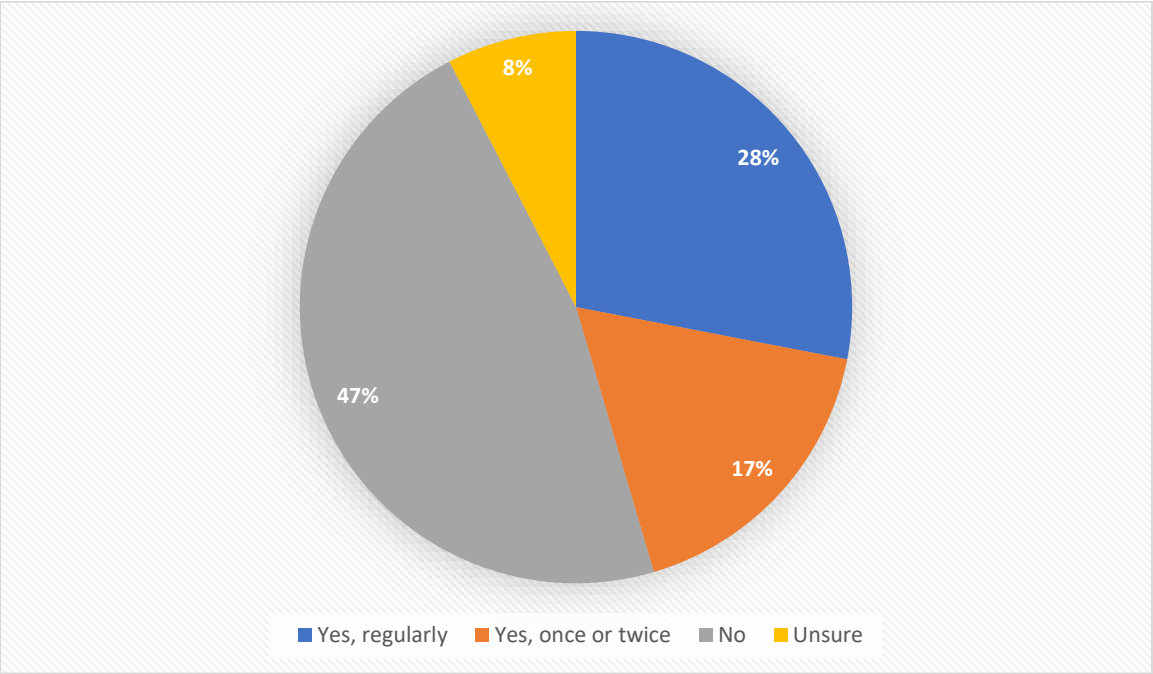

Fig 19: Thyroid function test

TSH, T3, and T4 tests are administered by 28% and 17% of individuals on a regular basis, respectively, and by 17% once or twice. The thyroid function of 47% of individuals is never tested.

Chapter Six:
Conclusion

6. Conclusion

This community-based survey offers a thorough comprehension of the risk factors and prevalence of thyroid disorders. The research indicates that thyroid dysfunction, particularly hypothyroidism, is widespread in the population, with age, female gender, familial history, and dietary iodine intake being significant risk factors. The survey also revealed that there are gaps in awareness regarding thyroid disorders, with a significant number of participants lacking knowledge regarding the significance of regular thyroid function testing, risk factors, and symptoms. This emphasizes the necessity of enhanced public health strategies that prioritize early screening and education. Furthermore, the community can benefit substantially from the improved management and prevention of thyroid disorders by increasing awareness, promoting routine testing, and addressing preventable risk factors.

Chapter Seven:

Reference

7. Reference

1. Vanderpump, M. P. J. (2011). The epidemiology of thyroid disease. British Medical Bulletin, 99(1), 39-51.

2. Wiersinga, W. M. (2018). Hashimoto's thyroiditis: Pathogenesis, diagnosis, and treatment. Thyroid, 28(4), 312-322.

3. Brent, G. A. (2008). Graves' Disease. The New England Journal of Medicine, 358(24), 2594-2605.

4. World Health Organization (2007). Iodine Deficiency in Thyroid Disorders. WHO Global Database on Iodine Deficiency.

5. Cooper, D. S. (2001). Subclinical Hypothyroidism. The New England Journal of Medicine, 345(4), 260-265.

6. Garmendia Madariaga, A., et al. (2014). The incidence and prevalence of thyroid dysfunction in Europe: A meta-analysis. Journal of Clinical Endocrinology & Metabolism, 99(3), 923-931.

7. Unschuld, P. U. (1985). Medicine in China: A History of Pharmaceutics. University of California Press.

8. Wharton, T. (1656). Adenographia. Thomas Roycroft.

9. Pearce, E. N. (2017). Iodine deficiency disorders and their elimination. Lancet Diabetes & Endocrinology, 5(6), 491-505.

10. Kendall, E. C. (1915). The isolation in crystalline form of the compound containing iodine which occurs in the thyroid: Its chemical nature and physiologic activity. Journal of the American Medical Association, 64(25), 2042-2043.

11. Hashimoto, H. (1912). Zur Kenntnis der lymphomatösen Veränderung der Schilddrüse (Struma lymphomatosa). Archiv für klinische Chirurgie, 97, 219–248.

12. Brent, G. A. (2012). Mechanisms of thyroid hormone action. The Journal of Clinical Investigation, 122(9), 3035-3043.

13. Brent, G. A. (2008). Graves' Disease. *The New England Journal of Medicine*, 358(24), 2594-2605.

14. Cooper, D. S. (2003). Hyperthyroidism. *Lancet*, 362(9382), 459-468.

15. Bahn, R. S., et al. (2011). Hyperthyroidism and other causes of thyrotoxicosis: Management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. *Thyroid*, 21(6), 593-646.

16. World Health Organization (2007). Iodine Deficiency in Thyroid Disorders. *WHO Global Database on Iodine Deficiency*.

17. Wiersinga, W. M. (2018). Hashimoto's thyroiditis: Pathogenesis, diagnosis, and treatment. *Thyroid*, 28(4), 312-322.

18. Pearce, E. N. (2017). Thyroiditis. *Lancet Diabetes & Endocrinology*, 5(6), 491-505.

19. Biondi, B., & Cooper, D. S. (2010). The clinical significance of subclinical thyroid dysfunction. *Endocrine Reviews*, 31(2), 151-162.

20. Brent, G. A. (2008). Graves' Disease. *The New England Journal of Medicine*, 358(24), 2594-2605.

21. Ross, D. S. (2020). Hyperthyroidism, thyroid storm, and differential diagnosis of thyrotoxicosis. *Endocrinology and Metabolism Clinics of North America*, 49(3), 465-484.

22. Davies, L., & Welch, H. G. (2006). Increasing incidence of thyroid cancer in the United States, 1973-2002. *JAMA*, 295(18), 2164-2167.

23. Pearce, E. N., et al. (2013). Thyroiditis. *Lancet*, 381(9871), 1227-1238.

24. Chaker, L., et al. (2017). Hypothyroidism. Lancet, 390(10101), 1550-1562.

25. Brent, G. A. (2008). Graves' Disease. The New England Journal of Medicine, 358(24), 2594-2605.

26. Cooper, D. S. (2003). Hyperthyroidism. Lancet, 362(9382), 459-468.

27. Pearce, E. N., et al. (2013). Thyroiditis. Lancet, 381(9871), 1227-1238.

28. Hegedüs, L., et al. (2003). Thyroid nodules: Clinical guidelines for assessment, treatment, and follow-up. Endocrine Reviews, 24(6), 102-118.

29. Tunbridge, W. M. G., et al. (1977). The spectrum of thyroid disease in a community: The Whickham survey. Clinical Endocrinology, 7(6), 481-493.

30. Brent, G. A. (2010). Environmental exposures and autoimmune thyroid disease. Thyroid, 20(7), 755-761.

31. Zimmermann, M. B., & Boelaert, K. (2015). Iodine deficiency and thyroid disorders. Lancet Diabetes & Endocrinology, 3(4), 286-295.

32. Boelaert, K. (2013). The association between serum TSH concentration and thyroid cancer. Endocrine-Related Cancer, 20(4), R213-R229.

33. Pearce, E. N., et al. (2013). Thyroiditis. Lancet, 381(9871), 1227-1238.

34. Garber, J. R., et al. (2012). Clinical practice guidelines for hypothyroidism in adults: Cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association. Endocrine Practice, 18(6), 988-1028.

35. Baskin, H. J., et al. (2002). Thyroid ultrasound and ultrasound-guided FNA biopsy. Thyroid, 12(12), 1049-1053.

36. Cooper, D. S., et al. (2009). Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid, 19(11), 1167-1214.

37. Hegedüs, L. (2004). The thyroid nodule. The New England Journal of Medicine, 351(17), 1764-1771.

38. Daniels, G. H. (1996). Diagnostic testing for hypothyroidism and hyperthyroidism. Endocrinology and Metabolism Clinics of North America, 25(1), 1-24.

39. McLeod, D. S., Cooper, D. S., & Ladenson, P. W. (2016). Managing complications and long-term outcomes of thyroid disease. Endocrinology and Metabolism Clinics of North America, 45(1), 157-174.

40. Brent, G. A. (2010). Mechanisms of thyroid hormone action. Journal of Clinical Investigation, 120(9), 3095-3103.

41. Zimmermann, M. B., & Boelaert, K. (2015). Iodine deficiency and thyroid disorders. Lancet Diabetes & Endocrinology, 3(4), 286-295.

42. Vanderpump, M. P. J., et al. (1995). The incidence of thyroid disorders in the community: A twenty-year follow-up of the Whickham survey. Clinical Endocrinology, 43(1), 55-68.

43. Pearce, S. H. S., et al. (2003). Clinical aspects of thyroid autoimmunity: Thyroid-associated ophthalmopathy. Best Practice & Research Clinical Endocrinology & Metabolism, 17(2), 221-239.

44. Pearce, E. N., et al. (2013). Iodine deficiency disorders and their prevention and control. Lancet, 381(9874), 1256-1267.

45. Zimmermann, M. B., et al. (2008). Iodine-deficiency disorders. The Lancet, 372(9645), 1251-1262.

46. McDermott, M. T. (2019). Hypothyroidism. The New England Journal of Medicine, 381(17), 1636-1643.

47. Singh, A., & Singh, A. (2011). Selenium and thyroid: a close-knit connection. Journal of Clinical Endocrinology & Metabolism, 96(5), 75-89.

48. Heidarpour, M., et al. (2010). The effect of amiodarone on the thyroid gland: A mini review. Iranian Journal of Endocrinology and Metabolism, 12(4), 374-379.

49. Ross, D. S., et al. (2016). American Thyroid Association Guidelines for the Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. Thyroid, 26(10), 1343-1421.

50. Garber, J. R., et al. (2012). Clinical Practice Guidelines for Hypothyroidism in Adults. Endocrine Practice, 18(6), 988-1028.

51. Cooper, D. S. (2009). Antithyroid Drugs. The New England Journal of Medicine, 360(20), 2005-2015.

52. Haugen, B. R., et al. (2016). 2015 American Thyroid Association Guidelines for the Management of Thyroid Nodules and Differentiated Thyroid Cancer.

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