



Hypothyroidism : a common phenomenon

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Abstract

Thyroid disorders are the most common worldwide. It has been reported that in India alone about 42 million people suffer from thyroid disorders. Though exact data is not available for the North Eastern part of the country but it is a very common problem amongst general population. The thyroid hormones are essential for growth and development, nervous system myelination, metabolism and organ functions. It influences the functioning of nearly all organ systems and that are of critical importance in normal physical and mental development and functions right from conception to old age. Thyroid hormone deficit or excess during development can have permanent, pervasive, and profound effects on adult neurological function. This paper will focus mainly on Hypothyroidism which is frequently found amongst the general population of North Eastern region.

Keyword : Thyroid disorder , metabolism, Hypothyroidism, Hormone

1. Introduction

Amongst various endocrine problems, thyroid disorders are the most common worldwide. It has been reported that in India alone about 42 million people suffer from thyroid disorders. Though exact data is not available for the North Eastern part of the country but it is a very common problem amongst general population.

Briefly, to mention about the thyroid gland – this is one of the largest endocrine gland in the body situated in front of neck, located between the two sternomastoid muscles in front of the trachea and larynx. The thyroid gland synthesizes and secretes two active hormones – thyroxin (T4) and tri-iodothyronine (T3). The function of the thyroid gland is regulated by thyroid stimulating hormones (TSH) secreted by the anterior pituitary gland through stimulation by thyrotropin releasing hormone (TRH) secreted from hypothalamus.

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T4 (Thyroxine) is the major hormone produced by the thyroid gland, An adult thyroid gland produces about 100 mcg of T4 and 20 mcg of T3 daily. Much of the circulating T3 is derived from T4 in the liver, kidney and other peripheral tissues. Many factors control the conversion of T4 to T3, including the body's needs from moment to moment and the presence or absence of other illnesses.

Formation of normal quantities of thyroid hormone requires the availability of adequate quantities of exogenous iodine to allow thyroidal uptake of approximately 60-75 mcg daily, taking into account the fecal losses of about 10-20 mcg, and urinary loss of about 100-150 mcg of iodine – in iodine sufficient populations. We get iodine mostly from

food. The daily dietary intake of iodine varies widely throughout the world depending on the iodine content of the soil and water and on dietary practice. Iodine may also enter the body via medications, diagnostic agents, dietary supplements and food additives. The daily recommended requirement of dietary iodine intake for adults is 150 mcg, during pregnancy 200 mcg and for children 90-120 mcg.

This article will focus mainly on Hypothyroidism which is frequently found amongst the general population of North Eastern region.

Hypothyroidism is one of the most common disorders encountered in an endocrine practice. This disease was first described by Gull under the name of myxedema in 1874 . Hypothyroidism results from reduced thyroid hormone actions at the peripheral tissues. This reduction in thyroid hormone action is in the vast majority of cases, secondary to reduced thyroid hormone synthesis and secretion by the thyroid gland which is known as primary hypothyroidism. Occasionally, peripheral resistance to thyroid hormone is the culprit. The availability of sensitive biochemical tests and effective therapies has simplified the diagnosis and management of this endocrine condition.

2. Epidemiology

Hypothyroidism is a relatively common disorder. The prevalence of hypothyroidism increases with age and is nearly 10 times more common in females than in males. The prevalence of overt hypothyroidism varies according to different surveys between 0.1 % to 2 %. Sub clinical hypothyroidism is more prevalent and can be seen in as many as 15% of older women. After sixth decade the prevalence in men approaches that of women with combined

prevalence of 10%. Studies from Mumbai have suggested that congenital hypothyroidism is common in India, incidence being 1 out of 2640 neonates where as worldwide frequency is 1 in 4000 live births and is associated with significant neurological and developmental morbidity, much of which can be prevented by early diagnosis and treatment. Therefore there is uniform agreement that screening for neonatal hypothyroidism is necessary.

In India amongst adult population, the prevalence of hypothyroidism is recently studied. This study was conducted in Cochin. Amongst 971 adult subjects, the prevalence of hypothyroidism was 3.9%. The prevalence of subclinical hypothyroidism was more being 9.4%. In North Eastern region of India the rate of hypothyroidism is high. In the Radio-Immuno Laboratory of N.L.Medicare & Research Centre, Guwahati, out of 2456 randomly analyzed blood samples over a period of one year revealed incidence of hypothyroidism in 10.9% and subclinical hypothyroidism being in 13.1%.

3. Causes of Hypothyroidism

Primary hypothyroidism may result from diseases or treatments that destroy thyroid tissue or interfere with thyroid hormone biosynthesis. Worldwide, iodine deficiency is the most common cause of hypothyroidism. In areas where iodine intake is adequate, the most common causes are autoimmune thyroiditis, (both goitrous and atrophic forms) and radiation induced hypothyroidism. The latter may be caused by radioactive iodine treatment of hyperthyroidism or external radiation therapy directed to the neck of patients with lymphoma or head and neck cancer. The following table shows the different causes of primary hypothyroidism.

Table – Causes of Hypothyroidism

A.Primary Hypothyroidism

Destruction of thyroid tissue

- Chronic autoimmune thyroiditis.
- Radiation – ¹³¹I therapy for thyrotoxicosis , External radiotherapy to the head and neck for non thyroid malignant diseases.
- Subtotal or total thyroidectomy.
- Infiltrative disease of thyroid (Rare)

Defective Thyroid hormone biosynthesis

- Iodine deficiency
- Drugs with antithyroid actions – Lithium, Iodine, Iodine containing drugs, Radio graphic contrast agents, sulfonamides
- Goitrogens in foodstuff or as endemic substances or pollutants.
- Congenital defects in thyroid hormone biosynthesis.

Transient Hypothyroidism

- Sub acute thyroiditis.
- Silent thyroiditis (painless)
- Post-partum thyroiditis.

B. Central Hypothyroidism

- Pituitary disease
- Hypothalamic disease.

Although central hypothyroidism is rare, some of its causes (pituitary or hypothalamic tumors) may have disabling and even potentiathy fatal effects.

4. Clinical manifestations

The clinical manifestations of hypothyroidism are largely independent of its causes, affecting persons of all ages and both sexes; although the majority of patients are women. Primary hypothyroidism may be overt or subclinical. The former is defined as high serum TSH concentrations and low serum free T4 concentrations, where as the latter is defined as high serum TSH and normal free T4 concentrations. The diagnosis of central hypothyroidism is based on the demonstration of low serum T4 concentration in the presence of inappropriately low serum TSH values. Spectrum of sign and symptoms of hypothyroidism is broad, at one extreme are those patients who have no or very few symptoms and signs of hypothyroidism which is detected only during routine examination and at other extreme are those patients with severe form known as myxedema coma.

The underlying problem in hypothyroidism is slowing of many physiologic processes and the clinical manifestations reflect that slowing. In hypothyroidism, there is accumulation of matrix glycosaminoglycans in the interstitial fluids. This is due to increased synthesis of hyaluronic acid. This and metabolic changes explain many of the clinical symptoms and signs reported by individuals who have hypothyroidism.

In very young infants, hypothyroidism can result in irreversible mental and physical retardation unless treatment is initiated within weeks after birth, where as in children and adults its effects, while they may be profound, are reversible provided if treatment is initiated on time. In general, the patients who develop hypothyroidism rapidly have more symptoms than those in whom it develops slowly. In some patients, particularly those with chronic autoimmune thyroiditis, hypothyroidism may remain subclinical for many years before becoming overt. Some of the common sign and symptoms of hypothyroidism are as follows.

Symptoms

- Fatigue
- Lethargy
- Sleepiness
- Mental impairment
- Depression
- Cold intolerance
- Hoarseness of voice
- Dry skin, brittle hair and nails
- Weight gain
- Decreased appetite
- Constipation
- Menstrual disturbances, Miscarriages
- Arthralgia
- Paresthesia
- Puffy face

Signs :

- Slow movements
- Slow speech
- Hoarseness
- Slow pulse rate
- Dry skin
- Nonpitting edema
- Hyporeflexia
- Delayed relaxation of reflexes

In our observations we have noticed few unusual presentations of hypothyroid patients

- Decreased body weight
- Increased bowel movement
- Increased pulse rate
- Palpitations
- Amenorrhoea
- Hirsutism and galactorrhoea.

5. Diagnosis

The diagnosis of hypothyroidism is based on the combination of clinical context and laboratory tests. Imaging of the brain and pituitary gland is required for patients in whom central hypothyroidism

is suspected.

Sensitive and accurate measurements of serum TSH along with free T4 and total T3 have greatly simplified the diagnosis of hypothyroidism. For diagnosis of central hypothyroidism assessment of other anterior pituitary functions are necessary. Measurement of antithyroid antibody helps to confirm the diagnosis of lymphocytic thyroiditis and aids in the prediction of which patients with mild failure will progress to develop overt hypothyroidism.

6. Treatment

Hypothyroidism can cause considerable morbidity. The treatment of hypothyroidism is, in principle, simple and rewarding. Synthetic thyroxine is the preferred form of thyroid hormone replacement therapy. Hypothyroidism in the majority of patients is permanent and should be treated lifelong. The main exceptions are patients who have transient hypothyroidism due to sub acute thyroiditis and patients who have drug-induced hypothyroidism. These patients should be treated during their hypothyroid phase.

6.1 The main goal of treatment is

- To restore euthyroid state
- To reduce symptoms
- To decrease goiter size who have goitrous autoimmune thyroiditis.

The choice of the starting dose of thyroxine

depends on factors such as age, presence of heart disease etc. Treatment can be started with a full replacement dose of 1.6 mcg/kg/day in young and healthy adult patients. In elderly individuals it is prudent to start thyroxine at a dose of 25 mcg to 50 mcg once daily. Ideally thyroxine should be taken on an empty stomach about 30 minutes before breakfast. Adequacy of treatment is monitored by measurement of serum TSH levels. Serum TSH levels must be measured 4 to 6 weeks after commencing treatment and every 4 to 6 weeks thereafter until a normal TSH is reached. Target of keeping TSH should be in the range of 0.5 to 3 mIU/L. This is based on data from the NHANES III survey. Once target level, of serum TSH is reached it is prudent to measure serum TSH and free T4 levels once a year, provided no other medications that may change the requirement of synthetic thyroxine added.

The major adverse effects of Thyroxine therapy is due to overdose, producing symptoms and signs of hyperthyroidism. Increased bone reabsorption and osteoporosis have been associated with long standing hyperthyroidism and will develop in post menopausal women chronically treated with thyroxine.

7. Conclusions

Hypothyroidism is a common disorder having multiple etiology. Early diagnosis and treatment are essential to prevent irreversible and permanent nervous system damage and developmental delay especially in infants.

References

- Ambike Gopalakrishnan Unnikrishnan, Usha V. Menon, 201, Thyroid disorders in India: An epidemiological perspectives: Indian J. of Endocrinology and Metabolism Vol 15 Suppl 2.
- Hollowell JG, Stohling MW, Flanders WD, et al, serum TSH, T4 and Thyroid antibodies in united states population (1988-1994) : National Health and Nutrition Examination survey (NHANES III) J. Clin Endocrinol Metal 2002; 87 : 489-499.
- Lewis E. Braverman, Robert D. Utiger, 2005, Introduction to hypothyroidism The Thyroid 9th Edition : 697 – 699.
- Medhuri Devdhar, Yasser H. Ousman Kenneth D. Burman: Hypothyroidism: Endocrinology and metabolic clinics of North America Vol : 36 page 5 93, Sept 2007.
- Michael T. McDermott and E. Chester Ridgway, 2009, Medical management of Thyroid disease, 2nd Edn : 145 – 179
- Mir Iftinher Bashir, Arshed Iqbal Md Ashraf Gani, Abdul Hamid Zargar *et al.*, 2004, Profile of Thyroid Disorders in Kashmir valley: J of Endocrinology & Metabolism Vol VI Jan-Mar, Research and practice, 2005, Vol 2 no 3.
- S K Das, S. S. Dey, DM Vasudevan : Neuronal connections and thyroid hormones : Thyroid