IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Iodine Deficiency Disorders

1Abhishek Ashok Lolge, 2Prof.Ansari R.A, 3Dr. Santosh Jain
1Student , 2Assistant professor
1Aditya institute of pharmaceuticals, Beed

Abstract

Iodine is an important micronutrient that is required for the synthesis of the thyroid hormones thyroxine (T4) and triiodothyronine (T3). The diet is the primary method of achieving adequate iodine nutrition, with dairy products, some breads, seaweed and other seafood, and iodized salt as the most common iodine-containing foods. Adolescents and adults require iodine in amounts of 150 µg/day, with higher amounts required during pregnancy and lactation. After digestion and absorption, the released iodine enters the plasma iodine pool and can be taken up again by the thyroid gland or excreted by the kidney. Iodine deficiency is the main cause of endemic goiter, but exposure to environmental pollutants and ingestion of certain dietary substances (goitrogens) can additionally interfere with iodine uptake into the thyroid to aggravate this effect. Finally, iodine ingestion greater than the recommended upper tolerable intake limit (1100 µg/day) increases the risk iodine

Introduction

Iodine is a micronutrient of crucial importance for the health and well-being of all individuals. Iodine is mostly concentrated in thyroid glandIodine is a mineral of the earth. Your body needs iodine to make thyroid hormones. Your body doesn't produce its own iodine. You must get iodine through the food you eat. You can get iodine in a few different ways:Iodine is present in some foods: Iodine occurs naturally in seawater. Foods that are high in iodine include seaweed, shrimp and other seafood. Some dairy products and other foods are fortified with iodine.Iodine is added to table salt: Iodine deficiency used to be common in certain areas of the United States and Canada. In 1924, the process of adding iodine to table salt was introduced. Rates of iodine deficiency dropped.Iodine is available as a dietary supplement: You can get iodine through a daily multivitamin. Iodine deficiency occurs when your thyroid gland lacks the amount of iodine it needs to function properly. Your thyroid gland is the butterfly-shaped gland located in the front of your neck. It's part of your endocrine system. Your thyroid makes thyroid hormones. Then, your thyroid releases the hormones into your bloodstream. Your blood carries them to your body's tissues.Thyroid hormones help your body use energy, stay warm and keep your organs working correctly. Your unborn baby also needs thyroid hormones for proper bone and brain development during your pregnancy. Iodine deficiency during pregnancy can cause severe

complications.Iodine in food and iodized salt is present in several chemical forms including sodium and potassiu m salts, inorganic iodine (I2), iodate, and iodide, the reduced form of Iodine in food and iodized salt is present in several chemical forms including sodium and potassium salts, inorganic iodine (I2), iodate, and iodide, the reduced form of iodine [4]. Iodine rarely occurs as the element, but rather as a salt; for this reason, it is referred to as iodide and not iodine. Iodide is quickly and almost completely absorbed in the stomach and duodenum. Iodate is reduced in the gastrointestinal tract and absorbed as iodide. When iodide enters the circulation, the thyroid gland concentrates it in appropriate amounts for thyroid hormone synthesis and most of the remaining amount is excreted in the urine

· **Iodine Deficiency Disorders (IDDs)** :Iodine is essential for human health as it is a constituent of thyroid hormone, which play an important role in physical and mental development. Iodine is one of the leading causes of preventable mental retardation and brain damage in the world. Iodine deficiency not only leads to Goiter and Cretinism but also to a much broad spectrum of disorders. The normal requirement of iodine for human being averages 150µg per person per day. Iodine deficiency disorders refer to a spectrum of health consequences resulting from inadequate intake of iodine. The adverse consequences of iodine deficiency lead to a wide spectrum of problems ranging from Abortion and stillbirth to mental and physical retardation and deafness which collectively known as Iodine Deficiency Disorders (IDDs).

Most important consequences of the spectrum of IDD are:[a.goitre
b.hypothyroidism c.cretinism
Increased morbidity and mortality of infants and neonates

Iodine regulates metabolism, the conversion of energy obtained from food into energy to help cells function and grow. A deficiency of iodine can therefore prevent normal growth and development. This is especially dangerous in pregnant women and infants, in which miscarriage, stillbirth, stunted growth, and cognitive impairments (difficulties with reading, writing, talking, problem solving, social skills) can occur. In adults, an iodine deficiency of less than 10-20 mcg a day can lead to inadequate thyroid hormone production, called hypothyroidism, which disrupts normal metabolic functions like regulating heart rate, body temperature, and body weight. [2] A lump or swelling in the neck, called goiter, often accompanies hypothyroidism. Other signs of hypothyroidism include:

-Fatigue, lethargy
-Weakness
-Sensitivity to cold
-Constipation
-Dry skin and hair
-Weight gain

A. Goiter A goiter may be an overall enlargement of the thyroid, or it may be the result of irregular cell growth that forms one or more lumps (nodules) in the thyroid. A goiter may be associated with no change in thyroid function or with an increase or decrease in thyroid hormones. The most common cause of goiters worldwide is a lack of iodine in the diet.
Treatment depends on the cause of the goiter, symptoms, and complications resulting from the goiter. Small goiters that aren't noticeable and don't cause problems usually don't need treatment Children and adolescents most commonly present with diffuse goiters, while adults have nodular goiter. More common in girls than in boys. Iodine deficient goiter for many subjects is a cosmetic concern – In some, particularly, older adults goiter may be large enough to cause compression of trachea or esophagus. The size of enlarged palpable goiter indicates the degree of longstanding iodine def

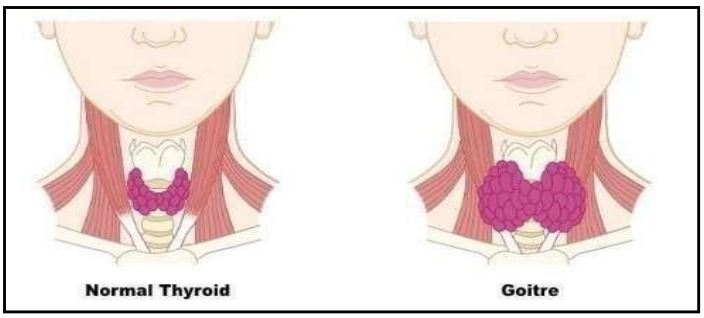

Fig.No.01

Based on thyroid size and degree of goiter WHO grades goiter in three stages/grades as follows:

Grade 0: No palpable or visible goiter

Grade 1: A goiter that is palpable but not visible when the neck is in the normal position Grade 2: A swelling in the neck that is visible when the neck is in a normal position.

B. Hypothyroidism

When your thyroid doesn't produce enough hormones, the balance of chemical reactions in your body can be upset. Thyroid is a small, butterfly-shaped gland situated at the base of the front of neck, just below Adam's apple.

Hormones produced by the thyroid gland are

- Tri-iodothyronine (T3)
- Thyroxine (T4)

These have an enormous impact on your health, affecting all aspects of your metabolism. These hormones also influence the control of vital functions, such as body temperature and heart rate.

Hypothyroidism results when the thyroid gland fails to produce enough hormones Hypothyroidism may be due to a number of factors, including:[10]

- Autoimmune disease
- Over-response to hyperthyroidism treatment
- Thyroid surgery
- Medication
- Radiation therapy

Manifestation may occur at different age groups, rarely recognized in the new born since the signs and symptoms are usually not sufficiently developed and difficult to diagnose. The symptoms seen in hypothyroidism are as follows:

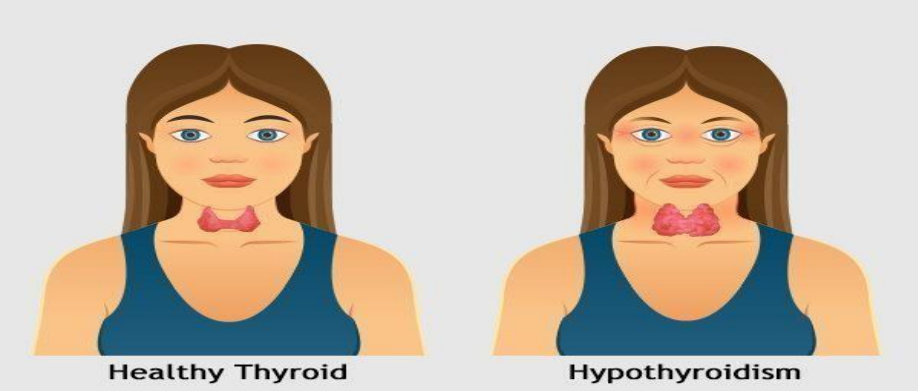

Fig.No 02

C. Cretinism:

A congenital condition caused by a deficiency of thyroid hormone during prenatal development and characterized in childhood by dwarfed stature and mental retardation. Cretinism is the most serious IDD and occurs when a pregnant woman is severely iodine deficient. Is a condition of severe physical and mental retardation due to iodine deficiency, and specifically due to deficiency of thyroid hormones during early pregnancy. This condition is irreversible, even after treatment with thyroid hormones or iodine soon after birth, but can be corrected if treatment with iodine starts prior to or early in gestation.
Severe mental retardation and Other neurological defects Divided into

- Neurological cretinism: which is characterized by Mental retardation, Deaf mutism, Gait disturbances, Spasticity but not hypothyroidism
- Myxedematous cretinism: which is characterized by Mental retardation, short stature, Hypothyroidism.[12]

The other Complications of Iodine Deficiency:

- Hashimoto's disease: Hashimoto's disease is an autoimmune disorder, an illness caused by the immune system attacking healthy tissues. The damaged and inflamed tissues of the thyroid don't produce enough hormones (hypothyroidism). When the pituitary gland detects the decline and prompts the thyroid to create more hormones, the thyroid can become enlarged.

- Graves' disease: Another autoimmune disorder called Graves' disease occurs when the immune system produces a protein that mimics TSH. This rogue protein prompts the thyroid to overproduce hormones (hyperthyroidism) and can result in thyroid growth.

- Thyroid nodules: A nodule is the irregular growth of thyroid cells that form a lump. A person may have one nodule or several nodules (multinodular goiter). The cause of nodules is not clear, but there may be multiple factors — genetics, diet, lifestyle and environment. Most thyroid nodules are noncancerous (benign).

- Thyroid cancer: Thyroid cancer is less common than other cancers and generally treatable. About 5% of people with thyroid nodules are found to have cancer.

- Pregnancy: A hormone produced during pregnancy, human chorionic gonadotropin (HCG), may cause the thyroid gland to be overactive and enlarge slightly.

- Inflammation: Thyroiditis is inflammation of the thyroid caused by an autoimmune disorder, bacterial or viral infection, or medication. The inflammation may cause hyperthyroidism or hypothyroidism

Global Action for Iodine Deficiency (IDD) Eradication

The planning of a global strategy for the prevention and control of IDD has been taken up by the United Nations Administrative Committee on Coordination – Subcommittee on Nutrition (ACC/SCN). In October 1985 the ACC/SCN requested the World Health Organization (WHO) to prepare an international support program for IDD control. The 39th World Health Assembly (Geneva, 1986) in its resolution urged all member nations to give high priority to the prevention and control of IDD within the ensuing five to ten years and requested the Director General of WHO to give all possible support to the member states in this regard. The International Council for the Control

of Iodine Deficiency Disorders (ICCIDD) was formed in 1986 to function as an expert consultative group on the assessment and control of IDD, operating with WHO and UNICEF at the global, regional and national levels. ICCIDD has also formed regional working groups in Africa, South East Asia and the Middle East for developing regional strategies for IDD control. In India the entire population is prone to IDD due to deficiency of iodine in the soil of the subcontinent and consequently the food derived from it. Of these, an estimated 350 million peopleare at risk of IDD as they consume salt with inadequate iodine. Surveys conducted by the Central and State Health Directorates, Indian Council of Medical Research (ICMR) and medical institutes since 1950s have clearly demonstrated that IDD is a public health problem in all States and union territories in India.[2]

In 2006, a National Coalition for Sustained Iodine Intake (NCSII) was established. These included Government of India agencies (Ministry of Health and Family Welfare and Salt Commissioners Office), State Government agencies (Ministry of Health and Family Welfare at State level), national institutes/organizations National Institute of Health and Family Welfare (NIHFW), National Cadet Corps (NCC), partner agencies (WHO, UNICEF, WFP, GAIN, MI, ICCIDD), health professionals groups Indian Public Health Association (IPHA), Indian Association of Preventive and Social Medicine (IAPSM), Indian Thyroid Society (ITS), Indian Society of Pediatric and Adolescent (ISPAE), salt manufacturers associations (ISMA), civil society/ consumer advocacy groups and media advocacy groups.[6]

Mainstreaming of IDD control in the policy-making process is imperative. All stakeholders should sensitize policy makers tothe criticality of IDD control for human resource development and national progress. It is to be emphasized that even moderate iodine deficiency is associated with cognitive impairment in children. More focus should also be given to the “rights approach” i.e., it is every child’s right to have access to optimal iodine nutrition to ensure optimal brain development.[7]

The main strategy to achieve the goal will be the universal fortification of all 'food grade' salt consumed by all people in countries at risk by the end of 1995. All salt for animal use should also be fortified, since such salt is often consumed by people, and improving the iodine status of animals will improve animal reproduction, milk and meat yield and increase the iodine content of food.[2]

Monitoring And Evaluation:

Monitoring Quality of Iodate Salt A monitoring system for IDD control and quality control mechanisms must be established. Allsalt should be checked for its iodine content and monitoring procedures should be carried out on an ongoing basis as part of routine health assessments. Frequent tests need to be performed at iodization plants to exercise timely correction of errors when they occur and monitoring should continue even after effective IDD control has been achieved.

Stability of Iodine in Salt The required amount of iodine in iodate salt is maintained only when the following conditions are avoided.

Exposure to: Moisture: Sunlight or high temperatures, Oxidizing contaminates in particular ferric ions;

Use of ordinary containers: Washing salt before use, storing more than recommended time Potassium iodate (KIO3) is more convenient than iodides for salt iodation. Iodates such as KIO3) are resistant to oxidation and do not require the addition of stabilizers.

Diagnosis

Iodine deficiency is diagnosed based on blood tests indicating low levels of thyroid hormones or a high level of thyroid- stimulating hormone (TSH) or based on the presence of a goiter.

Your healthcare provider may be able to visually diagnose iodine deficiency if you have an enlarged thyroid gland or goiter. They may order imaging tests, such as a thyroid ultrasound or a thyroid scan to measure your thyroid gland and examine it for abnormalities. Healthcare provider may also order a thyroid blood test. Low levels of thyroid hormone or high levels of thyroid-stimulating hormone (TSH) can indicate iodine deficiency.

All newborn babies are checked for hypothyroidism through a blood test Iodine level is best assessed by measurement of Urinary iodine, Thyroid size,

T3, T4, TSH; Thyroglobulin, Saliva /serum iodine ratio

Urinary Iodine concentration indicate current iodine nutrition. Thyroid size and serum thyroglobulin reflect iodine status over a period of months or years

The best diagnostic test to identify IDD in a population is a median 24-hour iodine urine collection. If a 24-hour urine collection is not practical, a random urinary iodine-to-creatinine ratio can be used instead

Prevention of iodine deficiency

Monitoring Intervention Programs and Their Impact

The key to success in prevention of IDD is longitudinal monitoring of both the supply of iodine and the impact of the prevention program on the targeted population. Too many programs have lapsed because of failed monitoring, with the subsequent reappearance of IDDs. Monitoring should be institutionalized on a continuing and stable basis. The iodine content of salt should be measured from the factory or import portal, to the retailer, and on to the household. Swings in concentration should be investigated and corrected. Quite simple and reliable methods are now generally available to measure the iodine content of salt to assure that it is within satisfactory limits (Sullivan et al., 1994). Results should be confirmed by external control laboratories.

The Impact of programs should be monitored by periodic assessment of the status of IDDs. Success is signaled by a decline in IDDs as indicated by one or more of the assessment techniques described above. Care is needed in interpreting the information gained through monitoring, For example, if the surveyed population is comprised of older subjects with long-standing goiter and the technique of assessment is goiter rate, little change may be observed.

Most people can get enough iodine from eating iodine-rich foods such as seafood. You can use small amounts of iodised salt and eat
packaged bread to increase the amount of iodine in your diet.

The National Health and Medical Research Council recommends that all women who plan to get pregnant, are pregnant or are breastfeeding should take an iodine supplement of 150 micrograms a day.

Taking too much iodine can also cause thyroid problems, so don't exceed the recommended dose of suppMost people can get enough iodine from eating iodine-rich foods such as seafood. You can use small amounts of iodised salt and eat packaged bread to increase the amount of iodine in your diet.

The National Health and Medical Research Council recommends that all women who plan to get pregnant, are pregnant or are breastfeeding should take an iodine supplement of 150 micrograms a day. Talk to your doctor about this.

What foods provide iodine?

Iodine is found naturally in some foods and is also added to salt that is labeled as "iodized". You can get recommended amounts of iodine by eating a variety of foods, including the following:

Fish (such as cod and tuna), seaweed, shrimp, and other seafood, which are generally rich in iodineDairy products (such as milk, yogurt, and cheese) and eggs, which are also good sources of iodine Iodized salt, which is readily available in the United States and many other countries*

*Processed foods, such as canned soups, almost never contain iodized salt. In addition, specialty salts, such as sea salt, kosher salt, Himalayan salt, and fleur de sel, are not usually iodized. Product labels will indicate if the salt is "iodized" or provides iodide.

Iodine is available in dietary supplements, usually in the form of potassium iodide or sodium iodide. Many multivitamin-mineral supplements contain iodine. Dietary supplements of iodine-containing kelp (a seaweed) are also available.

Iodine is found in soil and the ocean, which varies in amount and will affect how much of the mineral is contained in a food. Iodine is found mainly in animal protein foods and sea vegetables, and to a lesser extent in fortified foods like breads, cereals, and milk.

- Seaweed (nori, kelp, kombu, wakame)
- Fish, shellfish (cod, canned tuna, oysters, shrimp)
- Table salts labeled "iodized"
- Dairy (milk, cheese, yogurt)
- Eggs
- Beef liver
- Chicken
- Fortified infant formula

Life Stage	Recommended Amount
Birth to 6month	110 mcg
Infants 7-12month	130 mcg
Children 1-8month	90 mcg
Children 9-13month	120 mcg
Teens 14-18	150 mcg
Adults	150 mcg

Recommended iodine intake of per day (micrograms)

Conclusion

Studies for the past century have demonstrated that iodine deficiency causes a spectrum of disease, including goiter, cretinism, intellectual impairment, and adverse obstetric outcomes. Salt iodization, first used in Switzerland and the United States in the 1920s, ha s become the mainstay of iodine deficiency prevention efforts. The dramatic global reduction in IDD over the past century represents an under- recognized public health achievement.

However, work remains to be done. In some regions there has been backsliding-once iodine sufficiency has been achieved resources are diverted to other public health priorities and gains are not sustained. Since the introduction of universal salt iodization in most countries, severe iodine deficiency has been largely eradicated worldwide, but mild to moderate iodine deficiency remains prevalent, especially in pregnant women, who are at highest risk of adverse outcomes from IDD. Future studies are needed to understand how to sustain progress and to optimize iodine nutrition for the most vulnerable population groups.

Refrences

1. Module of iodine deficiency disorder for the Ethiopian health center team.

2. Monitoring and evaluation system 2000-BCHIMES

3. W.H.O., UNICEF and International council for the control of iodine deficiency disorders

4. New Delhi: ICCIDD; The Secretariat. Activity report, National Coalition for Sustained Iodine Intake (NCSII), 2009-2010.

5. Gordon RC, Rose MC, Skeaff SA, Gray AR, Morgan KMD, Ruffman T. Iodine supplementation improves cognition in mildly iodine-deficient children. Am J Clin Nutr. 2009;90:1264–71. [PubMed]

6. Assessment of iodine deficiency disorders and monitoring their elimination. Geneva: World Health Organization,2007

7. Sullivan KM HR, Gorstein J, Cervinskas J. Monitoring universal salt iodization programmes. Ottawa, Canada: United Nations Children's Fund, The Programme Against Micronutrient Malnutrition, The Micronutrient Initiative, The International Council for Control of Iodine Deficiency Disorders, World Health Organization, 1995

8. 1998-2022 Mayo Foundation for Medical Education and Research (MFMER)

9. M.B. Zimmermann, in Encyclopedia of Human Nutrition (Third Edition), 2013

10. Medicine-stephanie Lee iodine deficiencies. America college of Endocrinology, July 2006: Medlin.

11. Textbook of lecture note food and nutrition Melke Endris BSC MSC. Department of community Health, University of Gondar 2004: 68-71

12. Won's Essential of pediatric Nursing. 6th ed., Indian: Harcourt, 2001:1121

13. https://www.hsph.harvard.edu/nutritionsource/iodine/