Micronutrients deficiency -1

Prof Dr Najlaa Fawzi
Family and community medicine Dept.

Micronutrient deficiency

Micronutrient deficiencies are common worldwide and many individuals, especially women and children, suffer from the serious and widespread negative health consequences.

Deficiencies of micronutrients are a major global health problem.
More than 2 billion people in the world today are estimated to be deficient in key vitamins and minerals, particularly vitamin A, iodine, iron and zinc.

The groups most vulnerable to micronutrient deficiencies are pregnant women, lactating women and young children, mainly because they have a relatively greater need for vitamins and minerals and are more susceptible to the harmful consequences of deficiencies.

Micronutrient deficiencies increase the general risk of infectious illness and of dying from Diarrhea, measles, malaria and pneumonia.

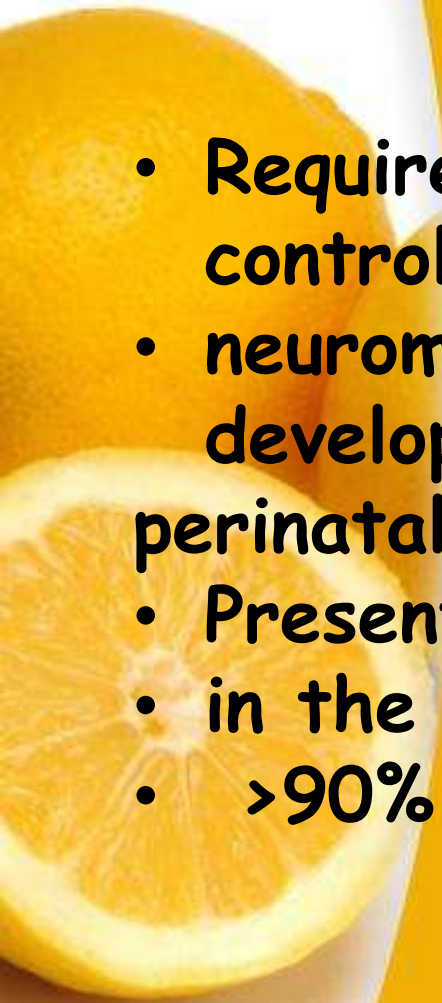
These conditions are among the 10 leading causes of disease in the world

As well as decreases in learning capacity and work productivity may severely lower income for the individual, family and country.

Over the last years, micronutrient deficiencies have become increasingly recognized as serious public health problems by governments, industry and non-governmental decision makers.

Image credit: istockphoto.com/photka

Iodine Deficiency
Iodine Deficiency Disorders (IDD)



- Required to produce thyroid hormones that control cell metabolism,
- neuromuscular tissue growth and development, especially the fetal-perinatal brain
- Present in minute amounts (15-20 mg)
- in the body
- >90% of iodine stored in the thyroid

Population effects of severe iodine deficiency, termed iodine deficiency disorders (IDDs), include endemic goiter, hypothyroidism, cretinism, decreased fertility rate, increased infant mortality, and mental retardation.

Iodine Deficiency Disorders refer to all of the ill-effects of iodine deficiency in a population that can be prevented by ensuring that the population has an adequate intake of iodine.

In developing countries, iodine deficiency has been identified as one of the modifiable factors that have an adverse effect on child development. It is a global public health problem and, in combating it, emphasis should be placed on diagnosis and correction at the level of the community rather than the individuals.

As many as 50 million infants born annually are at risk of iodine deficiency.

The effects of Iodine Deficiency Disorders:

On Individuals: goiter, hypothyroidism, loss of energy. decreased fertility rate

In Pregnant Mothers: miscarriages, stillbirths and mentally retarded children.

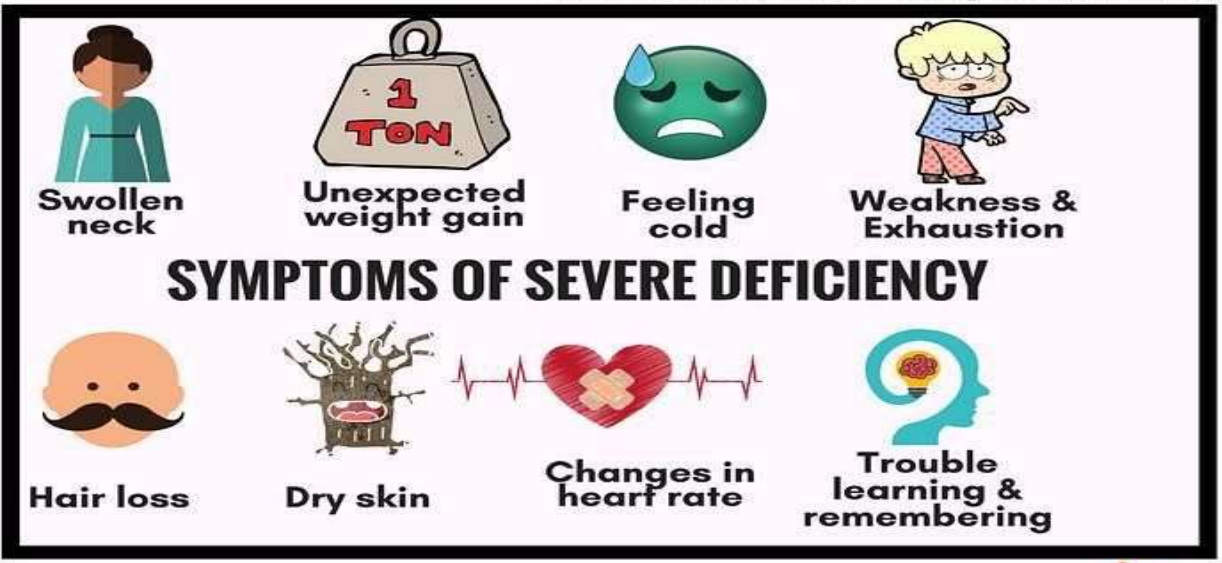
In Children: impaired mental and physical development, mental retardation, physical deformities and cretinism. increased infant mortality

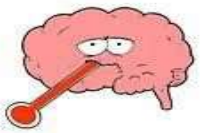
On Society: lower productivity and higher demand on social services.

THINGS TO KNOW ABOUT
IODINE

@sarahdufflifestyleandfitness

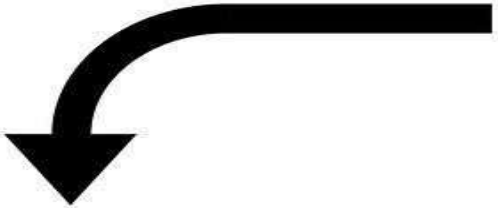
Info sources
ods.od.nih.gov/factsheets/Iodine-HealthProfessional/
Examine.com





Thyroid issues

FOODS CONTAINING IODINE



Yoghurt plain low fat 1 cup
50% RDI

Seaweed whole or sheet 11-989%. RDI

Shrimp 3oz
23% RDI

Boiled egg 1 large
16% RDI

Tuna in oil
3oz 11%

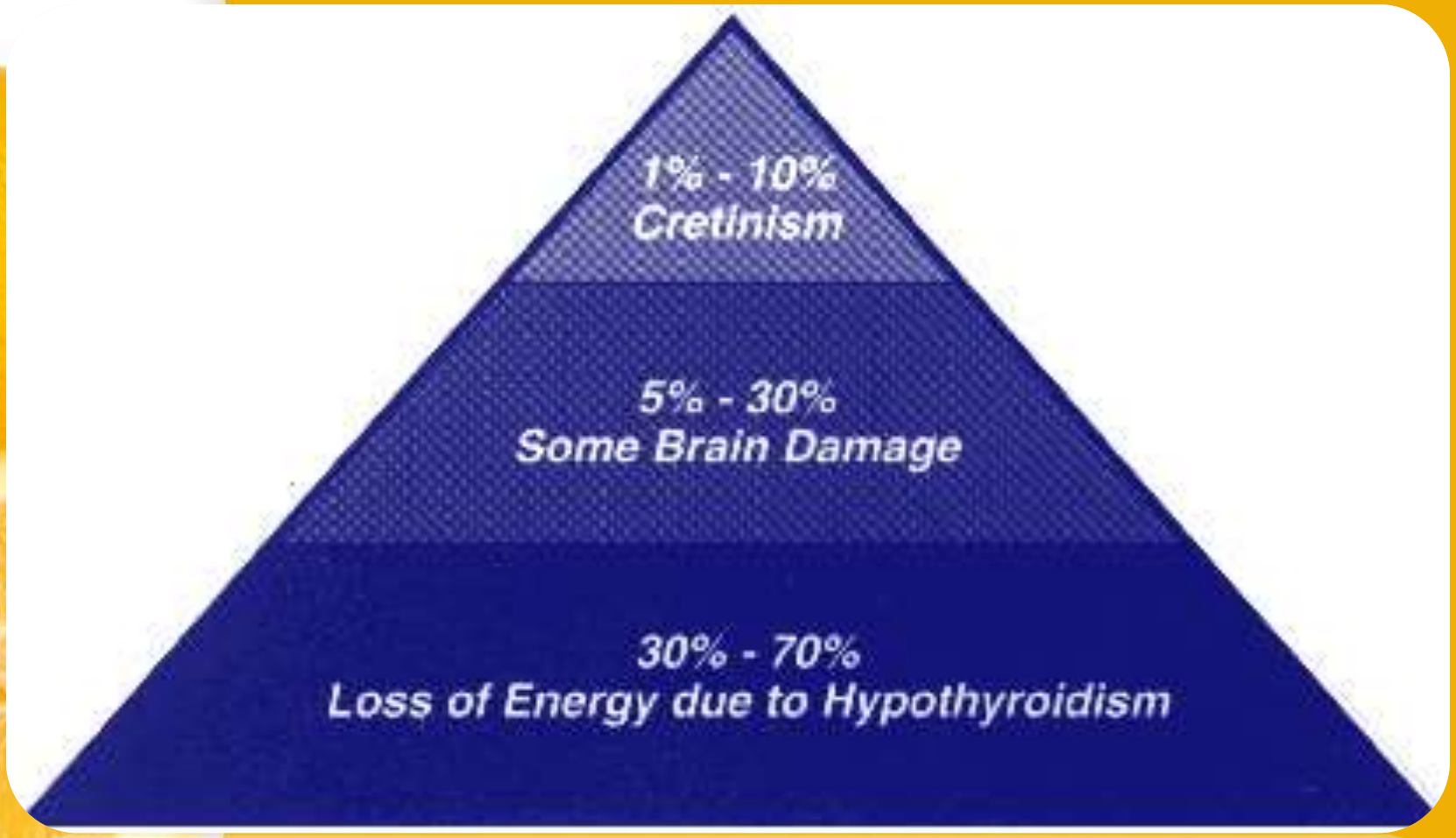
Cranberries 3.5oz
200%

Baked potato skin medium 40% RDI

Dried prunes 5
9% RDI

Cod 3oz
66%RDI

Importance of the problem



The spectrum of iodine deficiency disorders, IDD

Table 1. The Spectrum of Iodine Deficiency Disorders, IDD.	
Fetus Abortions	Stillbirths Congenital anomalies Increased perinatal mortality Endemic cretinism
Neonate Neonatal goiter	Neonatal hypothyroidism Endemic mental retardation Increased susceptibility of the thyroid gland to nuclear radiation
Child and Goiter	adolescent (Subclinical) hypothyroidism Impaired mental function Retarded physical development Increased susceptibility of the thyroid gland to nuclear radiation
Adult Goiter with its complications	Hypothyroidism Impaired mental function Spontaneous hyperthyroidism in the elderly Iodine-induced hyperthyroidism Increased susceptibility of the thyroid gland to nuclear radiation
Adapted from Hetzel (1), Laurberg et al. (52, 171) and Stanbury et al. (158).	

Prevalence

- 1 billion persons exposed
- 200 million persons affected (goitres)
- 26 million cases of mental problems
- 6 million cases of cretinism
- 38 million newborns in developing countries every tear remain unprotected from the life long consequences of brain damage associated with IDD

في العراق نقص اليود أعتبر من المشاكل الصحية العامة الهامة في ثلاث محافظات ,البصرة 24.7%, بغداد 24.6%

نينوى 64.7%

من النساء يعانين من نقص معتدل في اليود

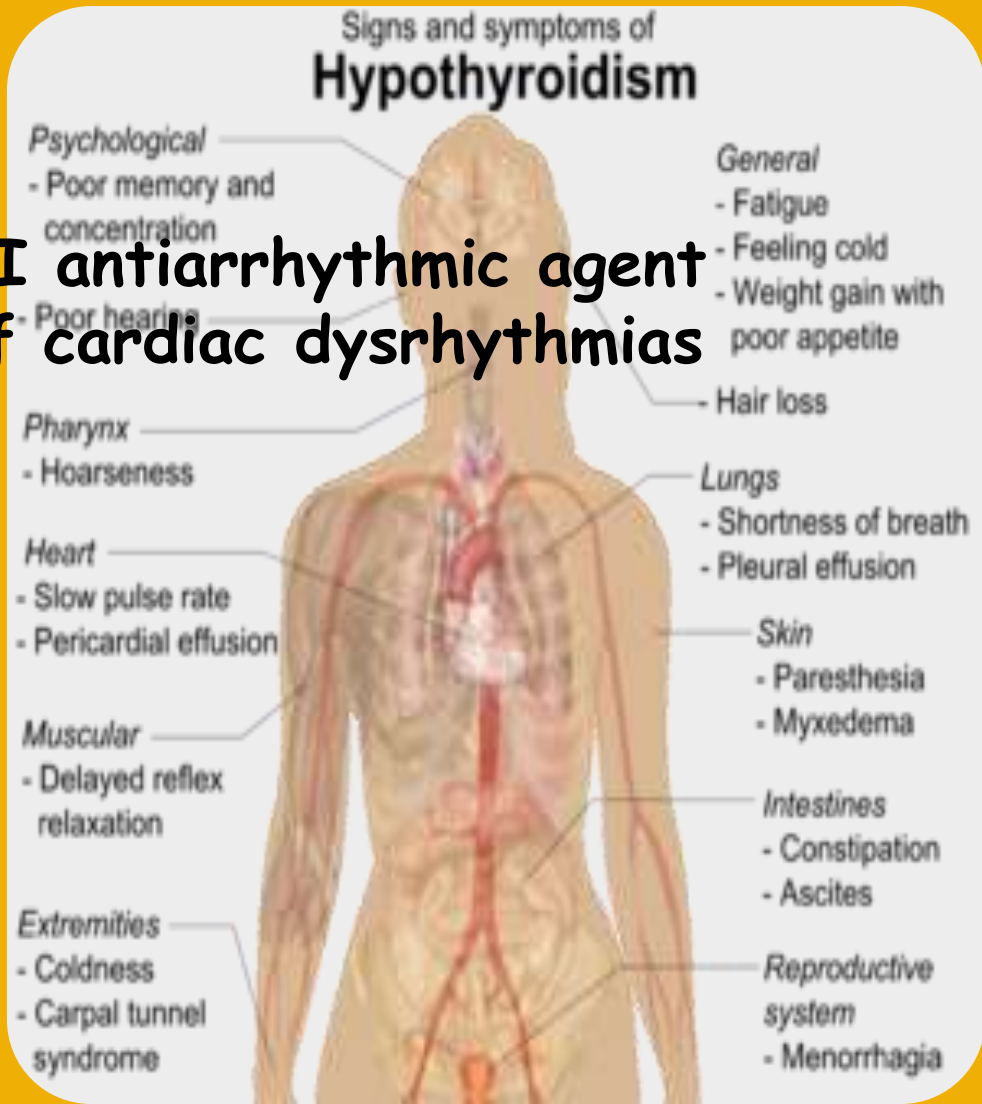
Aethiology

- Low iodine uptake. Soil dependent
  - erosion, wash away: deltas
- Goitrogens
  - Blocks uptake of Iodine at the thyroid, competitive inhibition
  - Goitrogenic foods : soybean, peanut, strawberry, pear, peach, Spinach, Broccoli, Cabbage, Cauliflower, radish.

Goitrogenic drugs and chemicals

Chemicals that have been shown to have goitrogenic effects include:

- **Sulfadimethoxine**
- **Thiocyanate**
- **Amiodarone is a class III antiarrhythmic agent used for various types of cardiac dysrhythmias**
- **phenobarbitone**



Iodine Status Assessment

- Goiter classification
- Urinary iodine concentration
- TSH (thyroid stimulating hormone) concentration
- Other common clinical measures are :
  - Ultrasonography of thyroid volume
  - Serum concentrations: thyroxin, TBG, many other analyses

Simplified Goiter Classification

Grade	Thyroid Size
0	Not palpable / not visible
1	Palpable in normal position
2	Visible in normal position

IDD severity according to size of goiter

IODE DEFICIENCY	SEVERE	MODERATE	MILD
Number of cases of goitre among the school children (6-12)			
visible goitre	**> 50 %**	**20-49 %**	**10-19 %**
total goitre	**> 10 %**	**5-9 %**	**1-5 %**

➢Urinary iodine concentration

Urinary iodine is sensitive indicators of iodine intake, not thyroid function

The median urinary iodine concentration is considered to be the main indicator of iodine status for all age groups, because its measurement is relatively non-invasive, cost-efficient and easy to perform.

Since most of the iodine absorbed by the body is excreted in the urine, it is considered to be a sensitive marker of current iodine intake and can reflect recent changes in iodine status.

Median urinary iodine concentrations have been most commonly measured in school children aged 6-12 years, because it is easy to access this population.

Advantages of Urinary Iodine

- Reflects directly intake
- Is best to follow up programme response, goitre takes time to decrease in size
- Samples needed are smaller
- Technique is simple and not expensive
- Samples can be taken easily, cheap, acceptable and don't need conservation techniques

- For school-age children (≥6 years of age), an adequate iodine level is defined as a population median urinary iodine concentration of 100-199 µg/L.
- a population median of <100 µg/L indicates that the population's iodine intake is insufficient.
- When the population median is <20 µg/L, the population is described as having severe iodine deficiency.
- at 20-49 µg/L, it is described as having moderate iodine deficiency.
- at 50-99 µg/L, it is described as having mild iodine deficiency.
- A population of school-age children should have a median urinary iodine concentration of at least 100 µg/L, with less than 20% of values being <50 µg/L.
- For pregnant women, the median urinary iodine should be between 150 µg/L and 249 µg/L.

Indicators of iodine status at population level (WHO/UNICEF/ICCIDD, 2007)

Indicator(units)	Age Group
1-Median urinary iodine concentration(µg /L)	School-age children, adults and pregnant women
2-Goiter rate by palpation (%) School-age children	Degree of IDD by goiter rate : 0-4.9% – None 5-19.9% – Mild 20-29.9% – Moderate ≥30% – Severe
3-Goiter rate by ultrasound (%)	School-age children
4-Thyroid stimulating hormone(m IU/L) Newborns	A <3% frequency of TSH values >5 mIU /L indicates iodine sufficiency in a population
5-Serum or whole blood thyroglobulin(µg/L) School-age children and adults	Reference interval in iodine-sufficient children is 4-40 µg/L

IDD: As a Public Health Problem

Indicator	Moderate/Severe Cut-off (% of population)
Goiter grade > 0	> 20%
Median urinary iodine	< 50 µg/L
TSH > 5 m U/L blood (best in newborns)	> 20%
Thyroid volume > 97% ile	> 20%

Best IDD Indicators by Target Group

Goiter grade >0	school children
Cretinism	children / adults
Median UI (µg/L)	school children
TSH >5 mU/L blood	Neonates
Thyroid volume >97% ile	school children
Thyroglobulin (DBS)	children

RDA for Iodine

Normal dietary iodine intake is 100-150 mcg/day. The US Institute of Medicine's (IOM's) recommended dietary allowance (RDA) of iodine is as follows:

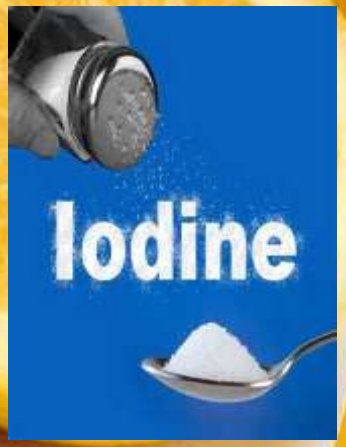
Adults and adolescents - 150 mcg/day
Pregnant women - 220 mcg/day
Lactating women - 290 mcg/day
Children aged 1-11 years - 90-120 mcg/day
Infants - Adequate intake is 110-130 mcg/day
WHO's recommendations are similar, although the organization recommends 200 mcg/day for pregnant or lactating women and 50-90 mcg/day for infants younger than 1 year

للاطلاع فقط

IODINE-RICH FOODS

Iodine deficiency disorders (IDD) are the most important preventable cause of impaired development of the brain and subsequent mental retardation
in the world.

Therefore, elimination of IDD as a public health problem is an important health and social goal.



Iodine deficiency disorders Interventions

Universal Iodization of Salt
Iodization of other "Vehicles"
Iodized Oil Supplementation

Global Iodine Deficiency Disorders Prevention Day

October 21 2020

How to Prevent Iodine Deficiency

1. Eat foods rich in iodine
2. Take an iodine supplement
3. Have iodized salt in small amounts

1-Iodized salt

- Universally and regularly consumed
- Costs ~$0.04/yr/person
- Simple technology

2-Iodized oil

- Effective in high risk groups
- Administered every 6 to 12 months

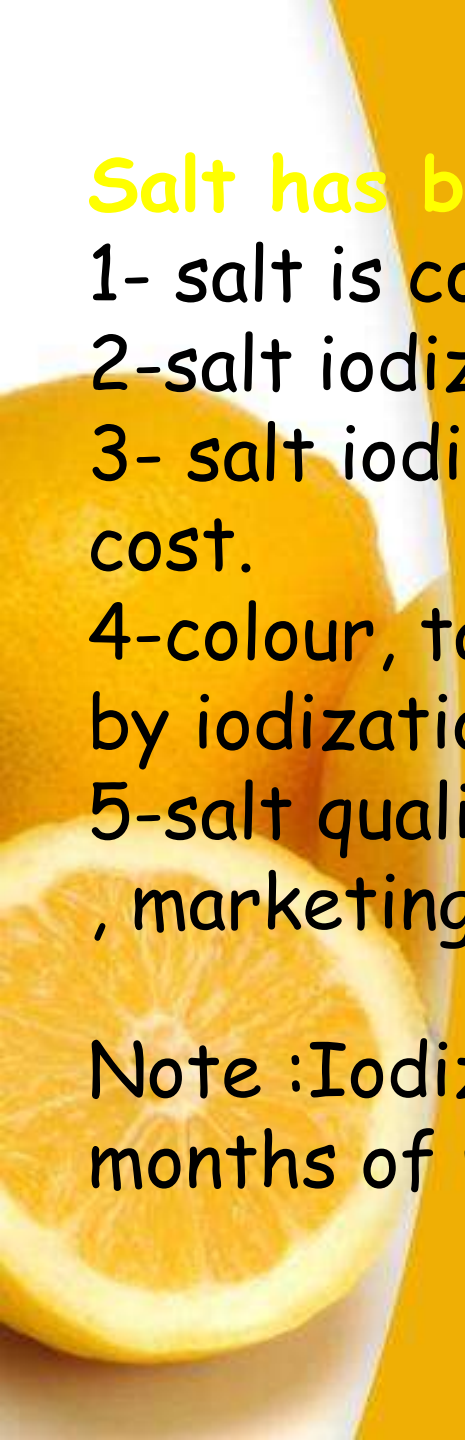
Target Group for iodized oil:

Women during pregnancy and 1st year post-partum; Children

When/Where give iodized oil:

- IDD moderate-severe
- Cretinism/neonatal hypothyroidism
- No universal salt iodization for 1-2 yr

An iodized oil supplementation program is necessary when other methods have been found ineffective or are inapplicable). Iodized oil can be regarded as an emergency measure for the control of severe IDD until an effective iodized salt program can be introduced.



Salt has been chosen for the following reasons :

1- salt is consumed by every one.

2-salt iodization is easy to implement.

3- salt iodization can be implement at a reasonable cost.

4-colour, taste, and odor of salt are not affected by iodization.

5-salt quality can be easily monitored at production , marketing, and household level.

Note :Iodized salt should be consumed within six months of purchase.

iodization of salt may not be a practical option for the sustainable elimination of IDD, at least in the short term.

other options for correction of IDD may have to be considered, such as:

- ✓ administration of iodized oil capsules every 6-18 months
- ✓ direct administration of iodine solutions, such as Lugol's iodine, at regular intervals (once a month is sufficient)
- ✓ iodization of water supplies by direct addition of iodine solution or via a special delivery mechanism.

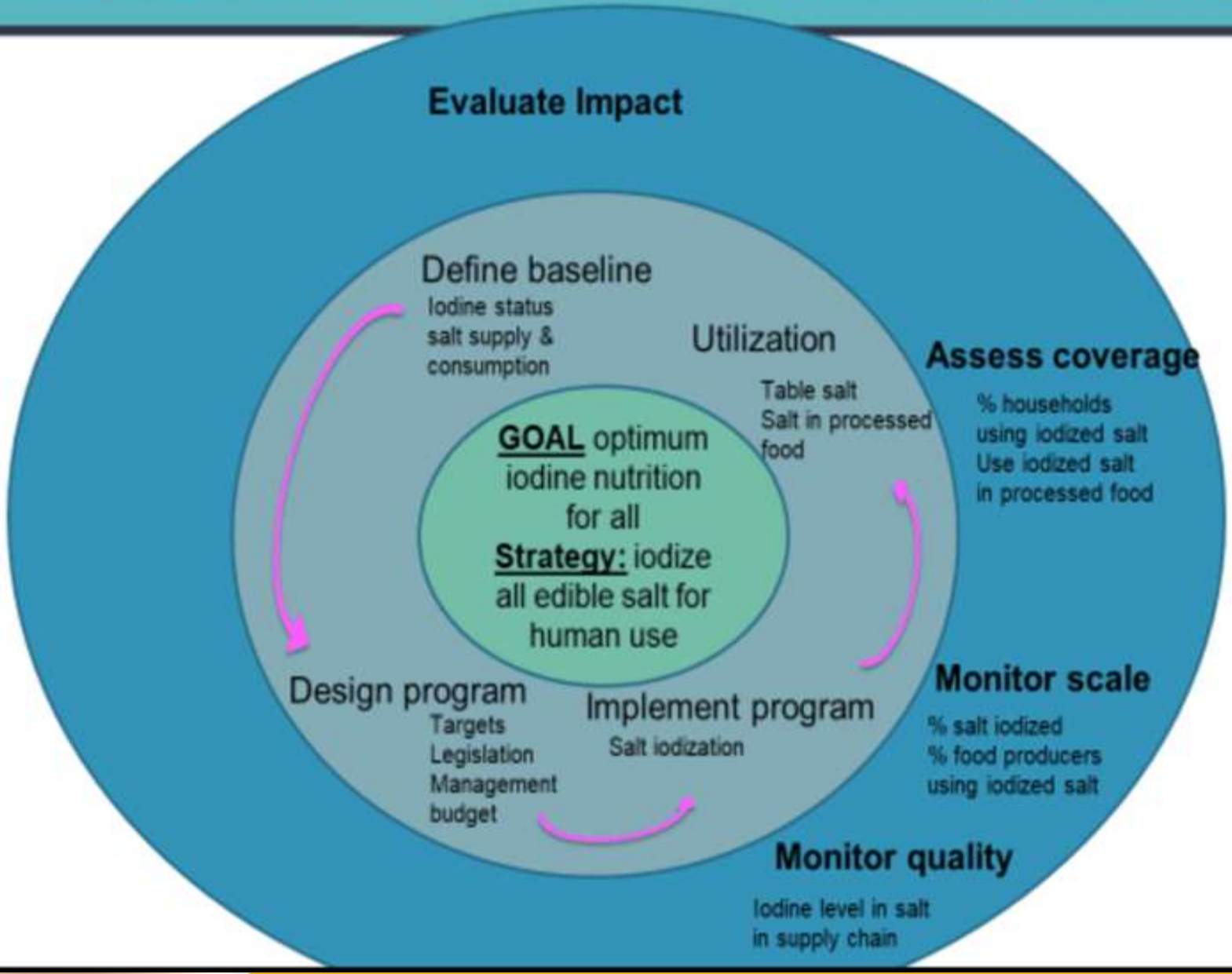
The sustainable elimination of IDD requires that:

- median urinary iodine levels in the target population are

at least 100 µg/l and no more than 20% of values are below 50 µg/l

- at least 90% of households are using salt with an iodine content of 15 parts per million (ppm) or more

IODINE NUTRITION PROGRAMS – QUALITY, SCALE AND IMPACT



In Iraq the iodine content in consumable salt was tested in99.7% of MICS-4 households.

The results showed that 28% of households consume salt that contains
15Parts Per Million (PPM) of iodine or more.

In urban areas iodine fortification was 32% in comparison with 20% in rural areas. Meanwhile, 46% of households in the sample consume non-fortified salt and 27% of households consume salt that contains less than 15 PPM.