

Micronutrients for healthy, happy families



# MICRONUTRIENTS IN SOMALIA

*Pocket Guide*



Food Security Analysis Unit for Somalia



FSAU is managed by FAO



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FSAU is managed by FAO

## **Acknowledgements**

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## **Preface**

The preparation of these materials has been undertaken in response to an acknowledgement that the problem of micronutrient deficiencies has been neglected in Somalia in recent years. Acute malnutrition remains at levels significantly higher than those in comparable conditions in other countries in the region and are accompanied by equally unacceptable levels of mortality and morbidity. It is clear that the population of Somalia does not have year round access to an optimal diet. It is also clear that other factors such as health and care have a significant negative impact on the wellbeing of the population.

Information on the nutritional status of the population continues to provide decision makers at all levels with valuable information on which types of interventions are most likely to be effective in improving the wellbeing of that population. The role of micronutrients in contributing to good physical and mental health, development and wellbeing is extremely important. Information on micronutrients and the disorders that result from their deficiency is therefore a key component of good information on nutrition. General awareness of quality diet promotion as a strategy to counter malnutrition problem in a population is long overdue in Somalia. We hope that these materials will assist in renewing interest in micronutrients and will prompt us to consider both short and longer term interventions aimed at prevention and management of deficiency disorders in the future.

## **Acronyms**

*mg – Milligram*

*IU – International Unit*

*IDD – Iodine Deficiency Disorder*

*RDA – Recommended Dietary Allowance*

*VAD – Vitamin A deficiency*

*FSAU/FAO – Food Security Analysis Unit of Food  
and Agriculture Organisation*

## MICRONUTRIENTS

### What are micronutrients?

Micronutrients are vitamins and minerals that are essential for healthy growth and development but required only in small amounts.

Micronutrients play very important roles in the body. They influence adult and child productivity, resistance to illness, educational achievement, child survival and maternal health.

### Examples of micronutrients of public health importance

Iron, Vitamin A, Iodine, Zinc and Vitamin C are very important micronutrients.

### Where do we get micronutrients?

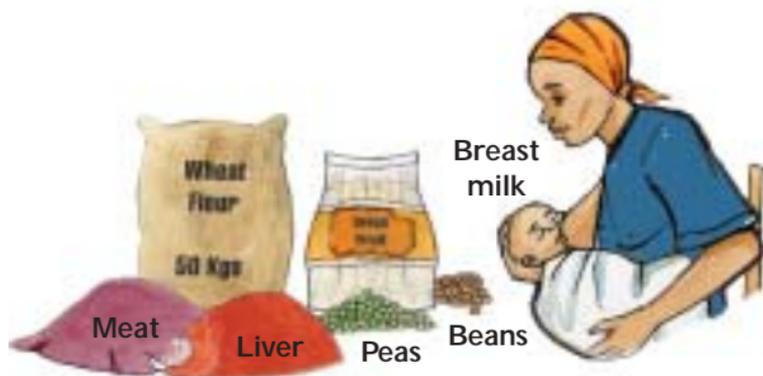
We get micronutrients from the foods that we eat. In order to get enough micronutrients, we must have access to nutrient-rich foods that are prepared and consumed in the right way. Infections and parasites can lower levels of micronutrients in the body.

We can also get micronutrients from supplements.

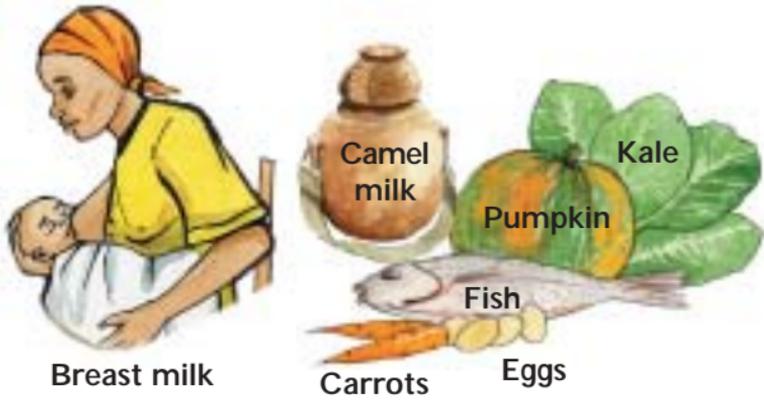
### What happens when we lack micronutrients?

Low levels or lack of micronutrients in the body result in micronutrient deficiencies (MNDs) as well as low immunity.

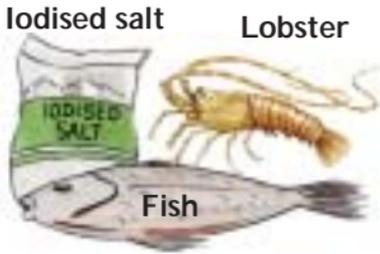
## Dietary sources of Iron



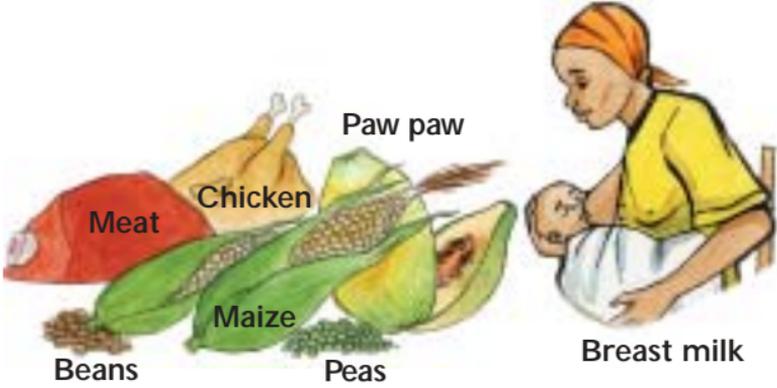
**Dietary sources Vitamin A**



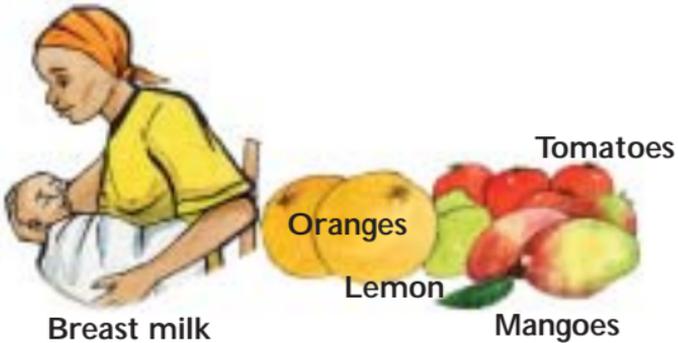
**Dietary sources Iodine**



**Dietary sources Zinc**



**Dietary sources Vitamin C**



## IRON

Iron helps to make blood. It produces haemoglobin, the protein in red blood cells that carries oxygen. Iron also helps to make essential enzymes that enable the brain, muscle, and immune systems to function properly. Tea reduces iron absorption if consumed together with iron-rich foods.

### Why do women and infants require more iron?

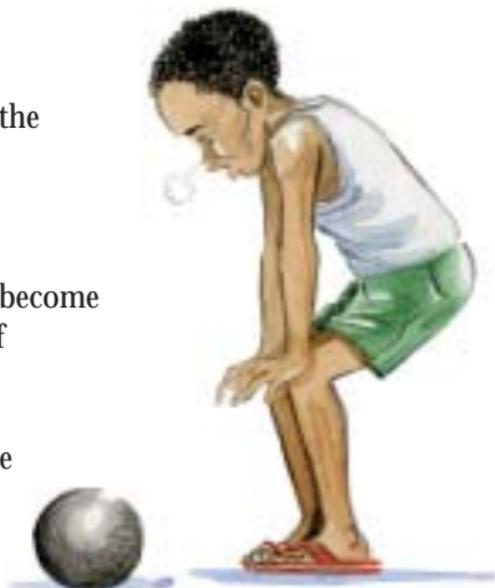
Everyone requires iron. However, women lose a lot of iron through menstruation and pregnancy. During pregnancy, blood volumes for the foetus rapidly increase. Infants need a high amount of iron to facilitate the rapid growth and expanding red blood cells.

Low levels or lack of iron in the body leads to iron deficiency. Severe lack of iron leads to iron deficiency anaemia (IDA). Iron deficiency is the most common nutritional deficiency. Young children and pregnant women suffer high rates of IDA.

### How do I tell that someone has IDA?

Someone with IDA has the following symptoms.

- Pallor: Pale skin on the lining of the eyes, the inner mouth, gums and the nails
- Fatigue: Lack of energy, tiredness and weakness
- Brittle fingernails: Nails become thin, white and break off easily. They may grow abnormally and get a spoon-shaped appearance
- Sore tongue: Tongue becomes sore, smooth, shiny and reddened



**Shortness of breath even during simple exercises.**

- Brittle hair: Hair thins out and breaks off easily
- Shortness of breath: Shortness of breath during a simple exercise like walking
- Unusual food cravings (pica): strong desire to eat non-food items like soil, charcoal, bones or dirt
- Low blood pressure: Low blood pressure with position change from lying down or sitting to standing up.
- Rapid heartbeat: The heartbeat becomes very rapid and forceful
- The person becomes very irritable
- Low immunity: Decreased immunity and increased vulnerability to infection
- Headache: The person experiences frontal headache
- Decreased appetite Severe appetite decrease, especially in children
- Severe menstrual pain and bleeding
- Disturbed sleep: The person frequently awakens from sleep

### **What are the consequences of IDA?**

IDA affects personal health and development as well as economic development. Pregnant women with IDA are at risk of having premature babies, complications and death during childbirth. Babies born to mothers with IDA have low birth weight, lower intelligence, higher infant mortality rate and decreased immunity. Children, adolescents, and adults with IDA are dull, have decreased immunity, lower concentration, intelligence, job productivity and physical capacity.

### **How do we prevent and treat IDA?**

We can prevent and treat IDA in the following ways.

- Educating, informing, and motivating communities to improve their diets and those of young children.
- Improving the diet to include iron-rich foods like meat and liver.
- Encouraging families to keep domestic animals like chickens and goats for food.

- Exclusively breastfeeding infants for the first 6 months. Thereafter, supplementing breast milk with other iron-rich foods up to the first year of life. Babies should not be weaned too soon.
- Fortifying foods like flour, margarine and breakfast cereal with iron.
- Giving pregnant women iron supplements.
- Deworming children regularly, at least twice a year, to control worm infestation. Pregnant women and people that live in humid climates should regularly take deworming medicine.
- Treating and controlling malaria and other diseases to prevent harmful parasites.
- Practising birth control in order to give women a chance regain their iron stores after childbirth.
- Fermenting and germinating cereals before cooking in order to enhance iron absorption.
- Not drinking tea or coffee with meals or slightly after meals. Tea and coffee decrease iron absorption.
- Eating vitamin C-rich foods (citrus fruits and tomatoes) to promote iron absorption.
- Use of iron pots instead of aluminium pots for cooking. Iron pots release some iron into the food.

## What foods are rich in iron?

Iron is found in meat, liver, fish, chicken, eggs, dark green leafy vegetables kales and spinach, legumes like beans and peas, dried fruits like sultanas, fortified flour and breakfast cereals.



## Clinical management of Iron deficiency

Age group	Indications for supplementation	Dosage schedules per day	Duration
Low birth weight infants	Universal supplementation	Iron: 2 mg/kg body weight/kg	From 2-23 month of age
Children from 6-23 months	Where the diet does not include foods fortified with iron or where anaemia prevalence is above 40%	Iron: 2mg/kg body weight/kg	From 6-23 months of age
Children from 24-59 months of age	Where anaemia prevalence is above 40%	Iron: 2mg/kg body weight/kg up to 30mg	3 months
School age children (above 60 months)	Where anaemia prevalence is above 40%	Iron: 30mg/day Folic acid: 2.5mg/day	3 months
Women of child bearing age	Where anaemia prevalence is above 40%	Iron: 60mg/day Folic acid: 4 mg/day	3 months
Pregnant women	Universal supplementation	Iron: 60mg/day Folic acid: 4 mg/day	As soon as possible after gestation starts and no later than the 3 <sup>rd</sup> month and continuing for the rest of pregnancy
Lactating women	Where anaemia prevalence is above 40%	Iron: 60mg/day Folic acid: 4 mg/day	3 months postpartum

**Doses above the recommended value can lead to toxicity.**



## VITAMIN A

Vitamin A (also called *retinoal* or *beta carotene*) is important to the maintenance of many body functions, especially the immune system. Vitamin A protects the body against night blindness and other eye illnesses.

### Why do children require more vitamin A?

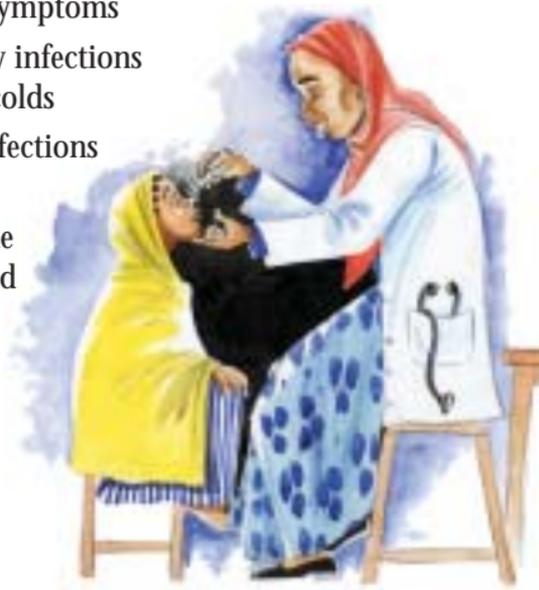
Young children (6 months to 6 years) need more vitamin A than other groups because vitamin A is essential for the healthy growth of children. Vitamin A protects children from dying from common childhood infectious illnesses like measles, malaria, and diarrhoea.

Low levels or lack of vitamin A in the body, lead to vitamin A deficiency (VAD).

### How do I tell that someone has VAD?

Someone with VAD has the following symptom.

- Decreased immunity symptoms
  - Easily gets respiratory infections like coughs, flu and colds
  - Easily gets urinary infections
  - Easily gets common infectious diseases like diarrhoea, malaria and measles
- Eye symptoms
  - Night blindness
  - Inflammation of the eye (conjunctivitis)
  - Inflammation of the cornea
  - Eye lesions
  - Xerophthalmia eyes



**Blindness and reduced night vision are some symptoms of VAD.**

- Skin symptoms
  - Rough skin
  - Dry skin
- Growth retardation in children
- Loss of appetite

### **What are the consequences of VAD?**

VAD has many negative consequences like night blindness, partial or total blindness. Children with VAD have high mortality rates due to lower immunity. These children suffer many childhood illnesses like coughs, flu, colds, diarrhoea, malaria and measles. Children with VAD suffer very severe cases of measles, with serious complications that could lead to blindness, brain damage or death. VAD in children also results in low growth and weight gain and contributes to iron deficiency anaemia (IDA).

Pregnant women with VAD get a low birth weight infant, gain very little weight in pregnancy, easily get malaria and other infections due to decreased immunity and tend to have IDA. HIV positive women with VAD are more likely to pass the HIV virus to their infants.

Alongside night blindness and other eye infections, adults with VAD have low immunity to common illnesses like malaria. Such illnesses are usually more severe in adults with VAD and are more likely to result in death.

### **How do we prevent and treat VAD?**

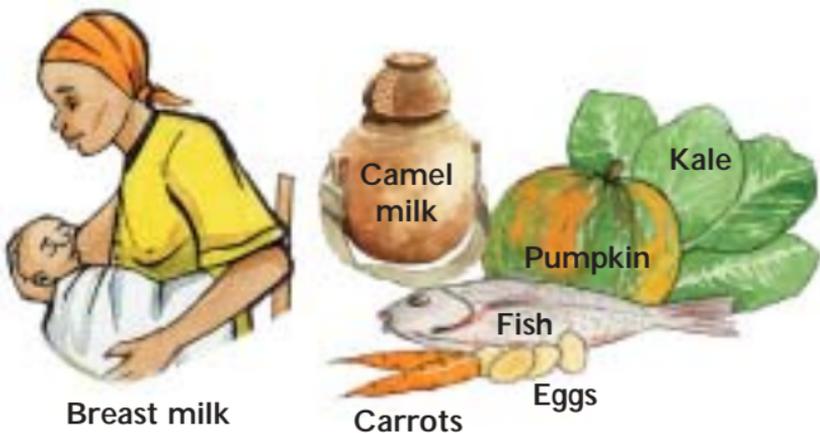
We can prevent and treat VAD in the following ways.

- Educating, informing, and motivating communities to improve their diets and those of young children.
- Diversifying and improving the diet to include foods rich in vitamin A like carrots, sweet potatoes, liver, beef, and pumpkins.
- Improving cooking methods in order to conserve vitamin A or improve its absorption. For instance, not overcooking vegetables, cooking vegetables in a little oil and washing vegetables before cutting them.

- Encouraging families to grow fruit and vegetable gardens if they can.
- Exclusively breastfeeding infants for the first six months. Thereafter, supplementing breast milk with other vitamin A-rich foods up to the first year of life. Babies should not be weaned too soon.
- Giving supplements to vulnerable groups like young children and pregnant women. Vitamin A supplements should be given to children at 6 months alongside the measles immunisation.
- Fortifying foods like milk, margarine, butter and sugar with vitamin A.
- Eradicating through immunisation.
- Controlling diseases like malaria, diarrhoea, measles and others.
- Controlling intestinal worms through regular deworming, especially in children and pregnant women, which use up the body's vitamin A stores.

## What foods are rich in vitamin A?

Vitamin A is found in yellow and orange sweet potatoes, eggs, liver, milk, including breast milk and milk products like butter, fermented milk, yoghurt, cheese and ghee; green leafy vegetables like spinach and kale, yellow and orange fruits and vegetables like pumpkins, carrots, guavas, mangoes and paw paws.



## Clinical management of VAD

Vitamin A capsules are given to prevent and treat VAD. The dosage is as follows:

Prevention dosage of Vitamin A supplement			
Target population	Age group	Dosage	Remark
Children	6-11 months	100,000 IU	Every 4-6 months
	12-59 months	200,000 IU	Every 4-6 months
Postpartum women	Within 6 weeks of childbirth	10,000 IU	Safe infertile period
Women during pregnancy		10,000 IU	Daily (as soon as pregnancy is detected)

Treatment dosage of Vitamin A supplements	Immediately on detection	Next days
Infant < 6 months	50,000 IU	50, 000 IU
Infants 6-11 months	100,000 IU	100,000 IU
Children > 12 months	200,000 IU	200,000 IU

**Higher doses than the recommended can result in toxicity.**



## IODINE

The body needs iodine for normal mental and physical development. Iodine is essential for the function of the thyroid gland, which is responsible for development. Iodine is also essential for foetal development.

### Why do women and children require more iodine?

Everyone needs iodine. However, pregnant women require more iodine because this micronutrient is essential for foetal growth. Young children especially need iodine to prevent mental retardation and growth failure.

- Lack of iodine leads to iodine deficiency disorder (IDD)
- Severe IDD leads to goitre (enlarged thyroid), cretinism (dwarfism and mental retardation caused by a thyroid deficiency)
- Iodine deficiency also leads to reduced intelligence.

### How do I tell that someone has IDD?

Someone with IDD has the following symptoms:

- Goitre or enlargement of the thyroid gland, is the earliest symptom of IDD. Someone with goitre has the following symptoms:
  - Swollen front of the neck
  - Lump in front of the neck
  - Protruding eyes



**Mother suffering from goitre a swelling around the throat.**

- IDD may eventually lead to ***hypothyroidism***, which has the following symptoms.
  - Fatigue
  - Weight gain
  - Weakness
  - Depression
- IDD can also cause ***hyperthyroidism***, which causes weight loss, rapid heartbeat and appetite problems.
- Severe IDD in pregnancy or infancy causes dwarfism and cretinism, a condition that has the following symptoms:
  - Severe mental retardation
  - Stunted physical growth
  - Enlarged head
  - Deafness

### What are the consequences of IDD?

IDD has many negative effects. Pregnant women with IDD are at risk of increased miscarriages, foetal deaths and stillbirths. IDD has adverse effects on infants, for instance severe brain damage, mental retardation, low intelligence, low physical coordination ability and dwarfism and cretinism.

In children and adults, IDD causes goitre, low intelligence, impaired mental function, retarded mental and physical development and dwarfism and cretinism.

### How do we prevent and treat IDD?

We can prevent and treat IDD in the following ways

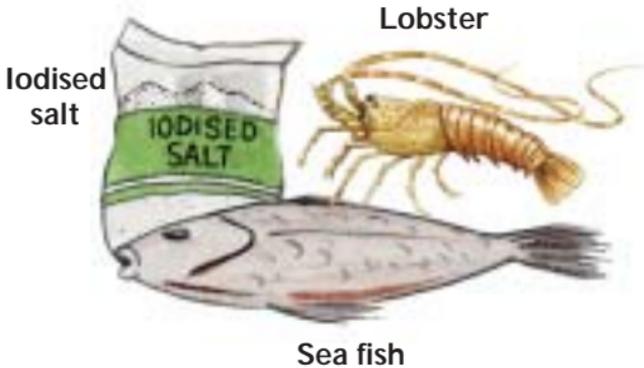
- Educating, informing, and motivating communities on the importance of consuming iodised salt.
- Encouraging communities to consume iodised salt.
- Exclusively breastfeeding infants for the first six months, and thereafter supplementing breast milk with nutrient-rich foods.
- Treating goitre at healthcare centres.
- Fortifying cooking salt with iodine.



- Giving all vulnerable groups—pregnant women and children—iodine supplements.
- Introducing iodine capsules to women of child bearing age in high IDD prevalent areas.

### What foods are rich in iodine?

The main source of iodine is iodised salt. Seaweed, sea fish and foods grown in iodine-rich soils also provide iodine.



### Clinical management of IDD and the recommended dietary allowances

Universal salt iodisation (USI) is the recommended intervention of preventing and correcting iodine deficiency. Iodine concentration at the production point should be within the range of 20-40mg of iodine per kg of salt. When all salt used in processed food is iodised, the lower limit (20mg) is recommended. To meet the iodine requirement, the recommended daily iodine intake is:

- 50mg for infants (first 12 months of age)
- 90mg for children (2-6 years of age)
- 120mg for school children (7-12 years of age)
- 150mg for children and adults (beyond 12 years of age)
- 200mg for pregnant and lactating women.



## ZINC

Zinc promotes normal growth and development. It promotes wound healing, maintains a healthy immune system and helps prevent diarrhoea in young children.

### **Why do women, children and boys require more zinc?**

The body requires more zinc during periods of rapid growth like pregnancy, infancy, childhood and adolescence. Children require more zinc to boost their delicate immune systems and prevent diarrhoea. Zinc also helps in the sexual maturation of boys.

Low levels of zinc or lack of zinc in the body result in zinc deficiency. Children and pregnant women are at high risk of zinc deficiency.

### **How do I tell someone has zinc deficiency?**

Someone with zinc deficiency has the following symptoms:

- Slow growth in children ( Dwarfism)
- Loss of hair
- Various skin lesions
- Peeling skin



**Poor appetite, lack of taste and smell are some symptoms of zinc deficiency.**

- Slow healing of wounds
- Frequent and recurring infections
- Severe diarrhoea
- Poor appetite
- Loss of taste and smell
- Fatigue
- Sterility in males

### **What are the consequences of zinc deficiency?**

Zinc deficiency has many negative outcomes. Pregnant women with zinc deficiency are at risk of premature labour and miscarriages, inefficient labour and delivery, stillbirths, lower mental ability of the child, retarded foetal growth and low immunity of both mother and baby. Children and adults with zinc deficiency are at higher risk of infections like diarrhoea, pneumonia and malaria. These diseases are more severe and last longer, leading to higher death rates.

Children with zinc deficiency have stunted growth and dwarfism, loss of appetite, poor nervous system development and lower levels of intelligence and psychological development. Adolescent boys that are zinc deficient are at risk of failure to mature sexually, leading to sterility in adulthood.

### **How do we prevent and treat zinc deficiency?**

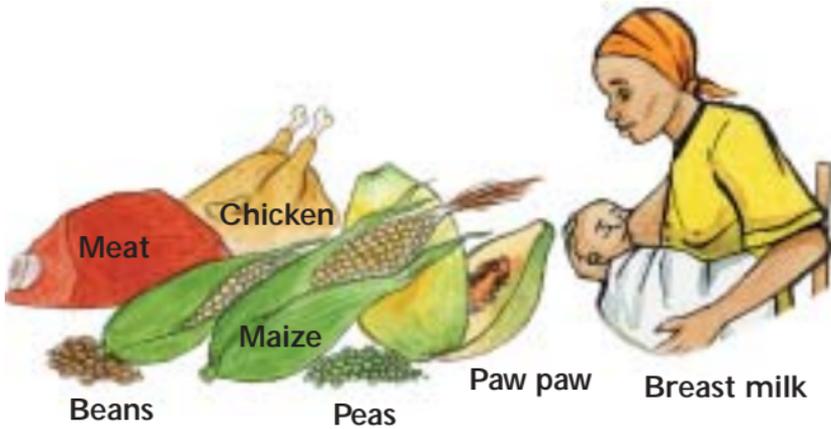
We can prevent and treat zinc deficiency in the following ways.

- Educating, informing and motivating communities to improve their diets and those of young children.
- Diversifying and modifying the diet to include animal products which are rich in zinc.
- Encouraging families to keep domestic animals like chicken and goats for food.
- Eating cereals like maize and wheat products alongside vegetables to enhance zinc absorption.

- Exclusively breastfeeding for the first six months of an infant's life.
- Providing supplements to high-risk groups like pregnant women, young children, adolescents, invalids, and the elderly.
- Fortifying foods like wheat and maize flour, salt, and beverages with zinc.
- Controlling intestinal worms by regularly deworming children and pregnant women.
- Controlling malaria, diarrhoea and wasting diseases like HIV/AIDS, which decrease the body's zinc levels.

### What foods are rich in zinc?

Zinc is found in meat, liver, kidney, fish, chicken and cereals, eaten alongside vegetables to enhance zinc absorption.



### Clinical management of zinc deficiency

The recommended dietary allowances are determined on the basis of age, sex, pregnancy and lactation. The RDA for zinc is 5mg/day for infants, 10mg/day for children under 10 years, 15mg/day for males over 10 years, 12mg/day for females over 10 years, 15mg/day during pregnancy and 19 and 16mg/day for lactation during the first and second 6 months respectively. Zinc requirements are 2.5-4 mg/day for adults and 100-300  $\mu\text{g}/\text{kg}$  body weight for children.



## VITAMIN C

Vitamin C (also called ascorbic acid) is essential for healthy teeth, gums and bones. It helps to heal wounds, produce red blood cells, build immunity and fight bacterial infections. Vitamin C helps to form collagen, the 'cement' that holds tissues together. Vitamin C enhances the absorption of iron in the body.

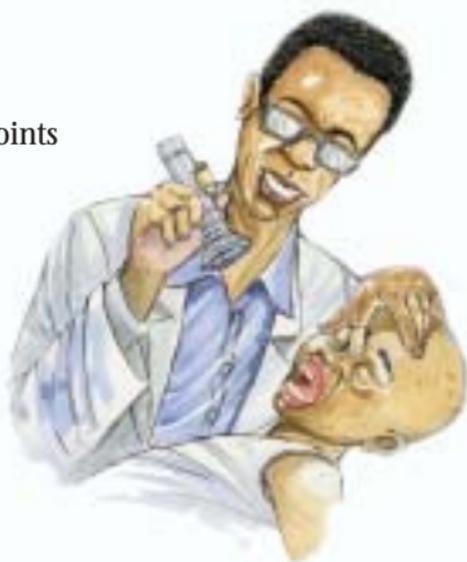
### Why do women and children require more vitamin C?

Everyone requires vitamin C. However, pregnant women need more vitamin C due to lowered immunity and increased iron requirements. Children have delicate immune systems and need more vitamin C. Low levels or lack of vitamin C in the body lead to vitamin C deficiency. Severe vitamin C deficiency leads to scurvy. Populations with limited or no access to vegetables and fruits are at high risk of vitamin C deficiency.

### How do I tell that someone has vitamin C deficiency?

Someone with vitamin C deficiency (Scurvy) has the following symptoms:

- Bruising
- Swollen or painful joints
- Bleeding gums
- Easily gets colds
- Anaemia
- Poor digestion
- Scurvy
  - Skin that bruises and bleeds easily



**Baby suffering from bleeding gums.**

- Bleeding on fingertips, old scars and internal bleeding
- Soft, swollen purple gums
- Hair and tooth loss
- Bones that easily fracture
- Swollen and painful joints
- Slow-healing wounds and fractures
- Loss of appetite
- Weakness, fatigue and irritability

### **What are the consequences of vitamin C deficiency?**

Vitamin C deficiency lowers the body's resistance to infections. People with vitamin C deficiency are at higher risk of getting common bacterial illnesses like colds. Since vitamin C promotes the absorption of iron in the body, low levels in the blood increase the risk of anaemia in children and pregnant women especially.

### **How do we prevent and treat vitamin C deficiency?**

We can prevent and treat vitamin C deficiency in the following ways:

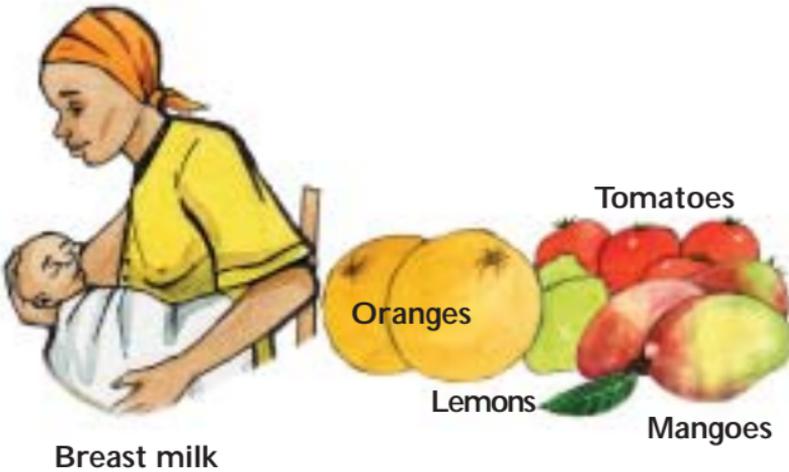
- Educating, informing and motivating communities to improve their diets and those of young children.
- Diversifying and modifying the diet to include fresh vegetables and fruits which are rich in vitamin C.
- Encouraging families to grow a vegetable and fruit garden for their food.
- Improving cooking methods so that vitamin C is better preserved, or for instance, not cooking vegetables for too long and not cutting vegetables before washing them.
- Encouraging communities to eat inexpensive uncooked vegetables like tomatoes and cabbages
- Exclusively breastfeeding for the first six months of an infant's life.



- Providing vitamin C supplements to high-risk groups like pregnant women, young children, invalids and the elderly.
- Fortifying foods like juices with vitamin C.

### What foods are rich in vitamin C?

Vitamin C is found in fresh fruits and vegetables like tomatoes, onions, green leafy vegetables like cabbage, green pepper, garlic, parsley, citrus fruits (oranges, limes, lemons), paw paw, pineapple and watermelon.



### Clinical management of vitamin C deficiency

The RDA for adults for vitamin C is 200mg/day. The upper safe recommendation for vitamin C ingestion is <1000mg/day. The deficiency signs and symptoms in adults are prevented by 60mg/day and it provides a margin of safety of several weeks if vitamin C intake is stopped.



## CALCIUM

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Calcium is the most abundant mineral in the human body. The body requires calcium in relatively large amounts. Calcium is a mineral that is used for building bones and teeth and in maintaining bone strength. Calcium is also used in muscle contraction and blood clotting.

Calcium requires Vitamin D for effective absorption.

### **Why do women and children require more calcium?**

Everyone requires calcium. However, pregnant women require more calcium to help the foetus develop strong bones. The foetus draws up calcium from the mother's bones if there is less calcium in mother's blood. This weakens the mother's bones. Children need more calcium since their bones grow and develop rapidly.

Low levels or lack of calcium in the body result in calcium deficiency. Young children, women and elderly people who do not have access to calcium-rich foods suffer high rates calcium deficiency. Severe calcium deficiency leads to rickets in children and osteoporosis in women and the elderly. Osteoporosis occurs when the mass of the bones is so reduced that the skeleton loses its strength and fractures occur easily.

### **How do I tell someone has calcium deficiency?**

Someone with calcium deficiency has the following symptoms:

- Weak teeth that easily fall off
- Lack of sleep or insomnia
- Premenstrual cramps
- High blood pressure
- Osteoporosis
  - Bones easily fracture due to minor falls and bumps



- Bones are so weak that they break under their own weight
- Hump in the back
- Curvature of the spine
- Rounded shoulders
- Losing height (becoming shorter)
- Inability to hold the body upright



**Osteoporosis in adults**

### **What are the consequences of calcium deficiency?**

Calcium deficiency affects the normal development of children. Weak bones and teeth lead to poor overall growth and low physical strength. Calcium deficiency in pregnant women is likely to cause premature births. Osteoporosis greatly reduces the quality of life of women and elderly people. Calcium deficiency is also linked to serious illnesses like cancer and high blood pressure.

### **How do we prevent and treat calcium deficiency?**

We can prevent and treat calcium deficiency in the following ways:

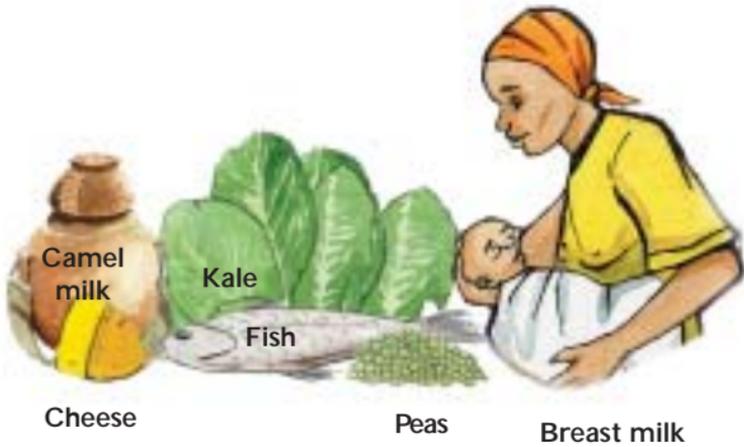
- Educating, informing and motivating communities to improve their diets and those of young children.
- Diversifying and modifying the diet to include milk and milk products which are rich in calcium.
- Encouraging families to keep dairy goats, camels and cows for their domestic milk supply.



- Improving cooking methods so that calcium is retained, for instance, cooking foods in a minimal amount of water and cooking food for the shortest possible time.
- Exclusively breastfeeding for the first six months of an infant's life.
- Providing calcium supplements to high-risk groups like pregnant women, young children and the elderly.
- Fortifying common foods like flour and juices with calcium.

### What foods are rich in calcium?

Calcium is found in milk and milk products like yoghurt, fermented milk, cheese, butter, ghee and cream. Other sources are dark green leafy vegetables like kale and spinach, beans, peas and bony fish like salmon and mackerel.



## Recommended dietary allowance of calcium

Category and age	RDA (mg/day)
Infants	
0-0.5 year	400
0.5-1.0 year	600
Children 1-10 years	800
Adolescents	
11-24 years	1200
25- $\geq$ 50 years	800



## VITAMIN D

Vitamin D helps the body to absorb calcium. Therefore a lack of vitamin D can lead to calcium deficiency.

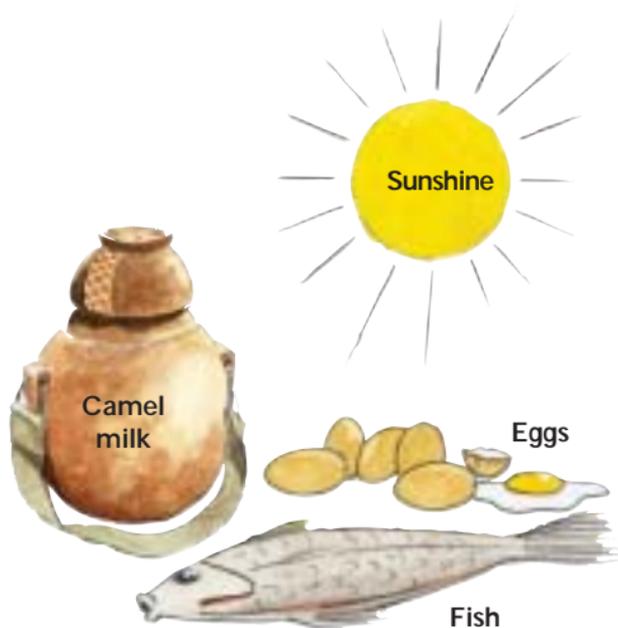
### Where do we get vitamin D?

The best source of vitamin D is sunshine. It is important to get a little sunshine everyday for the body to produce vitamin D. Babies, small children, the elderly and invalids need to be taken outside for a little sun every day.

Vitamin D is found in foods such as eggs, margarine, fortified milk, chicken liver, salmon, sardines, herring, mackerel, swordfish and fish oils (like cod liver oil).



**Rickets is mostly found in children and is caused by Vitamin D deficiency.**



### **The recommended dietary allowance for vitamin D**

The RDA for the adults beyond 24 years is 200IU/day (5mg/day) while the RDA for the pregnant and lactating women of all ages is 400 UI/day (10mg/day). The RDA for infants from birth to 6 months of age is 300IU (7.5mg/day), while children older than 6 months of age to adults of 24 years is 400IU (10mg/day).

## DETECTING MICRONUTRIENT DEFICIENCIES IN EMERGENCY SITUATIONS

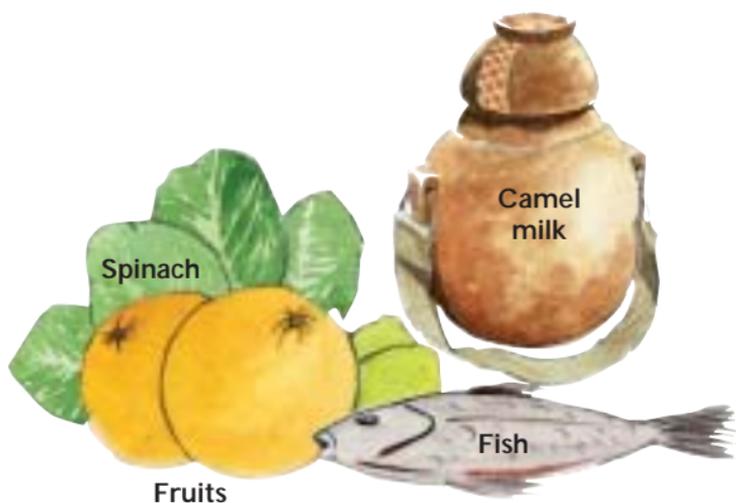
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There are other micronutrients deficiencies common in emergency situations. These include thiamine and niacin.

### **Thiamine deficiency**

This is common when populations consume polished cereals. Thiamine deficiency manifests as wet beriberi, dry beriberi and infant beriberi. It is also common among alcoholics.

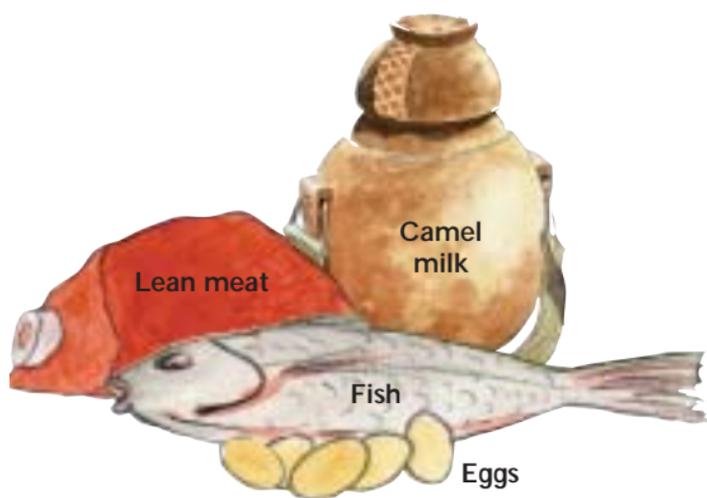
Main sources of thiamine are whole cereal grains and pulses, green vegetables, fish, meat, fruits and milk.



### **Niacin deficiency**

Niacin deficiency causes pellagra which manifests as dermatitis (skin lesions on sunlight exposed body parts, mainly face and hands), diarrhoea and dementia (mental disorientation).

Main sources are groundnuts and foods rich in tryptophan (niacin precursor) like eggs, milk, lean meat and fish.



**These are some of the sources of niacin.**





## ABOUT THESE GUIDES

The Food Security Analysis Unit has prepared some materials on Micronutrient Deficiencies. The materials are intended to serve as an introduction to the major micronutrient deficiency disorders and it is hoped that they will promote a greater awareness of the importance of this aspect of malnutrition. Users of the materials are encouraged to pay attention to the detection of micronutrient deficiency disorders and to become active in the development of interventions for their prevention and management.

### **Pocket Guide**

The pocket guide provides a brief overview of the major micronutrient deficiencies, signs and symptoms and reasons for deficiencies. It also provides some guidance on options for prevention and management of micronutrient deficiencies.

The pocket guide has been designed primarily for those actively involved in nutrition, health and food security work. The guide will be useful as a reference during work in a clinic or in a field setting and will be of particular use during nutrition assessments. Secondary target groups are project managers, community development worker (social workers) and school teachers.

### **Flip charts**

The flip charts will be used for educational sessions at health facilities or during training sessions for mid-level management. The target groups for these materials are health facility workers with health background.

### **Wall charts**

The wall charts have been designed for use in health facilities and will be distributed following training sessions using the flip charts. They can also be used in schools among other social places.

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