NATIONAL GUIDELINE FOR CONTROL AND PREVENTION OF MICRONUTRIENT DEFICIENCIES

Ethiopia

Federal Ministry of Health
Family Health Department

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ACRONYMS

EHNRI	Ethiopian Health and Nutrition Research Institute
ENI	Ethiopian Nutrition Institute
EPI	Extended Program on Immunization
HEP	Health Extension Package
HSDP II	Health Service Development Program
IDA	Iron Deficiency Anemia
IDD	Iodine Deficiency Disorder
MDG	Millennium Development Goal
MoE	Ministry of Education
NIDs	National Immunization Days
PEM	Protein Energy Malnutrition
USI	Universal Salt Iodization
VAD	Vitamin A Deficiency

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GUIDELINES FOR CONTROL AND PREVENTION OF MICRONUTRIENT DEFICIENCIES

I. INTRODUCTION

The health and vitality of human beings depends on diets that include adequate amounts of vitamins and minerals to promote effective physiological processes including reproduction, immune response, brain and other neural functions, and energy metabolism. Vitamins are organic compounds that are necessary in small amounts in our diet to facilitate growth, maintenance of health, and reproduction. Minerals are inorganic elements which do not originate in animal or plant life but rather from the earth's crust. Although minerals make up only a small portion of body tissues, they are essential for normal growth and functioning.

Very minute quantities of vitamins and minerals are needed for health and these are measured in micrograms or milligrams, thus supporting their description as micronutrients. These elements are essential; they cannot be manufactured by the human body and must be obtained through dietary means. Deficiencies of most micronutrients are known to have devastating health consequences. They increase the overall risk of mortality and are associated with a variety of adverse health effects, including poor intellectual development and cognition, decreased immunity, and impaired work capacity. The adverse effects of micronutrient deficiencies are most severe for children, pregnant women, and the fetus, and approximately 30% of the world's population is unable to use their full mental and physical potential as a result of micronutrient malnutrition.

The relationship of micronutrient deficiencies with major health, social and economic problems, as presented in the table below, was not widely recognized until 1970.

EFFECTS OF MICRONUTRIENT DEFICIENCIES

Physical	Mental	Socio-cultural	Economic
▪ Growth retardation ▪ Fatigue ▪ Lethargy ▪ Apathy ▪ Visual impairment ▪ Speech and learning disabilities ▪ Pallor	▪ Brain damage ▪ Impaired brain function ▪ Neuralgic dysfunctions ▪ Decreased IQ ▪ Decreased learning skills ▪ Decreased psychomotor skills	▪ Loss of self esteem ▪ Isolation ▪ Discrimination ▪ Non-participation ▪ Stigma associated with disability ▪ Increased number of unskilled workers ▪ Increased number of unemployed ▪ Increased time for care ▪ Decreased academic achievement	▪ Lost hours of work ▪ Decreased work capacity ▪ Decreased family income ▪ Decreased national economy ▪ Increased health care costs ▪ Increased custodial care ▪ Increased education cost (special education or grade repetition)

- For every day of delay, another 50,000 infants are born with reduced mental capacity from iodine deficiency,
- For every day of delay, another 300 mothers die in childbirth due to severe anemia,
- For every day of delay, another 4,000 children die from the effects of Vitamin A deficiency.
- According to the World Bank estimates the problem of micronutrient malnutrition cost national economies up to 5% their gross domestic product (GDP) through death and disability, but that the solution would cost as little as 0.3% of the GDP. Also the economic payoffs of micronutrient intervention programs are as high as 84 times the program costs.

Excerpted from *Joining Hands to End Hidden Hunger*

In the 1970s and 1980s scientists and international organizations such as WHO and UNICEF began to sensitize the world community and governments to this problem and the last decade of the twentieth century was a time for action to eliminate and control micronutrient deficiencies.

Among these micronutrients, three have obtained worldwide attention and are the focus of these guidelines due to their high public health significance. Vitamin A, Iodine and Iron deficiencies lead to grave health, social and economic consequences but the good news is that there are cost effective strategies to overcome these deficiencies. Other micronutrient deficiencies such as zinc, vitamin B, and folate have also been shown to have health consequences but are not presented in this document, as they are not currently seen as priority interventions.

Many of the world's nations, including some of the more developed ones, still have micronutrient deficiency problems though most, including Ethiopia, are now moving forward to tackle them.

The most notable of the many summits and meetings that have been conducted worldwide to face the challenges of micronutrient deficiencies include:

1. ***The World Summit for Children*** (New York, 1990), where 123 heads of state agreed upon a plan of action to support the survival, protection and development of children.
2. ***The Policy Conference on Ending Hidden Hunger*** (Montreal, 1991)
3. ***The International Conference on Nutrition*** (Rome, 1992). All participating countries pledged to virtually eliminate vitamin A and iodine deficiencies and their consequences, and to substantially reduce iron deficiency by the year 2000.
4. ***The OAU Member States Summits*** in August 1995 - Addis Ababa, and May-June 1996 - Cairo, also passed resolutions for its member states to consolidate the issue.

The Ethiopian government, after endorsing the Global Goal for the year 2000, formulated its own action plan and a national program was launched towards the end of 1995. In order to use resources most effectively, it was decided to first intervene with regard to vitamin A and iodine deficiencies and later to include iron deficiency anemia (IDA) which requires multiple strategies and more resources.

The Ministry of Health has also adopted the Essential Nutrition Actions approach to tackle malnutrition. The Essential Nutrition Actions (1, 2) represent an action-oriented approach that focuses on promoting seven clusters of nutrition behaviors that have been empirically proven to reduce morbidity and mortality. Currently this approach found to be very good for those who have access for health care services. For those who dose not have access, different community based strategies need to be followed as it is described in the guideline.

Although the MN deficiency control activities are anchored within the health sector, there is a need to extend it, as appropriate, into other sectors which are important for nutrition, such as agriculture, food security, education, and micro-enterprise.

II. GOAL AND OBJECTIVES

Goal
To achieve virtual elimination of micronutrient deficiencies in Ethiopia.

Objectives

- To increase coverage of the programs that improve the micronutrient status of the population
- To develop standards for national programs
- To provide reference materials and aids to health care professionals

III. CONTROL AND PREVENTION OF VITAMIN A DEFICIENCY (VAD)

1. INTRODUCTION

Vitamin A deficiency has long been known to cause blindness, but more importantly, recent studies reveal that vitamin A deficiency is closely associated with increased mortality and morbidity among young children. Research is also providing new evidence that VAD increases the risk of maternal death.

Vitamin A is an essential micronutrient for proper functioning of the immune system. Improving the vitamin A status of children increases their resistance to disease, and thus in countries like Ethiopia, where diarrhea, acute respiratory infection, and measles are among the major causes of child mortality, improved vitamin A status will play a critical role in reducing young child mortality. Vitamin A is also vital for proper functioning of the eye.

1.1 Background

On a national scale, vitamin A supplementation began in 1996 and was integrated with immunization services (EPI-plus) mainly targeting children under one year of age. Between 1998 and 2000 the program was scaled up to provide two rounds of vitamin A to children 6-59 months old through polio national immunization days (NIDs) and separate second round campaigns 6 months later. This strategy consistently achieved coverage of over 80% in the target groups. Vitamin A distribution through campaigns was halted for a time and then re-introduced towards the end of 2002. In the 2002 polio NIDs one round of vitamin A supplementation was conducted in six regions. In 2003, vitamin A was distributed in all drought-affected areas together with measles immunization for children from 6 months to 14 years of age in response to the emergency situation. Through this approach about 20 million children ages 6 months to 14 years in drought-affected areas were provided with one dose of vitamin A.

Currently, routine vitamin A delivery with EPI plus and other avenues is being strengthened. The Health Extension Package (HEP) is believed to provide an excellent opportunity for creating community awareness on the importance of vitamin A and creating demand for services.

1.2 Situation Analysis

The problem of Vitamin A Deficiency (VAD) is global. It affects more than 100 million children and is responsible for as many as one out of every four child deaths in regions, countries, and communities where the problem exists. Vitamin A deficiency is one of the most serious nutritional diseases among young children in developing countries. It is associated with Protein Energy Malnutrition (PEM) and causes night blindness, ulceration of the cornea and permanent blindness.
Recent research findings suggest that improving vitamin A status among deficient populations can significantly reduce young child mortality by 23% or more (Beaton et al, 1991).

Vitamin A deficiency is a major public health problem in Ethiopia. According to WHO standards, a prevalence of Bitot's Spots greater than 0.5% indicates a significant public health problem. In the 1980s, the prevalence of Bitot's Spots in Ethiopia was reported to be 0.87% nationwide and in the 1990s, prevalence was 1% (Zewdie, 1992) in school children. Data from some recent pocket studies (UNICEF 1996 and MICAH 1997 baseline) demonstrate that Bitot's Spot prevalence is as much as two to 40 times greater than the WHO cut off point in the East Hararghe and Tigray areas, suggesting that the problem of vitamin A deficiency in Ethiopia is extremely severe.

From the *Profiles* (4) analysis, it is estimated that 27% of children under five years of age suffer from sub-clinical vitamin A deficiency. This deficiency lowers children's resistance to common infections and results in increased levels of child mortality. The *Profiles* analysis reveals that in our country, 17% of child deaths are attributable to vitamin A deficiency. This means that each year, around 50,000 child lives will be lost as a result of vitamin A deficiency if no action is taken.

1.3 Rationale for Action

Improving children's vitamin A status increases their chance of survival:

- Deaths from measles can be reduced by 50%
- Deaths from diarrhea can be reduced by 40%
- Over all mortality can be reduced by 25%

Improving vitamin A status reduces the severity of childhood illnesses:

- Less strain on clinic outpatient services and hospital admissions
- Contributes to the well-being of children and families

Improving vitamin A status also:

- Prevents night blindness, xeropthalmia, corneal destruction, and blindness
- May reduce birth defects
- May prevent epithelial and perhaps other types of cancer
- Prevents Anemia

Improving vitamin A status is very cost-effective:

- Just a few cents per capsule
- Reduces health costs by decreasing hospital and clinic visits
- Easily integrated into existing public health /immunization programs

1.4 Causes of Vitamin A Deficiency

Vitamin A deficiency (VAD) occurs when vitamin A intake or liver stores fail to meet daily metabolic requirements and the most common cause is a persistently low intake of vitamin A-rich foods; when there is a problem with absorption, conversion or utilization of vitamin A; or when children suffer from repeated infections or diseases such as measles, diarrhea and acute respiratory infections (ARI). If a diet is lacking in oils or fats, vitamin A is not well absorbed and utilized.

1.5 Population at Risk

The population groups at highest risk for vitamin A deficiency are infants and children under five and pregnant and lactating women.

2. GOAL AND OBJECTIVES

2.1 Goal

To virtually eliminate vitamin A deficiency by the year 2015.

2.2 Objectives

- Achieve over 80% coverage with two annual doses of vitamin A in children 6-59 months
- Supplement 70% of post partum women with high doses of vitamin A within 45 days of delivery

3. STRATEGIES

The main strategies which have been adopted globally to control and eliminate vitamin A deficiency are:

1. Promote and support exclusive breastfeeding up to six months of age
2. Universal supplementation
3. Dietary diversification and modification
4. Food fortification

3.1 Promote and Support Exclusive Breastfeeding up to Six Months of Age

In their first six months of life, breastmilk protects infants against infectious diseases that can deplete vitamin A stores and interfere with vitamin A absorption. The vitamin A intake of a breastfed child depends on the vitamin A status of the mother, the stage of lactation, and the quantity of breastmilk consumed. From birth to about six months of age, exclusive, frequent breastfeeding can provide the infant with all the vitamin A needed for optimal health, growth, and development. Breastmilk is generally higher in nutritional value than alternative foods and liquids fed to children in developing countries. Consumption of other foods decreases the amount of breastmilk consumed and may disrupt the infant's absorption of vitamins and minerals from the breastmilk. Therefore**, exclusive breastfeeding until six months of age helps ensure sufficient vitamin A intake** (5).

In areas where vitamin A deficiency is common, post-partum women should be given a single high-dose (200,000 IU) vitamin A capsule as soon after delivery as possible, but no later than eight weeks postpartum[1]. This will help to build up vitamin A stores, improve the vitamin A content of breastmilk, and reduce the risk of infection in mothers and infants. High-dose vitamin A supplements should not be taken during pregnancy as it may harm the developing fetus. Since the risk of pregnancy for lactating women is very low during the first 45 days postpartum, this is the only time that they should be given the high-dose capsule (5).

Target Group	Dosage I.U.	Frequency
Post-partum women	200,000	Within 45 days after delivery

[1] Non-lactating mothers in vitamin A deficient areas should be given a high-dose vitamin A supplement no later than six weeks after delivery.

3.2 Supplementation of Vitamin A Capsules

3.2.1 Supplementation for prevention

This involves the periodic administration of supplemental doses to all pre-school age children. Universal supplementation with vitamin A capsules is a relatively short-term, low cost, highly effective strategy for improving the vitamin A status of children from 6 to 59 months of age.

Target Group	Dosage I.U.	Frequency
Infants 6 to 11 months	100,000	Once
Children 12 to 59 months	200,000	Every 4 to 6 months

Vitamin A should not be given in less than one-month intervals and all vitamin A supplementation must be recorded on each child's growth monitoring or other cards to avoid duplicate dosing.

Supplementation of vitamin A capsules should take place during:

- National Immunization Days
- Mass supplementation campaigns (twice a year)
- Routine health service delivery including immunization sessions
- Maternal Child Health contacts
- Out-patient clinics for targeted diseases in children
- Child Health Days

3.2.2 Therapeutic supplementation

The following schedule is appropriate for children with diarrhea, severe acute malnutrition.

Treatment for Children with Severe Acute Malnutrition

Target Group	Dosage I.U.	Frequency
Infants 6-11months	100,000 I.U.	One dose at first contact with health unit and then as to the management of severe acute malnutrition guideline
Children 12-59 months	200,000 I.U.	One dose at first contact with health unit and then as to the management of severe acute malnutrition guideline

Treatment for Children with persistent diarrhea

Target Group	Dosage I.U.	Frequency
Infants 6-11 months	100,000 IU	One dose
Children 12-59 months	200,000 IU	One dose

Treatment for Children With Xerophthalmia or Measles

Schedule	Dose in I.U. for children <1 year	Dose in I.U. for children >1 year
Immediately on diagnosis	100,000	200,000
Next day	100,000	200,000
15 days later	100,000	200,000

3.2.3 Method of Administration - supply

Presentation: 100,000 IU Vitamin A (blue)
200,000 IU Vitamin A (red)

The quantities should be calculated based on the target groups:

- Post partum women (once)
- Children from 6 to 59 months (twice a year)
- Children who are ill where the treatment includes vitamin A

The capsule must be cut with scissors and the liquid contents have to be squeezed into the child's mouth. The whole capsule of vitamin A as such should not be given to children.

Normally administration of vitamin A capsules to women and children is done by health workers at health facilities and outreach posts. However, properly trained and adequately supervised volunteers, community health workers or health extension agents (HEP) can also administer vitamin A during campaign activities.

When administered according to internationally accepted protocols, high dose vitamin A supplementations are completely safe for children when given at least one month apart. Benefits of vitamin A supplementation far outweigh any side effects.

There are no serious side effects or contraindications for vitamin A capsules. On rare occasions, a child may experience headache, nausea, vomiting, loss of appetite, or a bulging fontanel (in infants) following vitamin A supplementation. These conditions are infrequent, mild and transient, disappearing within 24 to 48 hours, and do not require any special treatment.

Finally, vitamin A capsules must be handled carefully to ensure their effectiveness. Some precautions include:

- Store at room temperature in a cool dry place
- Protect capsules from direct sunlight
- Do not freeze capsules - they should not be stored in the cold chain or transported in vaccine carriers

3.3 Food Diversification for Vitamin A

Food diversification is an important long-term, sustainable strategy for prevention of vitamin A deficiency. Populations should be encouraged to grow and consume vitamin A rich foods throughout the country at all times. This requires input from various entities such as the Ministries of Health, Agriculture, Education, Information and Communication, the Regional states, donors and NGOs.

Relevant regional bureaus must initiate and coordinate the establishment of horticultural demonstration gardens in health facilities and schools as well as agricultural extension demonstration plots in farming areas. These horticultural gardens would serve for demonstration purposes as well as dissemination of information on the use of fruits and vegetables and distribution of seedlings that could be grown around rural homes. Extension agents should play a significant role in promoting the introduction of vitamin A rich foods and improving consumption and storage of such foods.

Animal Sources of Vitamin A
The best food sources of pre-formed active retinol, which is most effectively used by the body, are animal foods. These include breastmilk, egg yolks, organ meats such as liver, whole milk, and milk products, small fish with liver intact, fish, cod liver oil, butter, and ghee. The best source of vitamin A for infants is breastmilk. The mother's secretion of vitamin A into breastmilk is related to her own vitamin A status.

Plant Sources of Vitamin A
Plants contain beta-carotene that needs to be converted into retinol by the body. The best plant sources of vitamin A are dark orange or dark yellow fruits and vegetables such as papayas, mangos, pumpkins, carrots, and yellow or orange sweet potatoes and dark green vegetables such as spinach, kale and Swiss chard. *Gommen* is an example of a traditional plant which is rich in vitamin A and commonly included in the Ethiopian diet. The amaranth plant grows wild in Ethiopia and its leaves are a good source of beta carotene as well. Its consumption should be encouraged.

3.4 Food Fortification with Vitamin A
This involves adding one or more vitamins and minerals to commonly consumed foods, especially those for children, for the purpose of preventing or correcting a demonstrated deficiency.

This strategy is beneficial for the whole population if many types of foods for human consumption were to be processed and fortified at the factory level. Unfortunately, it is difficult to fortify foods in Ethiopia because no staple food has been identified as widely consumed in the entire country and the foods that are relatively common are not processed in factories. Some efforts are underway to fortify sugar and oils that are being produced in some of the larger factories. Food fortification is not well known in Ethiopia thus the required technology will need to be transferred from abroad and studies and procedures need to be carried in order to apply food fortification.

4. SUPPORTIVE ACTIVITIES

- Establishment of a micronutrient committee from concerned sectors and other partners at all levels (up to woreda levels) to organize and assist program implementation
- Training for health workers and other partners at all levels including pre-service training of health providers
- Communities mobilized and supported to give due emphasis to production of fruit and vegetable gardens to improve access to vitamin A rich foods.
- Development, printing, and dissemination of appropriate IEC/BCC materials to support public awareness campaigns designed and implemented to increase vitamin A coverage
- Ensure supply of vitamin A capsules and the other necessary logistical materials for supplementation and fortification
- Technical and other logistical assistance provided to the food industry (private/public) to fortify foods
- Monitoring VAS coverage to identify areas of support

5. MONITORING AND EVALUATION

Review meetings on the vitamin A program at national, regional and woreda levels have to be conducted annually or biannually based on:

- **Routine data collection**

Strategies for monitoring the impact of any kind of vitamin A activity must be planned and built into programs from the earliest stage of program design and implementation. Routine data collection might include:

- Vitamin A supplementation during the EPI sessions for children
- Vitamin A supplementation during well baby check ups
- Vitamin A supplementation during sick child visits
- Vitamin A supplementation with women immediately postpartum in maternity wards or post natal check ups
- Vitamin A supplementation during mass campaign for children from 6-59 months, collected separately

Special intervention programs/projects have to be monitored and assessed locally based on stated goals and objectives and established targets.

Periodic reports have to be compiled and analyzed at all levels, including the national level, for feedback, follow up and fine-tuning of program implementation.

- **Monitoring surveys**

Surveys such as Multi Indicator Cluster Surveys must be carried out at the national/regional levels to evaluate progress using indicators such as:

- % of children 6- 59 months of age who have received vitamin A within the past six months,
- % of women who have received vitamin A postpartum,
- % of children who are consuming foods rich in vitamin A.

- **Periodic surveys**

The impact of vitamin A activities, especially supplementation, on infant and child mortality must be evaluated, though this requires more effective and rigorous surveys. Periodic food consumption surveys, assessment of retinol levels and other clinical signs in target groups will be used to estimate prevalence, and to monitor and measure program impact.

Prevalence of VAD in Children ≥1 year of age of serum values ≤0.7µ mol/L

Level of public health problem	Prevalence
Mild	≥2 - <10%
Moderate	≥10 - <20%
Severe	≥20%

Identification of Vitamin A Deficiency in Population

Vitamin A deficiency sign/symptoms	WHO cut-off levels
Children Clinical	
Night blindness	>1%
Bitot's Spots	>0.5%
Conjunctival xerosis/ulceration/ keratomalacia	>0.01%
Corneal scar	>0.05%
Pregnant women	
*Night blindness during recent pregnancy	>5%

Biochemical levels	
*Serum retinol levels <0. 35 μ mol/L or 10 μ g/dl	>5%
Serum retinol levels of 0.7μ mol/L or <20 μ g/dl	>15%

Source: WHO/UNICEF, 1994; newly suggested (IVACG, 2003)

- **Food fortification**

Private and public food processing industries must be encouraged to fortify foods with vitamin A and monitored on a regular basis to check quality assurance and compliance with national standard levels.

IV. CONTROL AND PREVENTION OF IODINE DEFICIENCY DISORDERS (IDD)

1. INTRODUCTION

Iodine is an essential micronutrient for regulation of physical growth and neural development. The adult daily requirement is only 150 micrograms, which translates into less than one teaspoonful in a lifetime. Iodine is an essential component of the thyroid hormones, thyroxin and triiodothyroxine and insufficient iodine levels in the blood lead to poor production of these hormones. This in turn affects development and functioning of the brain, muscles, heart, liver, and kidneys and results in iodine deficiency disorder (IDD). The most visible effect of IDD is goiter but the less visible effects are even more dramatic.

1.1 Background

Recognizing the extent of iodine deficiency and the disorders that could emanate from it, the Ministry of Health launched an iodine deficiency disorder prevention and control program as part of the National Micronutrient Deficiency Disorders prevention and control program in 1996.

In Ethiopia, only 28% of households with children use salt with adequate iodine to prevent IDD. The Gambella and Benishangul-Gumuz regions have the highest rates of households using iodized salt (46%) and the Tigray, Somali, and SNNPR have the lowest percentages (10%, 17% and 18%, respectively).

1.2 Situation Analysis

Globally, 30% of the world's population is affected with IDD and more than 150,000 million people in Africa are affected. In Ethiopia, one out of every 1,000 people is affected and about 50,000 prenatal deaths occur yearly due to iodine deficiency disorder. Twenty-six out of every 100 Ethiopians have goiter and 62% are at risk of IDD according to the national survey conducted by the previous Ethiopian Nutrition Institute. Some pocket areas of the country have goiter rates of between 50% and 95%. For example, in a baseline survey conducted by the MICAH project in four regions of the country in 1997, the total goiter rate was 42.2% and in the follow up survey conducted in 2000, it was found to be 28.6% (MICAH Phase 1 Results 1995-2001). According to WHO, a goiter rate above 5% constitutes a public health problem.

In the *Profiles* analysis, it is said that results from studies in different countries show that of all babies born to iodine-deficient mothers, an average of 3% suffer severe mental and physical damage, 10% show moderate mental retardation, and the remaining 87% suffer some form of mild intellectual disability. Iodine deficiency is the major cause of preventable mental retardation and severity can range from mild mental blunting to cretinism.

Other consequences include:

- Defects in nervous system development
- Reduced work capacity and performance
- Impaired school performance (decreased average intelligence by 10-15 IQ points)
- Economic stagnation
- Memory loss
- Growth retardation
- Deaf-mutism
- Goiter
- Inability to produce enough milk for offspring
- Reproductive failures (miscarriage, prematurity, stillbirth) and lower birth weights
- Nutritional problems
- Increased childhood morbidity and mortality
- Impotency

Iodine is not only essential for human beings but also for animals. Livestock with adequate iodine intake have better health, higher reproduction rates, and increased production capacities for meat, milk, butter, eggs, and wool, and thus iodine deficiency in animals has a significant negative effect on rural livelihoods.

1.3 Rationale for Action

- Universal Salt Iodization (USI) can lead to an increase of the average intelligence of the entire school age population by as much as 13 points.
- Salt iodization will improve the physical and mental development of millions more.
- The intellectual and cognitive development of whole generations of Ethiopian children will be reduced by around 10% unless adequate iodine is provided.

1.4 Causes of Iodine Deficiency

Iodine is found naturally in topsoil but in most areas of the country and especially the highlands, top soil has been lost due to deforestation, erosion, and flooding, and thus food crops lack iodine resulting in dietary iodine deficiency.

1.5 Population at Risk

People of all ages and sexes are vulnerable but this deficiency is more critical for the fetus, young children, pregnant women, and lactating mothers.

2. GOAL AND OBJECTIVES

2.1 Goal

Virtual elimination of iodine deficiency disorders by the year 2015 by means of Universal Salt Iodization (USI)

2.2 Objectives

- Decrease current goiter rate by 50%
- Increase access to iodized salt among households up to 80% (from HSDP II objective)

3. STRATEGIES

The main strategies to control and eliminate iodine deficiency are:

1. Universal iodization of salt for human and animal consumption
2. Supplementation of iodine capsules to populations in highly endemic areas

3.1 Universal Iodization

IDD can be eliminated by daily consumption of iodized salt. Salt is used universally by all age, socio-economic, cultural, and religious groups throughout the year. Iodized salt is both a preventive and corrective measure for iodine deficiency and is the most effective, low cost, long-term solution to a major public health problem. Iodized salt should be used on a daily basis in an iodine deficient environment and the daily requirement of iodine for adults is 150 micrograms.

The Correct Level of Iodine in Salt

Salt regulations stipulate the iodine content as either ppm (or mg/kg) of iodine or ppm (mg/kg) of KIO_3, and it is necessary to be able to work with both formats.

The KIO_3 content in the salt is the same as the iodine content times 1.68, i.e.,

KIO_3 = I x 1.68

In Ethiopia, an iodine content of 80 – 100 ppm is required as KIO_3 at the port of entry or at the packaging factory.

Iodine required for a level of 80 ppm or 80 mg/kg KIO_3 in one ton of salt = 80 g KIO_3/ ton salt

3.2 Supplementation of Iodine Capsules

As a short-term strategy in highly endemic areas, Lipiodol (iodized oil capsules), should be distributed on a one-time basis to individuals. This will cover the recipients for one to two years until salt iodization processes are in place.

Dosages are:
- 1 capsule for pregnant women and children under 5
- 2 capsules for women of reproductive age and children 5 to14 years of age

4. SUPPORTIVE ACTIVITIES

The following activities need to be carried out to strengthen the National Iodine Deficiency Control and Prevention Program:

4.1 Strengthen Legislation

- Include iodized salt in food rations
- Reinforce legislation for importation and production of iodized salt
- Collaborate with neighboring countries for the control of un-iodized salt smuggling and mutual cooperation in the production of iodized salt
- Facilitate all mechanisms and provide incentives to invite investors to invest in salt production and iodization

4.2 Training and Advocacy

- Follow up establishment of micronutrient committees at the regional level
- Implement advocacy for universal consumption of iodized salt and demand creation
- Conduct training for health workers and laboratory technicians in all regions
- Provide training for salt producers on how to iodize salt
- Coordinate with concerned government bodies and international and nongovernmental organizations

4.3 Strengthen Laboratories

- Strengthen regional laboratories in order to perform titration procedures in all regions

- Establish laboratory facilities at salt importation sites in conjunction with Quality and Standards and Customs Authorities to control iodization levels in imported salt.

5. MONITORING AND EVALUATION

5.1. Monitoring Quality of Iodated Salt

A monitoring system for IDD control and quality control mechanisms must be established. All salt 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 iodated 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 (KIO_3) is more convenient than iodides for salt iodation. Iodates (such as KIO_3) are resistant to oxidation and do not require the addition of stabilizers. Iodates are less soluble than iodides and are less prone to migrate out of the salt when the fabric of the container absorbs the moisture of the salt.

5.2 Monitoring Impact

Health information systems must be strengthened at all levels for the smooth running of the program, i.e., creation of a coordinated and computerized documentation system for data collection and compilation.

This monitoring could be done by identifying sentinel sites or through surveys to measure the biological impacts of iodization: urinary iodine excretion, estimates of thyroid hormones, and evaluation for goiter prevalence in children (TGR: Total Goiter Rate).

***Clinical Indicators*:**

- **Total Goiter Rate**: from Stage 0 to IV (visible and palpable goiter)

***Laboratory Investigation*:**

- Urinary iodine level
- Serum T3 and T4
- Isotope scanning

V. CONTROL AND PREVENTION OF IRON DEFICIENCY ANEMIA (IDA)

1. INTRODUCTION

In the nineteenth century iron was discovered to be a necessary part of hemoglobin in the red blood cells that transport oxygen and carbon dioxide in the body. A deficiency of iron leads to anemia which is defined as a low level of hemoglobin in the blood, as evidenced by reduced quality and quantity of red blood cells.

The daily requirement of iron for an adult male is 8-10 mg., for women, 10-18mg., and for pregnant and lactating women up to 20 mg.

1.1 Background

Currently in Ethiopia, no systematic programs are in place to address anemia because of a lack of consensus regarding the severity and magnitude of the problem. Supplementation programs have been sporadically implemented at health facility levels with no clear national protocol. Case diagnosis and treatment is being carried out as part of the general outpatient and inpatient services for all age groups. Malaria treatment and prophylaxis are being implemented as per the national protocol.

1.2 Situation Analysis

Anemia is a widespread health problem affecting more than two billion people worldwide – one third of the world's population. In almost all developing countries, between one third and one half of the female and child population are anemic. The highest prevalence is found in south Asia and sub-Saharan Africa. Among pregnant women and children from one to five years of age in developing countries, anemia prevalence is estimated to be 50-60%. In sub-Saharan Africa the prevalence rate for pregnant women is 50% while that for non-pregnant women is 40%.

In Ethiopia the studies conducted so far are very limited and localized, making it difficult to estimate the exact prevalence of iron deficiency anemia in the country. Nevertheless, a region specific study in Tigray showed that 16% of women in the reproductive age group were anemic. In this same study, anemia in children (6-60 months) was reported to be 42%.

The consequences of anemia are multiple. Iron deficiency can delay psychomotor development and cognitive performance, especially in preschool age children. Neurological manifestations may occur in children and adolescents. In adults, anemia with a hemoglobin concentration of less than 11g/dl leads to reduced work capacity, reduced mental performance and low tolerance to infections. When the hemoglobin concentration level falls below 4 g/ld it may result in death from anemic heart failure. Iron deficiency anemia can also cause increased maternal mortality due to adverse immune reactions. Maternal anemia can lead to prenatal infant loss, low birth weight, and pre-term births.

1.3 Rationale for Action

Control of anemia will:

- Decrease maternal mortality,

- Decrease premature birth, inter-uterine retardation, and low birth weight,
- Decrease infant mortality (due to low birth weight),
- Increase capacity to learn, and
- Increase productivity in all individuals.

Because anemia has many causes in addition to iron deficiency, many types of programs in the health sector and other social sectors have the potential to contribute to anemia prevention and control. Anemia control should be part of nutrition, family health, HIV/AIDS, food aid and security, environmental health and other commercial sector programs in order to reduce anemia prevalence and its debilitating consequences in the most vulnerable groups (mothers and children).

1.4 Causes of Anemia

Anemia has multiple causes. Its direct causes can be broadly categorized as poor, insufficient, or abnormal red blood cell production, excessive red blood cell destruction, and excessive red blood cell loss. Contributing causes include poor nutrition related to dietary intake; dietary quality; infectious and parasitic diseases; inadequate sanitation and health behaviors; lack of access to health services; and poverty. The two major direct causes of anemia, with excessive red cell destruction are malaria and helminth (worm) infections.

1.5 Population at Risk

- Low birth weight infants
- Children aged 6-24 months
- Adolescent girls
- Pregnant and lactating women
- Children between 6 and 11 years of age
- People living with HIV and AIDS

2. GOAL AND OBJECTIVES

2.1 Goal

Virtual elimination of iron deficiency anemia.

2.2 Objective

Reduce the prevalence of iron deficiency anemia in women of reproductive age and children under five, by one third by 2015.

3. STRATEGIES

The strategy for the reduction of iron deficiency anemia should be multifaceted and sustainable. For this to happen there is a need to involve relevant stakeholders from agriculture, education, information, and other relevant sectors in planning and implementation of priority programs.

The main strategies are:
1. Supplementation of iron and folic acid
2. Treatment of severe anemia

3. Dietary diversification – increased production and consumption of locally available iron rich foods
4. Fortification of foods with iron

Additional strategies to reduce non-iron deficiency anemia are:
5. Control of malaria (prophylaxis and treatment), helminthiasis, and schistosomiasis.

3.1 Supplementation of Iron and Folic Acid

3.1.1 Supplementation for Pregnant and Lactating Women

Pregnant women require a much higher amount of iron than is met by most diets and therefore, it is important that they routinely receive iron supplements. In places where anemia prevalence is high, supplementation should continue into the postpartum period to enable them acquire adequate stores of iron.

Iron and Folic Acid Doses For Universal Supplementation for Pregnant and Lactating Women

Group	Iron-Folic Acid Doses	Duration
Pregnant and lactating women	**Iron**: 60 mg/day **Folic acid**: 400 mcg/day	▪ Six months during pregnancy where anemia prevalence is < 40% ▪ Six months during pregnancy and three months postpartum where anemia prevalence is ≥ 40% ▪ If it is not possible for women to take iron and folic acid for six months in pregnancy, supplementation should continue into the postpartum period or the dose should be increased to 102 mg/day

Source: WHO/UNICEF/UNU (2001); Stoltzfus and Dreyfuss (1998)

When?

- During Ante-Natal Care
- During Post-Natal Care

3.1.2 Supplementation for Children and Adolescents

Many children from 6 to 24 months of age need more iron than is available in breastmilk and common complementary foods. Infants with low birth weight have less iron stores, and are thus at a higher risk for deficiency after two months of age. In areas where iron fortified complementary foods are not available for regular consumption, children should routinely receive supplements in the first year of life.

In areas where anemia prevalence in young children is 40% or more, delivery of iron supplements should continue through the second year of life, to adolescent girls

Iron and Folic Acid Doses For Universal Supplementation for Children and Adolescents

Group	Iron-Folic Acid Doses	Duration
Low-birth weight infants (<2,500 g)	**Iron**: 2mg/kg body weight/day **Folic acid**: 50 mcg/day	2-24 mos. of age
6- to 24-month-old children	**Iron**: 2mg/kg body weight/day **Folic acid**: 50 mcg/day	▪ 6-12 mos. of age where anemia prevalence is <40% ▪ 6-24 mos. of age where anemia prevalence is ≥ 40%
24-to 59 month old children	**Iron**: 20-30 mg iron	At least once a week for three months
School-age children (6-11 years)	**Iron**: 30-60 mg/day	At least once a week for three months
Adolescents	**Iron**: 60 mg/day **Folic acid**: 400 mcg/day	At least once a week for three months

Source: WHO/UNICEF/UNU (2001); Stoltzfus and Dreyfuss (1998).

When?

- During Post-Natal Care
- During Well Baby Visit
- During sick child visit

Note: Generally there are no side effects to supplementation if protocols are followed.

3.2 Treatment of Anemia

If anemia is diagnosed:

- by clinical examination (extreme pallor of the palms of the hands)
- by laboratory (hemoglobin/ hematocrit tests)

Hemoglobin Values Defining Anemia for Population Groups

Age or Sex Group	Hemoglobin Value Defining Anemia (g/dL)
Children 6-59 mos	< 11.0
Children 5-11 yrs	<11.5
Children 12-14 yrs	<12.0
Nonpregnant women >15	<12.0
Pregnant women	<11.0
Men >15	<13.0

Source: WHO/UNICEF/UNU (2001) values used in DHS

Treatment has to be initiated as:

Iron and Folic Acid Doses For Treating Severe Anemia in Vulnerable Groups

Group	Iron-Folic Acid Dose	Duration
Children < 2 years old**	**Iron:** 25 mg/day **Folic acid:** 100-400 mcg/day	3 months
Children 2-12 years old	**Iron:** 60 mg/day **Folic acid:** 400 mcg/day	3 months
Adolescents and adults, including pregnant women	**Iron:** 120 mg/day **Folic acid:** 400 mcg/day	3 months

Source: Stoltzfus and Dreyfuss (1998)

** Children with kwashiorkor or marasmus should be assumed to be severely anemic. Oral iron supplementation should be delayed until the child starts eating again and gains weight, usually after 14 days.

Standard storage precautions as per the national guideline for drug storage should be followed. It is also important to ensure proper labeling with expiry dates on vitamin supplement containers.

3.3 Dietary Diversification

Food diversification is an important strategy for prevention of iron deficiency. Populations should be encouraged to produce and consume iron rich foods throughout the country at all times. This requires input from various entities such as the Ministries of Health, Agriculture, Education, Information and Communication, the Regional states, donors and NGOs. Extension agents should play a significant role in promoting the introduction of iron rich foods and improving consumption and storage of such foods. The best source of iron for infants is breastmilk.

3.3.1 Animal Sources of Iron

Animal products (meat, organs and blood) provide the best food sources of dietary iron. If these are available, children 6 to 24 months of age and pregnant women should have priority to include small amounts in their diet. Animal products not only provide iron that is well absorbed (20 to 30 percent is absorbed compared to the less than 5 percent that is absorbed from plant sources) but also counter the effects of iron inhibitors in plant products. Animal products are also the only source of vitamin B-12, an important micronutrient for preventing anemia. (7)

3.3.2 Plant Sources of Iron

The best plant sources of iron include dark green leafy vegetables and legumes. Legumes are also excellent sources of folic acid. Consumption of foods which are rich in vitamin A will also aid in preventing anemia. Food processing techniques such as cooking, germinating, fermenting and soaking of grains should be encouraged as they reduce factors that inhibit iron absorption. (7)

3.4 Food Fortification

Fortification of staple foods with iron is the major way to increase dietary intake of iron in countries where iron-rich foods are too expensive for the poor to purchase.

This strategy would be beneficial for the whole population if many types of foods for human consumption were to be processed and fortified at the factory level. Unfortunately, it is difficult to fortify foods in Ethiopia because no staple food has been identified as widely consumed in the entire country and the foods that are relatively common are not processed in factories. Some efforts are underway to fortify sugar and foods such as oils that are being produced in some of the larger factories.

3.5 Control of Direct Causes of Anemia

To control non-iron deficiency anemia it is also very critical to coordinate actions with the malaria control and helminthiasis control programs

Malaria Control

Target Groups	Prophylaxis	Treatment
Pregnant and Lactating Women	Sleep under an impregnated mosquito net	**Immediate access to treatment:** Refer to national guidelines
Children		

Helminthiasis Treatment and Control

Target Groups	Treatment	When
Pregnant and Lactating Women	Mebendazole 500 mg in 1 dose	During the third trimester of pregnancy
Children older than 2 years	Mebendazole 500 mg in 1 dose	Every 6 months

In addition, it is important to encourage hygiene and environmental sanitation to prevent women, children, or people living with HIV & AIDS from getting parasites (worms).

Control of schistosomiasis is also critical in endemic areas. Refer to the national guidelines.

4. MONITORING AND EVALUATION

Reports of control and prevention of anemia programs must be compiled by health institutions following the national health service delivery system and analyzed routinely for feedback, follow up and fine-tuning of programs.

Review meetings on the national anemia control and prevention program have to be conducted along with review of family health programs.

Food processing plants carrying out iron fortification will be monitored on a regular basis to verify proper management of fortification processes.

Process Indicators:

- Number of health workers trained in anemia prevention
- Types of fortified foods available in the market
- Number of food factories fortifying food with iron

Outcome Indicators:

- Target groups who take recommended number of Iron/Folic Acid tablets
- Target groups receiving nationally recommended prophylactic drugs for malaria

Impact Indicators:

- Percent of target groups with anemia
- Shift in population's hemoglobin curve

Public Health Significance of Anemia

Anemia Prevalence	Public Health Significance
>= 40%	Severe
20-39%	Moderate
5 –19%	Mild
0 – 4.9%	Normal

Indicator:Hemoglobin
Source: WHO/UNICEF/UNU 2001

VI. REFERENCES

1. **Nutrition Essentials. A Guide for Health Managers**. WHO, UNICEF, BASICS 1999

2. **Using the Essential Nutrition Actions to Improve the Nutrition of Women and Children in Ethiopia, including under the situations of Emergencies and HIV & AIDS**. MOH/Carter Center/AED-LINKAGES/USAID. 2003

3. **Ethiopian *Profiles.* Analysis of consequences of malnutrition in Ethiopia**. GOE/FANTA/USAID, 2001.

4. **Vitamin A Supplements**, Second Edition, Prepared by a WHO/UNICEF/IVACG Task Force. World Health Organization, Geneva, 1997.

5. **Facts for Feeding: Breastmilk: A Critical Source of Vitamin A for Infants and Young Children**. Linkages Academy for Educational Development, October 2001.

6. **Assessment of Iodine Deficiency Disorders and Monitoring Their Elimination – A guide for programme managers**, Second Edition. United Nations Children's Fund, WHO 2001.

7. **Anemia Prevention and Control: What Works**, USAID, The World Bank, UNICEF, PAHO, FAO, the Micronutrient Initiative, WHO, June 2003.