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<td>Agro-ecological Zone</td>
</tr>
<tr>
<td>ANC</td>
<td>Ante Natal Care</td>
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<tr>
<td>CBO</td>
<td>Community Based Organization</td>
</tr>
<tr>
<td>CDD</td>
<td>Community-Directed Distributor</td>
</tr>
<tr>
<td>CDTI</td>
<td>Community Directed Treatment of Ivermectin</td>
</tr>
<tr>
<td>COA</td>
<td>Certificate of Analysis</td>
</tr>
<tr>
<td>CSB+</td>
<td>Corn Soya Blend</td>
</tr>
<tr>
<td>CSO</td>
<td>Civil Society Organizations</td>
</tr>
<tr>
<td>DAR</td>
<td>Damage Assessment Report</td>
</tr>
<tr>
<td>DFS</td>
<td>Double Fortification of Salt</td>
</tr>
<tr>
<td>DNA</td>
<td>Deoxyribonucleic Acid</td>
</tr>
<tr>
<td>EDTA</td>
<td>Ethylenediaminetetraacetic acid</td>
</tr>
<tr>
<td>FMA</td>
<td>Federal Ministry of Agriculture</td>
</tr>
<tr>
<td>FMOH</td>
<td>Federal Ministry of Health</td>
</tr>
<tr>
<td>FMS&amp;T</td>
<td>Federal Ministry of Science and Technology</td>
</tr>
<tr>
<td>FMI &amp; NO</td>
<td>Federal Ministry of Information and National Orientation</td>
</tr>
<tr>
<td>GAIN</td>
<td>Global Alliance for Improved Nutrition</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Analysis and Critical Control Points</td>
</tr>
<tr>
<td>HB</td>
<td>Haemoglobin</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immune Virus</td>
</tr>
<tr>
<td>ICCIDD</td>
<td>International Council for the Control of Iodine Deficiency Disorders</td>
</tr>
<tr>
<td>IDA</td>
<td>Iron Deficiency Anaemia</td>
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<tr>
<td>IDD</td>
<td>Iodine Deficiency Disorders</td>
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<tr>
<td>IEC</td>
<td>Information, Education and Communication</td>
</tr>
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<td>IITA</td>
<td>International Institute of Tropical Agriculture</td>
</tr>
<tr>
<td>IPTp-SP</td>
<td>Intermittent Preventive Treatment of malaria in pregnancy using Sulfadoxine-Pyrimethamine</td>
</tr>
<tr>
<td>ITN</td>
<td>Insecticide Treated mosquito Net</td>
</tr>
<tr>
<td>IU</td>
<td>International Unit</td>
</tr>
<tr>
<td>IYC</td>
<td>Infant &amp; Young Child</td>
</tr>
<tr>
<td>IYCF</td>
<td>Infant &amp; Young Child Feeding</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area.</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
</tr>
<tr>
<td>MIS</td>
<td>Management Information System</td>
</tr>
<tr>
<td>MNCHW</td>
<td>Maternal Child Health Week</td>
</tr>
<tr>
<td>MNDC</td>
<td>Micronutrient Deficiency Control</td>
</tr>
<tr>
<td>MNP</td>
<td>Micronutrient Powders</td>
</tr>
<tr>
<td>MITOSATH</td>
<td>Mission to Sight and Health</td>
</tr>
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<td>NAFDAC</td>
<td>National Agency for Food and Drugs Administration and Control</td>
</tr>
<tr>
<td>NCFN</td>
<td>National Committee on Food and Nutrition</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>NID</td>
<td>National Immunization Day</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institute of Health</td>
</tr>
<tr>
<td>NPHCDA</td>
<td>National Primary Health Care Developement Agency</td>
</tr>
<tr>
<td>PHC</td>
<td>Primary Health Care</td>
</tr>
<tr>
<td>RBM</td>
<td>Roll Back Malaria</td>
</tr>
<tr>
<td>RDA</td>
<td>Recommended Dietary Allowance</td>
</tr>
<tr>
<td>RNI</td>
<td>Recommended Nutrient Intake</td>
</tr>
<tr>
<td>RUTF</td>
<td>Ready to Use Therapeutic Feeding</td>
</tr>
<tr>
<td>RUSF</td>
<td>Ready to Use Supplementary Feeding</td>
</tr>
<tr>
<td>SAM</td>
<td>Severe Acute Malnutrition</td>
</tr>
<tr>
<td>SMOH</td>
<td>State Ministry of Health</td>
</tr>
<tr>
<td>SON</td>
<td>Standards Organization of Nigeria</td>
</tr>
<tr>
<td>SSI</td>
<td>Sight Saver International</td>
</tr>
<tr>
<td>TBAs</td>
<td>Traditional Birth Attendants</td>
</tr>
<tr>
<td>TGR</td>
<td>Total Goitre Rate</td>
</tr>
<tr>
<td>VVHWs</td>
<td>Voluntary Village Health Workers</td>
</tr>
<tr>
<td>VAD</td>
<td>Vitamin A Deficiency</td>
</tr>
<tr>
<td>VMD</td>
<td>Vitamin Micronutrient Deficiency</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children Education Fund</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>USI</td>
<td>Universal Salt Iodization</td>
</tr>
<tr>
<td>WFP</td>
<td>World Food Programme</td>
</tr>
<tr>
<td>WHA</td>
<td>World Health Assembly</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</tbody>
</table>
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Preface

Given the importance of micronutrients, especially vitamin A, iron, iodine and recently zinc, their persistent deficiencies remain a significant public health problem in Nigeria, thereby making every strategy for health, education and prosperity an uphill struggle. This is despite the fact that the world has collectively promised to make real headway on issues including child mortality, maternal deaths, low education rates, poverty and inequality by 2015.

The implementation and coordination of effective intervention and programs to eliminate or reduce the prevalence of vitamin and mineral deficiencies in populations requires a wide array of interventions directed towards ensuring high coverage. To achieve this, Federal Ministry of Health (FMOH) in 2005 developed and approved the National Guidelines for Micronutrients Deficiency Control to guide the smooth and uniform operation of programme implementation in the country by various stakeholders. The guidelines have since been operationalized to a different extent in the key strategic areas of supplementation, fortification and dietary diversification; and with different degrees of progress.

Despite the remarkable progress made, significant risks to the micronutrient deficiencies control program in Nigeria remain. The challenges posed by the inability of the program to reach the target groups can severely reduce the effectiveness of the program. FMOH is committed to ensuring adequate nutrition and health for all; and in doing so, it is open to dynamic innovation, aimed at improving diet quality of nutritionally vulnerable groups, such as infants, young children, adolescent, women of child-bearing age (WCBA), pregnant women, and the elderly at affordable price.

Therefore, the current global drive towards promoting strategies for addressing micronutrient deficiencies at the household level prompted the revision of this guideline to include home fortification with multiple supplement and biofortification. In lieu of this, Chapter 5 has been added to this document to address the concept of home fortification which comes in the form of micronutrient powder to complement existing channels for controlling micronutrient deficiencies in Nigeria.

It is my sincere hope that these guidelines will be useful for all stakeholders including the health community, development agencies, research and academics, NGOs, and the general public.

Professor C.O Onyebuchi Chukwu
Honourable Minister of Health
Federal Republic of Nigeria
Abuja
2013.
ACKNOWLEDGEMENT

The revision of these guidelines has benefited immensely from the wealth of experience of members of the Working Group, which was made up of individuals from relevant stakeholders, government agencies, development partners, academia, research institutions, NGOs, professional bodies, industries, who are specialist in the field of micronutrients deficiencies.

We appreciate the contributions of the Nutrition Division and in particular the Working Group that finalized this document, especially, Mr John Uruakpa; Ozigi Abdulsalam, Mrs Jumoke Oladapo, Mr. Tokunbo Farayibi, and Francis Aminu.

Our special thanks go to all contributors from line ministries, parastatal and agencies of government such as National Primary Health Care Development Agency (NPHCDA), Standards Organization of Nigeria (SON) and National Agency for Food and Drugs Administration and Control (NAFDAC), and Lagos State Ministry of Health.

We also expressed our profound gratitude to representatives of Global Alliance for Improved Nutrition (GAIN) and UNICEF for their financial and technical contribution, Harvest Plus, Micronutrient Initiative (MI), Partners for Development, Helen Keller International (HKI), Save the Children, International Institute of Tropical Agriculture (IITA), University of Ibadan, Federal University of Agriculture, Abeokuta, Ahmadu Bello University, Zaria are appreciated for their technical assistance. Very deep appreciation to the private sector especially, Bio-Organic Nutrient Systems Ltd and BioChemical Derivatives.

The technical guidance of Dr. Chris Isokpunwu and his team from the Nutrition Division is highly recognized.

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Director Family Health
Abuja.
2013
PREAMBLE

Despite the efforts made by Government at all levels in Nigeria to improve the nutritional status of its citizens, especially women and children under 5 years of age, approximately 40% of the children under the age of 5 are stunted with no improvement over time. With 10 million children less than 5 years stunted, malnutrition in Nigeria is alarmingly high and has not significantly improved during the last 10 years. Malnutrition is found to be worse in northern regions of Nigeria – but the situation is only slightly better in the South. The situation is no different with wasting (14%) and underweight (23%)(NDHS 2008). Worse still, the prevalence of anemia and micronutrient deficiencies still remains unacceptably high. With rising poverty levels, access of low income people to good quality, affordable fortified complementary foods remains a major challenge. For a country with a population of almost 160m people, the high prevalence levels of anemia and micronutrient deficiencies and their consequent negative impact on human development and national economic growth is unarguably high.

Iron deficiency and anemia are highly prevalent in older infants and young children (IYC) aged 6-23 months in Nigeria, particularly in some regions. The typical staple foods used to feed IYC in Nigeria are lacking or inadequate in the essential vitamins and minerals needed during this critical stage of rapid growth, and nutrient-rich foods such as meat, liver, and other animal-source foods that contain high amounts of highly bioavailable iron are unaffordable for most low-income families. Adding multiple vitamins and minerals to complementary food by caregivers at home is a strategy known as home fortification. This approach has been applied successfully in many settings across the globe with significant impacts on anemia reduction and improving iron status. The approach fills gaps in the diets of IYC so that the combination of breast milk, locally available foods, and these additional vitamins and minerals satisfy daily nutrient requirements.
CHAPTER ONE: PREVENTION AND CONTROL OF IRON DEFICIENCY ANAEMIA

1.0- INTRODUCTION

Iron Deficiency Anaemia (IDA) is the most common micro-nutrient deficiency in Nigeria and worldwide. Children, pregnant women, women of reproductive age and adolescent girls are mostly affected. The Nigeria Food Consumption and Nutrition Survey (NFCNS, 2001-2003) indicates very high levels of Iron deficiency among the vulnerable groups. Major causes of iron deficiency in Nigeria include: inadequate dietary intake, parasitic infestation, diseases and excessive menstrual loss. Iron deficiency usually occurs as a result of inadequate intake of iron, poor dietary bioavailability of iron, which is influenced by the form in which the iron is present in the food as well as the presence of enhancers and/or inhibitors.

There are couples of strategies that exit for control of IDA in Nigeria; however, there is need to review these strategies in term of planning, implementation and coordination to ensure reaching the most vulnerable.

1.1 BASELINE DATA COLLECTION AND ANALYSIS

In developing the guidelines for MNDC, there is need for baseline data for appropriate monitoring and evaluation. For the purposes of these guidelines, the IDA prevalence reported by the Vitamins and Mineral Deficiencies (VMD) Global Report 2009 will be used as baseline data. The report shows the current proportion of populations with Iron Deficiency anemia as it relates to Nigeria, as follows:

- 76.1 % among pre-school age children (Hb<110 g/L)
- 66.7 % among pregnant women (Hb<110 g/L)
- 62.0 % among non-pregnant women (Hb<120 g/L).

Also, relevant data on the iron content of locally available foods and the bioavailability of iron in Nigerian diets are lacking. All these are necessary for proper monitoring and evaluation of the prevention and control of IDA.

Note: However surveys should be conducted whenever these guidelines will be implemented to identify if the prevalence is greater or lower than 40%.

1.2 GOAL AND OBJECTIVES
1.2.1 **Goal**

The overall goal of intervention is to reduce IDA by 50% of its current level among women of reproductive age and children under-five years old by 2020.

1.2.2 **Objectives**

The specific objectives are:

i) To 40% coverage from the current level of iron supplementation and compliance among women of reproductive age and children.

ii) To strengthen public health interventions (sensitization of pregnant women and deworming to improve dietary intake of Iron and reduce parasitic infestation) that reduces IDA in urban and rural communities.

iii) To strengthen establishment of feasible, effective, and sustainable methods of food fortification with iron.

iv) To increase production and consumption of Iron-rich foods including iron-fortified food by 50% of current.

1.3 **INTERVENTION STRATEGIES**

Strategies for control of IDA would be based on:

- Supplementation (short term)
  - Prevention
  - Treatment
- Fortification (medium term)
- Dietary Diversification/ Biofortification (Long term)
- Control of parasitic infestation as part of public health measures

1.3.1 **Supplementation (Short-term Intervention)**

1.3.1.1 Prevention

Most efforts on iron supplementation (with folate) in the past have focused on controlling anemia in pregnant women who can be reached through the health system. However, a more preventive approach is also needed to raise iron stores of women before they become pregnant and in-between pregnancies, adolescent girls as well as infant and young children.
In order to establish a sustainable supplementation programme, the following should be put in place:

- Establish framework for integration of iron/folate supplementation into existing programmes and essential obstetric care at the different health care levels in Nigeria
- Develop sustainable structure for procurement of iron/folate nationally for distribution to vulnerable groups.
- Include iron/folate in the national essential drug list
- Distribute iron/folate through PHC centre as well as community based care givers such as TBAs, VVHWs, School teachers, CDTI etc
- Deworm preschool children twice a year
- Initiate deworming of pregnant women as per WHO guideline
- Develop advocacy and mobilization packages for promoting Iron/folate supplementation.
- Develop training manuals for trainings.
- Conduct training of trainers for TBAs, NGOs, and CBO on Iron supplementation.
- Develop and distribute IEC packages and MIS tools for data generation.
- Universal Iron supplementation for adolescent girls.

1.3.1.2 Recommended Dosage of Iron Supplements for Children, Pregnant and non-anaemic Pregnant Women, and Menstruating Women

Recommended dosage of iron supplements for children, pregnant and non-anaemic pregnant women and menstruating women to prevent anemia is presented in tables 1, 2, 3, and 4.

Table 1: Suggested Schemes for Intermittent Iron Supplementation in Preschool and School-age Children

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Preschool-age children (24-59 months)</th>
<th>School-age children (5-12 years)</th>
</tr>
</thead>
</table>

14
<table>
<thead>
<tr>
<th>Supplement composition</th>
<th>25 mg of elemental iron(^1)</th>
<th>45 mg of elemental iron(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplement form</td>
<td>Drops/syrups</td>
<td>Tablets/capsules</td>
</tr>
<tr>
<td>Frequency</td>
<td>One supplement per week</td>
<td></td>
</tr>
<tr>
<td>Duration and time interval between periods of supplementation</td>
<td>3 months of supplementation followed by 3 months of no supplementation after which the provision of supplements should restart. If feasible, intermittent supplements could be given throughout the school or calendar year.</td>
<td></td>
</tr>
<tr>
<td>Settings</td>
<td>Where the prevalence of anaemia in preschool or school age children is 20% or higher</td>
<td></td>
</tr>
</tbody>
</table>


**Notes:**
- In malaria-endemic areas, the provision of iron supplements should be implemented in conjunction with adequate measures to prevent, diagnose and treat malaria.
- Intermittent iron supplementation is a preventive strategy for implementation at population level. If a child is diagnosed with anaemia in a clinical setting, he or she should be treated with daily iron supplementation until the haemoglobin concentration rises to normal. He or she can then be switched to an intermittent regimen to prevent the recurrence of anaemia.
- As there is limited evidence for the effective dose of folic acid or other vitamins and minerals for intermittent supplementation, it is suggested providing two times the recommended nutrient intake in these age groups without exceeding the daily upper limit. Thus children 24–59 months of age may be given a dose of 300 μg (0.3 mg) of folic acid once a week, whereas older children may be given 400 μg (0.4 mg).
- Where infection with hookworm is endemic (prevalence 20% or greater) it may be more effective to combine iron supplementation with anthelminthic treatment in children above the age of 5 years. Universal anthelminthic treatment, irrespective of infection status, is recommended at least annually in these areas.
- The provision of iron supplements on an intermittent basis may be integrated into school or community programmes to reach the target populations. These programmes should ensure that the daily nutritional needs of preschool or school-age children are met and not exceeded, through the evaluation of nutritional status and intake, as well as consideration of existing anaemia and micronutrient deficiency.

\(^1\) 25 mg of elemental iron equals 75 mg of ferrous fumarate, 125 mg of ferrous sulfate heptahydrate or 210 mg of ferrous gluconate.

\(^2\) 45 mg of elemental iron equals 135 mg of ferrous fumarate, 225 mg of ferrous sulfate heptahydrate or 375 mg of ferrous gluconate.
control measures (such as provision of vitamin A supplements, fortified foods and anthelminthic therapy).

- The intermittent provision of supplements may include a behaviour communication change strategy that promotes the awareness on anaemia, its importance, address potential side effects and correct use of this product along with other practices such as hand washing with soap, prompt attention to fever in malaria settings, and measures to manage diarrhoea, particularly among younger children.

- The establishment of a quality assurance process is important to ensure that supplements are manufactured, packaged and stored in a controlled and uncontaminated environment.

- The selection of the most appropriate delivery platform should be context-specific, with the aim of ensuring that the most vulnerable members of the populations are reached. For example, if the education system is selected as delivery channel, efforts should be made to reach children who do not attend school.

- Oral supplements are available as drops or syrups or MNPs for preschool-age children, and tablets or capsules for school-age children. Liquid preparations for oral use are usually supplied as solutions, emulsions or suspensions containing one or more of the active ingredients in a suitable vehicle. All these preparations are supplied either in the finished form or, with the exception of oral emulsions.

**Table 2:** Suggested scheme for daily iron and folic acid supplementation in pregnant women

| Supplement composition | Iron: 30-60 mg of elemental iron\(^3\)  
Folic acid: 400 µg (0.4 mg) |
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>One supplement daily</td>
</tr>
<tr>
<td>Duration</td>
<td>Throughout pregnancy, iron and folic acid supplementation should begin as early as possible</td>
</tr>
<tr>
<td>Target group</td>
<td>All pregnant adolescents and adult women</td>
</tr>
<tr>
<td>Settings</td>
<td>All settings</td>
</tr>
</tbody>
</table>


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\(^3\) 30 mg of elemental iron equals 150 mg of ferrous sulfate heptahydrate, 90 mg of ferrous fumarate or 250 mg of ferrous gluconate.
Notes:

- Low dose enteric coated single formulation of iron and folic acid is encouraged to reduce the possible GIT side effects and improves uptake and adherences compliance during pregnancy.

- In settings where anaemia in pregnant women is a severe public health problem (40% of higher), a daily dose of 60 mg of elemental iron is preferred over a lower dose.

- If a woman is diagnosed with anaemia in a clinical setting, she should be treated with daily iron (120 mg of elemental iron) and folic acid (400 μg or 0.4 mg) supplementation until her haemoglobin concentration rises to normal. She can then switch to the standard antenatal dose to prevent recurrence of anaemia.

- Folic acid requirements are increased in pregnancy because of the rapidly dividing cells in the foetus and elevated urinary losses. As the neural tube closes by day 28 of pregnancy, when pregnancy may not have been detected, folic acid supplementation after the first month of pregnancy will not prevent neural tube defects. However, it will contribute to other aspects of maternal and foetal health. Give iron supplements even if folic acid is not available.

- In addition to iron and folic acid, supplements may be formulated to include other vitamin and minerals according to the United Nations Multiple Micronutrient Powders (MNP) to overcome other possible maternal micronutrient deficiencies.

- In malaria-endemic areas, provision of iron and folic acid supplements should be implemented in conjunction with measures to prevent, diagnose and treat malaria.

- Deworming of pregnant women should be initiated as preventive and treatment measure as per WHO guideline

Table 3: Suggested scheme for intermittent iron and folic acid supplementation in non-anaemic pregnant women

| Supplement composition | Iron: 120 mg of elemental iron<sup>4</sup>  
|                        | Folic acid: 2800 μg (2.8 mg) |
| Frequency              | One supplement once a week |
| Duration               | Throughout pregnancy, iron and folic acid |

<sup>4</sup> 120 mg of elemental iron equals 600 mg of ferrous sulfate heptahydrate, 360 mg of ferrous fumarate or 1000 mg of ferrous gluconate.
supplementation should begin as early as possible

<table>
<thead>
<tr>
<th>Target group</th>
<th>Non-anaemic(^5) pregnant adolescents and adult women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings</td>
<td>Areas where prevalence of anaemia among pregnant women is lower than 20%.</td>
</tr>
</tbody>
</table>

**Source:** WHO. *Guideline: Intermittent iron and folic acid supplementation in non-anaemic pregnant women.* Geneva, World Health Organization, 2012

**Notes:**

- If a woman is diagnosed with anaemia at any time during pregnancy, she should be given daily iron and folic acid supplements throughout pregnancy as per current guidelines.
- The implementation of this recommendation may require a strong health system to facilitate confirmation of non-anaemic status prior to the start of supplementation and to monitor anaemia status throughout pregnancy.
- As there is limited evidence for the effective dose of folic acid in intermittent supplementation, the recommendation for the folic acid dosage is based on the rationale of providing seven times the recommended daily supplemental dose during pregnancy. Folic acid requirements are increased in pregnancy because of the rapidly dividing cells in the foetus and increased urinary losses. As the neural tube closes by day 28 of pregnancy, by when pregnancy may not have been detected, folic acid supplementation after the first month of pregnancy may not prevent neural tube defects. However, it will contribute to other aspects of maternal and fetal health.
- In malaria-endemic areas, iron and folic acid supplementation programmes should be implemented in conjunction with measures to prevent, diagnose and treat malaria during pregnancy.
- An iron supplementation programme may form part of an integrated programme of antenatal and neonatal care that promotes adequate gestational weight gain, screening of all women for anaemia at antenatal and postpartum visits, use of complementary measures to control and prevent anaemia (e.g. hookworm control), and a referral system to manage cases of severe anaemia.
- The implementation of a behaviour change communication strategy to communicate the benefits of the intervention and management of side-effects, along with provision

\(^5\) Haemoglobin concentrations should be measured prior to the start of supplementation to confirm non-anaemic status.
of high-quality products with appropriate packaging, is vital to improving the acceptability of and adherence to recommended supplementation schemes. The strategy can also serve to promote the use of dietary diversity and intake of food combinations that improve iron absorption.

- Oral supplements are available as capsules or tablets (soluble, tablets, dissolvable and modified-release tablets). Establishment of a quality assurance process is important to guarantee that supplements are manufactured, packaged and stored in a controlled and uncontaminated environment.

- The selection of the most appropriate delivery platform should be context-specific, with the aim of reaching the most vulnerable populations and ensuring a timely and continuous supply of supplements.

Table 4: Suggested scheme for intermittent iron and folic acid supplementation in menstruating women

| Supplement composition | Iron: 60 mg of elemental iron\(^6\)  
<table>
<thead>
<tr>
<th></th>
<th>Folic acid: 2800 µg (2.8 mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>One supplement per week</td>
</tr>
<tr>
<td>Duration and time</td>
<td>3 months of supplementation followed by 3 months of no supplementation after which the provision of supplements should restart. If feasible, intermittent supplements could be given throughout the school or calendar year</td>
</tr>
<tr>
<td>interval between periods of supplementation</td>
<td></td>
</tr>
<tr>
<td>Target group</td>
<td>All menstruating adolescent girls and adult women</td>
</tr>
<tr>
<td>Settings</td>
<td>Populations where the prevalence of anaemia among nonpregnant women of reproductive age is 20% or higher</td>
</tr>
</tbody>
</table>


**Notes:**

- Intermittent iron and folic acid supplementation is a preventive strategy for implementation at population level. If a woman is diagnosed as having anaemia in a clinical setting, she should be treated with daily iron (120 mg of elemental iron) and folic acid (400 µg or 0.4 mg) supplementation until her haemoglobin concentration

\(^6\) 60 mg of elemental iron equals 300 mg of ferrous sulfate heptahydrate, 180 mg of ferrous fumarate or 500 mg of ferrous gluconate.
rises to normal. She can then switch to an intermittent regimen to prevent recurrence of anaemia.

- As there is limited evidence for the effective dose of folic acid in intermittent supplementation, the recommendation for the folic acid dosage is based on the rationale of providing seven times the recommended supplemental dose to prevent neural tube defects (400 μg or 0.4 mg daily). Further limited experimental evidence suggests this dose can improve red cell folate concentrations to levels associated with a reduced risk of neural tube defects.

- In malaria-endemic areas, the provision of iron and folic acid supplements should be made in conjunction with adequate measures to prevent, diagnose and treat malaria. The provision of iron and folic acid supplements on an intermittent basis can be integrated into national programmes for adolescent and reproductive health. However, to ensure that the daily needs are met and not exceeded, supplementation should be preceded by an evaluation of the nutritional status of women of reproductive age and of the existing measures to control anaemia and folate insufficiency, such as programmes for hookworm control, food fortification or adequate diet promotion.

- Intermittent iron and folic acid supplements could be given to women planning pregnancy to improve their iron stores. On confirmation of pregnancy, women should receive standard antenatal care including daily or intermittent iron and folic acid supplementation depending on their anaemia status.

- The establishment of a quality assurance process is important to guarantee that supplements are manufactured, packaged and stored in a controlled and uncontaminated environment according to pre-specified conditions (e.g. colour and size of pills).

- The implementation of a behaviour change communication strategy to communicate the benefits of the intervention and management of side effects, along with provision of high-quality supplements with appropriate packaging, may improve the acceptability and adherence to iron and folic acid supplementation. Such a strategy can also serve to promote dietary diversification and the intake of food combinations that improve iron absorption.
• The selection of the most appropriate delivery platform should be context specific, with the aim of reaching the most vulnerable populations and ensuring a timely and continuous supply of supplements.

• Oral supplements are available in tablet and capsule form. Tablets (soluble tablets, effervescent tablets, dissolvable tablets for use in the mouth, and modified-release tablets) are solid dosage forms containing one or more active ingredients. They are manufactured by single or multiple compression (in certain cases they are moulded) and may be uncoated or coated. Capsules are solid dosage forms with hard or soft shells, which are available in a variety of shapes and sizes, and contain a single dose of one or more active ingredients. Capsules are intended for oral administration and may allow modified release of their contents.

1.3.1.3 Treatment of Severe Anaemia in Children, Adolescents and Adults

The prevalence of anaemia, defined by low haemoglobin or hematocrit, is commonly used to assess the severity of iron deficiency in a population (Table 5). Severe anaemia is clinically defined as haemoglobin (Hb) concentration of <7.0g/dL, or haematocrit <20% or clinically extreme pallor of conjunctiva, palm or nail beds. In most cases, referral to specialized clinic, doctor or hospital is required. This is especially necessary in children with signs of respiratory distress or cardiac abnormalities (laboured breathing at rest or oedema).

Table 5: Haemoglobin and hematocrit cut offs used to define anaemia in people living at sea level

<table>
<thead>
<tr>
<th>Age or sex group</th>
<th>Haemoglobin below: g/dL</th>
<th>Hematocrit below: %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 6 months to 5 years</td>
<td>11.0</td>
<td>33</td>
</tr>
<tr>
<td>Children 5-11 years</td>
<td>11.5</td>
<td>34</td>
</tr>
<tr>
<td>Children 12-13 years</td>
<td>12.0</td>
<td>36</td>
</tr>
<tr>
<td>Non-pregnant women</td>
<td>12.0</td>
<td>36</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>11.0</td>
<td>33</td>
</tr>
</tbody>
</table>
Table 6: Guidelines for oral iron and folate therapy to treat severe anaemia in Children, adolescents and adults

<table>
<thead>
<tr>
<th>Age group</th>
<th>Dose</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2 years</td>
<td>25 mg iron + 100-400 µg folic acid daily</td>
<td>3 months</td>
</tr>
<tr>
<td>2-12 years</td>
<td>60 mg iron + 400 µg folic acid daily</td>
<td>3 months</td>
</tr>
<tr>
<td>Adolescents and adults, including pregnant women</td>
<td>120 mg iron + 400 µg folic acid daily</td>
<td>3 months</td>
</tr>
</tbody>
</table>

Note:
- Patients treated on out-patient basis should return for evaluation 1 week and 4 weeks after initiation of supplementation for follow up visits.
- After completing 3 months of therapeutic supplementation, pregnant women and infants should continue preventive supplementation regimen.
- Children with Severe Acute Malnutrition should be assumed to be severely anaemic. However, oral iron supplementation should be delayed until the child regains appetite and starts gaining weight, usually after 14 days.

1.3.1.4 Supply and Logistics

All tiers of government (National, State and LGA) should be responsible for procurement and distribution. As part of government’s procurement plans, Iron/folate and anti-helmenthics should be sustained in the essential drug list. It is expected that Government will fully procure iron supplement and deworming tablets by the year 2020. In addition to this, iron/folate supplies procured by other agencies and developmental partners and private sector should be incorporated into the national procurement and distribution plans. Thus, LGAs are to collect and distribute Iron/folate for target beneficiaries through PHC structures, primary schools, CDTI structures etc.
1.3.1.5 Service Delivery System
In an effort towards effective integration of the various intervention strategies for the control of Iron deficiency anaemia, the following service delivery system, among others, are to be used:

Existing structure for service delivery should be used including:

- Routine Child Welfare
- Antenatal Care Services
- MNCHW services
- Community – Based Care Services (TBAs VVHW)
- School Health Services
- CDTI and other avenues e.g. RBM
- NGO, CBOs
- Agricultural extension services.

1.3.1.6 Chemical Form of Supplement
Iron is usually given as ferrous sulphate in capsule, tablet or elixir for the control of iron deficiency anaemia. Iron/folate is given in special cases as indicated.

1.3.1.7 Potential Toxicity and Side Effects
Iron/folate has no potential toxicity; however transient side effects like nausea, epigastric pains, constipation and diarrhoea related to dosage do exist.

1.3.1.10 Adherence
NDHS 2008 shows that the percentage of women who take iron supplements for 90 days and above is 14.5% nationally. Common barrier to compliance have been identified to include side effects like nausea, vomiting, constipation, unusual strol coloring, abdominal pains and metallic task. It is therefore important to develop BCC interventions targeted at the health care providers, various community group including pregnant women and community health workers in order to address the barrier to compliance.

1.3.2 Food Fortification (Medium-term Intervention)
Currently fortification of wheat flour with iron and folic acid is mandatory (NIS 121:2010). Food fortification through addition of nutrients that may or may not be present naturally
in the food to improve its overall nutritional quality has proven to be effective in both prevention of iron deficiency disorders and sustenance of adequate status of the population. The most important criteria for choosing the iron source for fortification are bioavailability and safety. The iron fortificant should be bio-available, stable and compatible with the food vehicle and be of proven efficacy. The fortified food should equally be acceptable and affordable. Current status of iron fortification of foods in Nigeria includes:

- Pilot studies on feasibility, effectiveness and efficacy of salt iodization with Iron.
- Continue efforts on bio-fortification of staple foods with Iron (Millet, beans and rice).
- Use of MNP for home fortification

1.3.3 Dietary Diversification (Long-term intervention)

Dietary Diversification means consumption of as many varieties of foods and animal products as possible, especially locally available foods these include grains & tubers, legumes & nuts, daily products, meat, poultry, fish and fruits and vegetables. This is aimed at increasing the consumption of iron-rich foods and absorption of iron in foods. Besides it also includes production of iron rich foods at home and community at affordable cost. Among practices to be promoted for dietary diversification, intra-house food distribution should be considered. Priority should be given to the vulnerable groups (under 5, pregnant and lactating women) for consumption of iron-rich foods. To achieve the objectives of dietary diversification, the following practices are necessary, and should be promoted.

- Increase intake of iron-rich foods
- Encourage household practices that promote the production and consumption of iron-rich fruits and vegetables.
- Encourage food preparation practices that reduce iron loss e.g. washing vegetables before cutting.
- Increase intake of foods which enhance non-heam iron absorption
- Avoid simultaneous intake of foods and beverage with meals to prevent inhibition of non-heam iron absorption.
- Promote food processing methods that reduce phytic acid levels in cereals and legumes and whole grains e.g through fermentation, soaking, germination and de-hulling.
- Encourage the use of mixed diets at household and community levels with citrus fruits.
- Promote back yard and school gardening for production of iron-rich foods/fruits.
- Promote adequate complementary feeding.

1.3.4 Control of Parasitic Infestation

1.3.4.1 Control of Intestinal Parasites

Some intestinal parasites especially hookworm and whipworm can induce iron deficiency mainly through blood loss from the gut. Control of these intestinal parasites through regular de-worming of children in addition to improved personal hygiene and domestic hygiene will be beneficial.

Specific activities to control parasitic infestation include the following:
- De-worming of pre-school and school-age children nationwide twice a year using PHC structures and other mechanisms.
- Prompt diagnosis and treatment of parasitic infection and diseases associated with IDA.
- Health education to reduce parasitic infestation and infection.
- Deworming of pregnant women and adolescents.
- Provision of portable water (clean water).
- **Promotion of personal hygiene.**

1.3.4.2 Treatment for parasites to prevent Anaemia

For Children above 12 months to five years of age

Mebendazole 500
1 tablet; 12-59 months

Or

Albendazole 400
½ tablet 12-23 months
1 tablet                        24 – 59months
Or
Albendazole               200
1 tablet                       12- 23months
2 tablets                      24 – 59 months

1.4 TRAINING NEEDS

For effective implementation of this guidelines, a training manual will be
developed for the training at all levels, various cadres of caregivers will be trained
and updated on the guidelines and strategies for control. The groups that would
require training include:

i) Primary Health Care Personnel(JCHEWs, CHEWs, CHOa,among others)
ii) Agric Extension Workers
iii) Nutritionists
iv) DieticianHome Economists
v) Staff of Regulatory Agencies
vi) Information & Education Officers/groups
vii) Community Based Care givers (TBAs, VVHWs, Red Cross, First Aiders,
CDDs etc.)
viii) Doctors, Nurses, Pharmacist, school teachers and other relevant
personnel

1.5 MONITORING AND EVALUATION

Effective mechanism is necessary for the monitoring of the performance plan of the
different strategies.

Appropriate indicators that should be monitored include:
Capacity building
- Number of health workers trained.

Supplementation
- % of children U5 who received Iron supplement in the last 2 months
- Proportion of adolescent girls who received iron supplement in the last 2 months.
- Proportion of Women within reproductive age who receive Iron supplements in the last 2 months.
- Proportion of children dewormed.

**Food Fortification**
- Availability of staple foods that has been mandatorily fortified with iron
- Proportion of household consuming iron fortified staple food stuffs (biofortified, MNP, Premix and mandatory fortified).

In addition to the monitoring and enforcement of mandatorily fortified foods and products, any voluntarily fortified foods with claims should be subjected to assessment.

**Dietary diversification**
- % of Households with access to iron-rich foods in sample communities
- % of Households consuming foods rich in iron
- Proportion of Households with backyard garden producing foods rich in iron.

### 1.6 RESEARCH NEEDS

1) Iron content of different foods/diet consumed in Nigeria
3) Rapid assessment techniques in community diagnosis of Iron Deficiency.
4) Instituting Surveillance System on iron status of the vulnerable groups
5) Assessment of impact of supplementation, food fortification, and dietary diversification programmes on the vulnerable groups.
6) Issues on adherence levels of target groups
7) Periodic assessment of Compliance level of food fortification
8) Periodic assessment of supply chain management system for effective coverage
9) Latest prevalence data on anemia and IDA-national and states level with factors associated
CHAPTER TWO: PREVENTION AND CONTROL OF VITAMIN A DEFICIENCY

2.0 INTRODUCTION

Vitamin A (retinol) is an essential fat-soluble nutrient needed in small amounts for the normal functioning of the visual system, growth and development; maintenance of epithelial integrity; immune function; reproduction and child survival.

There are plant and animal sources of vitamin A. These include green leafy vegetables, yellow fruits, carrots, red palm oil, biofortified crops, egg yolk, liver, milk, meat, dairy and other animal products.

The pro vitamin A (PVA) carotenoids derived from plant sources are biologically less active than retinol and are converted to retinol in the intestinal wall. They constitute the most common sources of vitamin A to most families and communities in Nigeria.

About 50 to 90% of ingested retinol is absorbed in the small intestine.

Safe daily vitamin A requirements vary from 180mg to 450 mg/day of retinol or its equivalent. This is dependent on age, sex and physiological status of the individuals.

Vitamin A deficiency (VAD) is a situation in which serum retinol level falls below 10ug/dl or 20 ug/dl. It results from conditions in which prolonged low intake, often due to low supply, result in depletion of liver stores and consequent fall in serum levels from normal (above 20ug/L) through marginal deficiency levels (between 10 ug/L to 20 ug/L) to low (less than 10 ug/L).

Consequences of vitamin A deficiency include impaired cellular function, abnormal cellular differentiation and other physiological and clinical manifestations.

Ecological, economic and socio-cultural factors operating at both the macro environment (regions and countries) and the microenvironment (communities and households) influence the epidemiology of vitamin A Deficiency. Because of the varying levels of these factors in different communities, Vitamin A Deficiency tends to cluster rather than
being evenly distributed. Therefore, nationally designed intervention strategies must be amenable to modifications, to be effective and appropriate to address specific local conditions.

2.1 BASELINE DATA COLLECTION AND ANALYSIS
Available data from the VMD Global Report 2009 give the following national prevalence levels for vitamin A deficiency:

- Children under five - 29.5%
- Night blindness in pregnant women – 7.7%

In summary, the data show that VAD is a public health problem in Nigeria

2.2 GOAL AND OBJECTIVES

2.2.1 Goal
The overall goal of intervention is virtual elimination of VAD as cause of morbidity and mortality among the vulnerable groups by the year 2020.

2.2.2 Objectives:
- To integrate vitamin A control programme with other related micronutrient dietary programmes.
- To achieve at least 80% coverage of children 6-59 months bi-annually with vitamin A supplements by the year 2020.
- To ensure that at least 80% of households in Nigeria have access to and consume food mandatorily fortified, biofortified and home fortified with standard levels of Vitamin A by the year 2020.
- To establish an effective monitoring, evaluation and assessment systems in order to determine the performance of vitamin A deficiency control programmes.
- All States have the capacity to assess the compliance of vitamin A fortification.

2.3 INTERVENTION STRATEGIES
The major intervention strategies include supplementation, food fortification, dietary diversification, biofortification and other public health measures. Supplementation is a feasible alternative in the short term, especially if the distribution mechanism is efficient. However, in Nigeria, the major constraint to supplementation is the limited coverage of the target population and also cost of delivery to beneficiaries.

Food fortification normally is the most cost-effective option, technically feasible, and cost of fortification with vitamin A is marginal for the industry and consumer.

Dietary diversification is a sustainable food-based strategy, which is being promoted in Nigeria, largely through nutrition education, and establishment of home and community gardens. This intervention requires behavioural change, it is therefore a long-term strategy. Other constraints include socio-economic factors, such as ignorance; poverty and cultural taboos, which preclude consumption of vitamin A-rich foods by some population groups.

### 2.3.1 Supplementation (Short-term)

#### 2.3.1.1 Prevention

Large-scale biannual vitamin A supplementation for 6-59 months children shall be implemented using the MNCH weeks and routine immunization at PHC Centres.

#### 2.3.1.2 Treatment

High risk children i.e. children who have, measles and diarrhoea at the first point of contact with the health system (Table 8)

#### 2.3.1.3 Dosage

**Table 8: Suggested Vitamin A Supplementation Scheme for Infants and Children 6-59 months of age**

| Target group | Infants 6-11 months of age | Infants 12-59 months of age |
2.3.1.3 Treatment Dosages of Vitamin A for Children

<table>
<thead>
<tr>
<th>Category</th>
<th>Timing</th>
<th>Age</th>
<th>Dosage (IU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Children with eye signs or recent measles</td>
<td>Day 1</td>
<td>&lt; 6 months</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 – 11 months</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 – 59 months</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td>Day 2</td>
<td>Same age-specific dose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Day 15</td>
<td>Same age-specific dose</td>
<td></td>
</tr>
</tbody>
</table>

Treatment dosages of vitamin A are given if:

- The child has visible clinical signs of vitamin A deficiency: Bitot’s spots, corneal clouding or corneal ulceration or

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* An oil-based vitamin A solution can be delivered using soft gelatin capsules, as a single-dose dispenser or a graduated spoon. Consensus among manufacturers to use consistent colour coding for the different doses in soft gelatin capsules, namely red for the 200,000 IU capsules and blue for the 100,000 IU capsules, has let to much-improved training and operational efficiencies in the field.
• The child has measles now or has had measles in the past 3 months.

The treatment doses are given regardless of the SAM status, on day 1, day 2 and at least 2 weeks later, preferably on day 15.

Table 10: Timing and Oral Preventive Dosages of Vitamin A for Children with SAM

<table>
<thead>
<tr>
<th>Category</th>
<th>Timing</th>
<th>Age</th>
<th>Dosage (IU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Children*</td>
<td>After 4 weeks or upon discharge</td>
<td>&lt;6 months</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>Child is free of oedema.</td>
<td>6 – 11 months</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 – 59 months</td>
<td>200,000</td>
</tr>
</tbody>
</table>

*Unless definite evidence of a dose in the last month and no eye signs

• Oral treatment with vitamin A is standard. However, for children with severe anorexia, oedema or septic shock, Intra-muscular (IM) treatment is preferred for the first dose only.
• For oral administration, an oil-based formulation is preferred. For IM treatment, only water-based formulations should be used. The IM dosages are 100,000 IU (water-based) except for children under age 6 months, who should be given 50,000 IU.

Table 11: Vitamin A Supplementation for Treatment Protocol

**TREATMENT PROTOCOL**

As soon as the diagnosis for xerophthalmia or measles is made according to age…

<table>
<thead>
<tr>
<th>Timing</th>
<th>Dosage (IU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 months</td>
<td>50,000</td>
</tr>
<tr>
<td>6 – 11 months</td>
<td>100,000</td>
</tr>
<tr>
<td>&gt; 12 months</td>
<td>200,000</td>
</tr>
</tbody>
</table>

The next day

The day after the diagnosis for chronic diarrhoea or SAM (< -3 SD) is made according to age…

<table>
<thead>
<tr>
<th>Timing</th>
<th>Dosage (IU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6 months</td>
<td>50,000</td>
</tr>
<tr>
<td>6 – 12 months</td>
<td>100,000</td>
</tr>
<tr>
<td>&gt; 12 months</td>
<td>200,000</td>
</tr>
</tbody>
</table>

According to WHO 2011 Guideline
2.3.1.5 Vitamin A Supplementation for Women of Reproductive Age:
According to WHO guideline 2011\(^8\), Vitamin A supplementation in postpartum women is no longer recommended as a public health intervention for the prevention of maternal and infant morbidity and mortality (strong recommendation). Further remarks include:

- The guideline replaces and updates previous recommendations on vitamin A supplementation in mothers for the prevention of vitamin A deficiency and for improving the vitamin A status of mothers and their infants.
- Postpartum women should be encouraged to receive adequate nutrition, which is best achieved through consumption of a balanced healthy diet, and to refer to guidelines on healthy eating during lactation.
- Recommendations for the treatment of xerophthalmia are not covered in this guideline. Existing guidelines for the treatment of xerophthalmia in women of reproductive age should be referred to in these cases.

2.3.1.6 Vitamin A Supplementation for Pregnant Women:
- Do not give vitamin A capsules to pregnant women or those who could be pregnant, as the vitamin A could lead to foetal defects.
- According to the WHO Guideline (2011) Vitamin A supplementation in pregnancy is not recommended as part of routine antenatal care for the prevention of maternal and infant morbidity and mortality. However, in areas where vitamin A deficiency is considered a severe public health problem (i.e., where the prevalence of night blindness in pregnant women or children 24-59 months of age is ≥5%).
  - Note that recommendations for the treatment of xerophthalmia are not covered in this guideline. Existing guidelines for the treatment of xerophthalmia in pregnant women should be referred to in these cases.
  - Vitamin A supplementation is recommended in pregnancy for the prevention of maternal night blindness. The recommended dose of vitamin A

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supplementation during pregnancy is up to 10,000 IU daily OR up to 25,000 IU weekly for at least 12 weeks. Higher doses are contra-indicated because of the risk of vitamin A toxicity.

- Advise all pregnant women to eat a piece of liver once a week as a preventive measure.
- If a pregnant woman suffers from night blindness, advise her to eat a piece of liver once a day as a curative measure.

- Vitamin A supplementation in HIV-positive pregnant women is not recommended as a public health intervention for the prevention of mother-to-child transmission of HIV. Results of existing trials indicate that vitamin A supplementation had no impact on mother-to-child transmission of HIV among children followed up from 3-24 months of age and no effect on maternal or young child mortality. However, HIV – positive mothers are encouraged to eats foods rich in vitamin A.

### 2.3.1.4 Supply and logistics

All tiers of government (National, State and LGA) should be responsible for procurement and distribution. As part of government’s procurement plans. It is expected that Government will fully procure vitamin A supplement by the year 2020. In addition to this, vitamin A supplies procured by other agencies and developmental partners and private sector should be incorporated into the national procurement and distribution plans. Thus, LGAs are to collect and distribute vitamin A for target beneficiaries through PHC structures, primary schools, CDTI structures etc

### 2.3.1.5 Service Delivery System

In an effort towards effective integration of the various intervention strategies for the control of VAD in a sustainable manner, vitamin A supplementation should piggy-back into the following service delivery structures:

- Routine Child Welfare
- MNCHW services
- Community – Based Care Services (TBAs, VVHW)
- School Health Services
2.3.1.6 Chemical Form of Supplement

The nation should continue to use the currently available retinyl palmitate.

2.3.1.7 Potential Toxicity and Side Effects

Doctors, Nurses and other health workers operating in areas where high dosage Vitamin A supplementation is being conducted should be made aware of the possibility of toxicity of over dosing and transient side effects of vitamin A supplements. Protocol for the recognition of the symptoms and signs of toxicity and side effects of vitamin A should be made available to these workers to enable them participates in management of both acute and chronic toxicity. The protocol should specify what the health worker must do when a side effect or toxicity occurs, including treatment options.

2.3.2 Food Fortification (Medium-Term Intervention)

There is a mandatory fortification of selected food vehicles such that at least 80% of households have access to food fortified with Vitamin A by 2002. Meal programmes for schools and other institutions should include foods fortified with Vitamin A. This will ensure that all persons at risk of VAD have access to and consume Vitamin A fortified foods by the year 2020.

Other issues in vitamin A fortification include:

- Fortification of appropriate food vehicles including enrichment and replacement of lost Vitamin A in processed foods. In Nigeria the following food vehicles have been approved for mandatory fortification with vitamin A.
  - Vegetable oil 20,000 iu/kg
  - Wheat Flour 30,000 iu/kg
  - Sugar 25,000 iu/kg
• In addition to vegetable oil, wheat flour and sugar, fortification of margarine and butter are also mandatory at the level 26,000-33,000 IU/kg.

• Wheat Flour is not the only flour base identified for vitamin A fortification, maize flour and other flour based are mandatory for fortification at the same level.

• Retinyl palmitate will remain the form of Vitamin A for use in Nigeria’s fortification programme.

• Existing regulatory agencies (SON and NAFDAC) should be strengthen, monitor and enforce compliance with the fortification requirements at the key stages of importation, manufacturing and retailing.

• As a result of the difficulties in assaying Vitamin A, there should be Zonal laboratories appropriately equipped and staffed to test for Vitamin A levels in fortified foods and help quality control by manufacturing industries.

• Reward the industries that comply and sanction those that do not comply with approved levels of fortification.

2.3.3 Biofortification (Long-Term Intervention)

“Biofortification” is a new strategy that complements other micronutrient deficiencies control strategies to improve health. It makes agriculture deliver necessary nutrients naturally through the foods we eat, more cost efficiently and sustainably, as it involves the development of micronutrient – dense staple crops using traditional breeding practices. It differs from fortification because it focuses on making plant foods more nutritious as the plant is growing rather than having nutrients added to the food when they are being processed. A typical and well-known biofortified food in Nigeria is the pro-vitamin A biofortified Cassava, others are orange fleshed sweet potato and orange maize.

The delivery strategy should focus on creating a consumer demand (pull strategy) in combination with a strong emphasis on rootstock multiplication. In order to be successful the combined push and pull strategy will need to address all four program pillars:

• Rootstock multiplication.

• Farmer extension services.

• Nutrition and food processing.
• Branding, marketing and strategic advocacy.

2.3.4 Dietary Diversification (Long-term Intervention)
The long-term strategy for Vitamin A control would be through dietary diversification /modification. The mechanisms for this would include:
- Production and consumption of Vitamin A rich foods.
- Nutrition education of the public and inclusion in school curricula on consumption of Vitamin A rich foods.
- Social marketing techniques aimed at increasing acceptability, demand and consumption of foods containing vitamin A.

2.3.5 Other Support Public Health Measures
Measures to prevent and control diseases and infections known to worsen the Vitamin A status of individuals and communities should continue to be implemented. Such diseases include measles and diarrhoea.

2.4 TRAINING NEEDS

For effective implementation at all levels, various cadres of caregivers will be trained and updated on the guidelines and strategies for control. The groups that would require training include:

i) Primary Health Care Personnel (JCHEWs, CHEWs, CHO, among others)
ii) Agric Extension Workers
iii) Nutritionists
iv) Dieticians
v) Home Economist
vi) Staff of Regulatory Agencies
vii) Information & Education Officers/groups
viii) Community Based Care givers (TBAs, VVHWC, Red Cross, First Aiders, CDDs etc.)
ix) Doctors, Nurses, Pharmacist, school teachers and other relevant personnel
**Note:** A standard training manual for all mechanisms should be made available to institutions training relevant personnel including health workers for inclusion in their curriculum.

### 2.5 MONITORING AND EVALUATION

Effective mechanism is necessary for the monitoring of the performance plan of the different strategies using appropriate indicators such as:

**Supplementation**
- % of children 6-59 months who received vitamin A supplements in the last 6 months

**Food Fortification**
- Proportion of flour, sugar and vegetable oil sold in Nigeria that is fortified with vitamin A.
- Proportion of household consuming vitamin A fortified staple food stuffs (biofortified, MNP, Premix and mandatory fortified)

**Dietary diversification**
- % of Households with access to vitamin A-rich foods in sample communities
- % of Households consuming foods rich in vitamin A
- Programme of HHs with backyard garden producing foods rich in vitamin A.

### 2.6 RESEARCH NEEDS

There is a need for further studies in the following areas:

- Recent prevalence data of vitamin A deficiency (clinical and sub-clinical status at national and state levels)
- Knowledge, attitudes and food practices related to Vitamin A rich foods
- Vitamin A content of Nigerian foods – raw, processed and cooked
• Stability of vitamin A in fortified foods
• Operational research on the processes of vitamin A fortification
CHAPTER THREE

PREVENTION AND CONTROL OF IODINE DEFICIENCY

3.0 INTRODUCTION

Iodine is one of the mineral nutrients required by the body in trace or minute quantities. A person requires only about a teaspoonful of iodine throughout his lifetime; a minimum daily requirement of about 50 ug. It is a vital raw material required by the thyroid gland for the manufacture of its product called thyroid hormones. These products are chemical messengers through which the brain regulates and control important body functions. In particular, thyroid hormones stimulate the body processes responsible for tissue growth and development, and proper development of the brain. Thus, when the diet lacks iodine these functions are impaired and, in prolonged chronic deficiency, may result in any of the definite disease conditions, called iodine deficiency disorders (IDD).

Iodine deficiency disorders manifest clinically in various forms, ranging from relatively mild afflictions like simple goiter in mild deficiency to mental and growth retardation and cretinism in severe deficiency. IDD is considered a serious public health problem because the intellectual and physical impairments associated with it have serious social and economy implications. Besides, the consequences of iodine deficiency are most telling at the developmental and critical growing stages of human life, that is, foetal and infant stages. Iodine deficiency has been described as the single greatest cause of preventable mental retardation in the world today.

Consequently, the World Health Organization in 1990 passed a resolution on global eradication of IDD which was subsequently endorsed by the World Health
Assembly and the World Summit on Children. The goal was virtual elimination of IDD by the year 2000. Nigeria was a signatory to that resolution.

3.1 BASELINE DATA COLLECTION AND ANALYSIS

Prior to the WHO resolution on virtual elimination of IDD, there had been ample evidence that many populations in Nigeria were at risk of IDD. Isolated regional survey had indicated IDD endemic areas in different parts of the country. A national benchmark survey conducted in 1993 indicated a 20% prevalence rate for IDD as grades 1 and 2 goiter, with an estimated 25-35 million Nigerians at risk. The findings of the survey served to fine-tune the then emergent initiative for a national IDD eradication programme. Subsequent national surveys have confirmed that IDD constitutes a public health problem in Nigeria. The National Food Consumption and Nutrition Survey (NFCNS 2001-2003) indicated the following prevalence.

<table>
<thead>
<tr>
<th>Population</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under – 5 children</td>
<td>13.0%</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>10.5%</td>
</tr>
<tr>
<td>Nursing mothers</td>
<td>13.0%</td>
</tr>
</tbody>
</table>

A population is considered at risk of IDD if the total goiter rate (TGR) of the school-age sub-population is greater than 5% and/or the mean daily urinary excretion of iodine in the given population is less than 50 ug; a value less than 25 ug indicates severe deficiency.

Also important to state salt iodisation data
3.2 GOAL AND OBJECTIVES

3.2.1 Goal
The overall goal of intervention is the virtual elimination of IDD by the year 2020.

3.2.2 Objectives
- To increase to > 90% the proportion of household that have access to adequately iodized salt from the current level by 2020.
- To sustain universal salt iodization

3.3 INTERVENTION STRATEGIES
Two strategies commonly adopted in micronutrient deficiencies control are generally applicable to IDD: food fortification (medium term) and dietary diversification (long term)

3.3.1 Food fortification (medium term)

3.3.2 As part of government plan to eradicate IDD, table salt was iodized in the country which resulted into achieving 98% of salt iodization in the country and corresponding certification of Nigeria as universal salt iodization in 2005. However, there seem to be a decline in the 98% achieved. Therefore, there is an urgent needs to strengthen the enforcement at all levels especially by SON and NAFDAC to ensure total compliance and sustain of salt iodization in the country. Also, there is need to control uniodized salt that sneak into the country through our porous border.

Iodization of edible salt has proved the most efficient method of IDD control. Since 1990 following WHO resolution, emphasis has been on achieving USI. The main strategy that was adopted and currently being pursued by the Government of Nigeria. Successful food fortification
requires long term commitment of government through the following activities;

- Universal salt iodization (USI) backed by legislation
- Iodization of centrally controlled municipal water supply
- Enact the requisite legislations

- Establish and empower a regulatory/enforcement agency
- Establish a functioning quality assurance and monitoring system
- Establish effective partnership with the salt manufacturing industry and major salt importers/distributors
- Establish effective partnership with international donor agencies.
- Institute a sustainable system of technical assistance to traditional and/or very small-scale producers of good salt.

3.3.3 Dietary diversification (long term)

Dietary diversification means the consumption of as many varieties of food as possible especially locally available foods. This is aimed at

- Increasing production and availability of foods rich in iodine.
- Promoting iodine-rich foods (fresh sea foods) production and consumption at the community level.
- Encouraging a diet diversified to include natural and fortified iodine rich foods.
- Education on proper handling of salt (e.g. dissuading traditional habits of preserving by smoking/baking).

Key to this strategy is changing people’s dietary choices and practices. Program planners need to choose the most feasible and acceptable behaviours to promote, overcome identified barriers to new ideas, and support positive practices. The new practices can be disseminated and popularized through
national campaigns, the media, and community workers, mothers’ groups, extension agents, religious leaders, and teachers.

**TRAINING NEEDS**

For effective implementation at all levels, various cadres of caregivers will be trained and updated on the guidelines and strategies for control. The groups that would require training include:

i) Primary Health Care Personnel (JCHEWs, CHEWs, CHO, among others)

ii) Agric Extension Workers

iii) Nutritionists

iv) Dieticians

v) Home Economist

vi) Staff of Regulatory Agencies

vii) Information & Education Officers/groups

viii) Community Based Care givers (TBAs, VVHWC, Red Cross, First Aiders, CDDs etc.)

ix) Doctors, Nurses, Pharmacist, school teachers and other relevant personnel

**Note:** A standard training manual for all mechanisms should be made available to institutions training relevant personnel including health workers for inclusion in their curriculum.

### 3.3.4 MONITORING AND EVALUATION

Monitoring and evaluation is an indispensable component for a successful and sustainable IDD eradication programme. An effective monitoring and evaluation regime must in turn, have the following indispensable components:
Regular reviews of fortification levels at factory (quarterly),
distribution/retail (bi-annually) and household levels (annually) by
appropriate agencies/ institutions.

An effective recording and reporting system that ensures prompt feedback.

Continuous impact assessment of fortification programme (USI).

Monitoring of cross-border trade in the iodine food vehicle, especially across borders with countries that do not have effective fortification programme

Monitoring of technical assistance given to traditional producers of iodine food vehicles at the community level.

3.3.5 RESEARCH NEEDS

Research efforts should focus on:

- Pockets of resistance to USI achievement
- Clinical studies of hyperthyroidism
- Iodization of feed-grade salt
- Double or multiple fortification of table grade salt with iodine and other nutrients.

Note: Supplementation and dietary diversification strategies are not accommodated in Nigeria’s IDD eradication programme. The IDD control programme is being prosecuted solely through USI as available evidence from successful IDD eradication programmes elsewhere have shown that a faithfully implemented USI strategy is sufficient to eliminate IDD. Specifically, it has been shown that provided that all the population at risk has daily access to adequately iodized salt, the body’s requirements would be met through consumption of iodized salt and that no supplementation or dietary diversification is needed. The entire population at risk is the target group.
CHAPTER FOUR:
PREVENTION AND CONTROL OF ZINC DEFICIENCY

4.0 INTRODUCTION

Zinc is an essential mineral element that is found in almost every cell. It stimulates the activity of about 100 enzymes needed for the various biochemical reactions in the body. Such important enzymes stimulated by zinc support important metabolic processes as immune system, wound healing, organoleptic abilities and in the synthesis of the important genetic material – DNA. The presence of adequate supply of zinc is necessary for normal growth and development during pregnancy, childhood and adolescence. It is known to influence cell division, growth and development and sexual maturation. It also seems to be involved in the proper storage and release of insulin. Zinc has also been reported to have a positive role in the control of diarrhea. Inadequate Zinc intake has also been linked to impaired growth in children and poor genital development in males. In May 2004, a joint statement by WHO and UNICEF on home management of childhood diarrhea, introduced the use of Low-ORS and zinc supplementation as an adjunct therapy that decreases the duration and severity of the episode and the likelihood of subsequent infections in the 2–3 months following treatment.

4.1 BASELINE DATA COLLECTION AND ANALYSIS

The available Information on Zinc nutrition in Nigeria comes from the Nigeria Food Consumption and Nutrition Survey (NFCNS 2001-2003). Prior to that, very few data existed on the Zinc Status of Nigerians. The NFCNS (2001-2003) gave the percentage deficiencies of Zinc as follows:

- Under 5 Children = 20.0%
- Mothers = 28.0%
- Pregnant women = 47.7%.

Findings from restricted localized clinical and communities' studies in Nigeria in 2005 on zinc supplementation for the management of childhood diarrhea supported evidence that:
- Zinc supplementation had no adverse effect
- Zinc supplementation caused reduction in duration, severity and recurrence of diarrhea

Furthermore to this, operational research carried out between 2007 and 2012 strongly suggests the feasibility of distribution of the zinc supplement by the health care providers through the Primary Health Care facilities and also the uptake of the zinc supplement in Nigeria. These studies also indicate that with effective mobilization, its use can be an effective tool in addressing morbidity attributable to severe diarrhea.
These high levels of deficiencies call for immediate action.

4.2 GOAL AND OBJECTIVES

4.2.1 Goal
The goal of Zinc Deficiency Control in Nigeria is to reduce the prevalence by 50% of the current level by the year 2020.

4.2.2 Objectives
The specific objectives are as follows:

- To identify the target groups with Zinc deficiency before commencement of any intervention.
- To create awareness on the prevalence of Zinc deficiency and the need to solve the problem
- To scale up on going Zinc supplementation for childhood diahorea management in Nigeria.
- To increase consumption of zinc rich foods.

4.3 Interventions Strategies

The major intervention strategies include supplementation, food fortification, dietary diversification and other public health measures.

4.3.1 Supplementation (Short-term Intervention)
Supplementation (prophylactic) of under five children with diarrhea should be more than 3mg/day. Currently, Nigeria is not supplementing for preventive measures, rather further research might be needed to justified the preventive supplementation.

4.3.1.1 Supply and Logistics
I Government at all levels should procure and distribute zinc supplements or Multiple Micronutrient Supplements for the treatment of diahorea among children under five.
There should be sourcing for manufacturers and funding agencies for the supplements and for fortification programmes different grades of Zinc Gluconate from 3mg to 15 mg. The development partners should also assist in the procurement of the supplements at subsidised rate.

4.3.1.2 Service Delivery System

Such supplements could be distributed through the following centers such that it can piggy-back on the following service delivery structures:

- PHC
- Antenatal Care Services
- NIDs Services
- Community – Based Care Services (TBAs, VVHW, Community support groups)
- School Health Services
- CDTI and other avenues e.g RBM other Avenue
- NGO, CBOs
- Agricultural extension services.

4.3.1.3 Chemical form of Supplement

Research findings on the use of Zinc Supplements indicate that Zinc Gluconate is the most effective. Hence, Zinc Gluconate is the supplement of choice.

4.3.1.4 Dosage

In cognizance of the RDA and toxicity dose (NIH, 2002), the following dosages are to be used for therapeutic supplementation:

Supplement therapeutic of under-five with dispersable zinc of 10mg/day for less than one year of age and 20mg/day for 1.5 years of age.

4.3.1.5 Potential Toxicity and Side Effects

Information available on side effects arising from zinc supplementation include:

1. Nausea
2. Vomiting

Toxicity doses range from 34 – 40 mg for adults.
4.3.2 Food Fortification (Medium –term Intervention)

- There is need for Zinc fortification in Nigeria, but this should be determined through research before any recommendation can be made.
- There is no fortification standard for Zinc in Nigeria, but based on experiences in Zambia and South Africa, wheat flour may be considered as a possible vehicle. For Zinc fortification to be effective there is need to do the following:
  - Monitor the level of zinc in fortified foods
  - Identify and strengthen (in terms of equipment, logistic, personnel etc) a laboratory/laboratories for testing the level of zinc in foods
- Reward those that comply and sanction those that do not comply with approved levels of fortification

4.3.3 Dietary Diversification (Long-term Intervention)

- The long-term strategy is dietary diversification and behavioural changes. Hence the following needs to be done:
  - % of Households with access to vitamin A-rich foods in sample communities
  - % of Households consuming foods rich in vitamin A
  - Programme of HHs with backyard garden producing foods rich in vitamin A.

- Nutrition education to create awareness of occurrence of Zinc deficiencies and cause(s) and the food items that would help prevent zinc deficiency. Proper nutrition education based on the best food groups diversification should be put out in the form of a Food Guide Pyramid or any form that can be easily understood by ordinary people or the general public.
- Social marketing techniques aimed at behavioral towards foods containing Zn

4.4 TRAINING NEEDS
For effective implementation at all levels, various cadres of caregivers will be trained and updated on the guidelines and strategies for control. The groups that would require training include:

- Primary Health Care Personnel
- Agric Extension Workers
- Nutritionists
- Dietitians
- Home Economist
- Staff of Regulatory Agencies
- Information & Education Officers/groups
- Community Based Care givers (TBAs, VVHWs, Red Cross, First Aiders, CDDs etc.)
- Doctors, Nurses, Pharmacist, school teachers and other relevant personnel

**Note:** A standard training manual for all mechanisms should be made available to institutions training relevant personnel including health workers for inclusion in their curriculum.

### 4.5 MONITORING AND EVALUATION:

Effective mechanism is necessary for monitoring the potency of the supplements at factory, retail and household levels by the relevant agencies. Similarly, the side effects of the supplements, and effectiveness of the delivery systems should be monitored at least once a year.

- The proportion of households that have access to zinc/Zinc supplements and Osmolar ORS in the management of diarrhea in the last two months.
- The percentage of health facilities that have stock of zinc+ ORS for under-five.
- The proportion of health facilities that treated under five diarrhea using zinc supplements and ORS in the last two months.

### 4.6 RESEARCH NEEDS
Research as shown that the use of zinc supplements indicate that both zinc gluconate and zinc sulphate are effective. However, base on WHO recommendation on diarrhea treatment, zinc sulphate is supplement of choice.

There is a need for further studies on the following

- The source(s) of zinc intake in Nigeria
- Major Inhibitors and enhancers to zinc status in Nigeria.
- Vehicles that will be suitable for zinc fortification in Nigeria.
- Bio-fortification of major staples as a long term solution towards elimination of Zinc deficiency in Nigeria
- Zinc content of commonly used foods in Nigeria.
CHAPTER FIVE: USE OF MICRONUTRIENT POWDERS (MNP) FOR HOME FORTIFICATION

5.0 INTRODUCTION

Micronutrient powders (MNP) are a mixture of vitamins and minerals that are packaged in a 1 gram sachet and are added and mixed into a small amount of any soft or mashed, semi-solid food that can be consumed in one feeding. The sachets are lightweight, stable, easy to use and inexpensive, costing approximately USD 0.02 or equivalent of ₦ 3 per sachet in some Africa and Asia countries; the local price for Nigerian market is yet to be determined. The pre-mix of vitamins and minerals are prepared so that they do not react with or cause changes in taste or colour to the foods into which they are added and mixed (It should be noted however that the food mixed with MNP should be eaten within 30 minutes because the vitamins and minerals in the MNP will cause the food to darken). The approach has been accepted widely by those implementing and delivering these programs and by the target recipient beneficiaries.

Home fortification is recommended where complementary foods do not provide enough essential nutrients. This occurs where one or more of the following apply:

i. dietary diversity is low (due to limited availability or affordability);

ii. complementary foods prepared for the small child have insufficient nutrient content and density (for example, watery porridges and foods with too low micronutrient content);

iii. the bioavailability of micronutrients is poor due to absorption inhibitors in the diet (fibre, phytate, tannin), which is especially the case in plant-source based meals.

Home fortification increases micronutrient intake, which leads to an improvement of micronutrient status, and can therefore improve child health, including reduced morbidity and mortality, improved growth, cognition, appetite and other functional outcomes.
5.1 BASELINE DATA COLLECTION AND ANALYSIS

Although there is a dearth of information on current rates of malnutrition, vitamin and mineral deficiencies remain a major issue among children and women as presented in Chapter one to four.9

5.2 GOAL AND OBJECTIVES

5.2.1 Goal

The goal of home fortification using MNPs in Nigeria is to contribute to reduction of the prevalence of vitamins and mineral deficiencies among vulnerable groups especially children aged 6-59 months by 80% of the current level by the year 2020, thereby enhancing survival, growth and development.

5.2.2 Objectives

The specific objectives are as follows:

- To contribute to intake of essential micronutrient through the use of MNPs.
- To increase the proportion of households having access to MNPs.
- To increase the micronutrient content of complementary foods consumed by children through the use of MNPs.

5.3 INTERVENTION STRATEGIES

The main implementation strategies following adoption of MNDC policies/guidelines include production, supply and logistic; delivery of MNPs; behavior change and communication; training of service providers;—monitoring and evaluation of the programme implementation.

5.3.1 Supply and Logistics

MNP sachets for children 6-59 months containing 100% RNI of 15 micronutrients should be imported or locally produced. Government at all levels should take responsibility for procurement and distribution of MNPs.

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9 48% of the population are iron deficient, only 52% of the households consume adequately iodized salt, 20% of <5s with Zinc deficiency and with marginal low or clinical levels of vitamin A.
The sachet has a shelf life of 2 years under specified storage conditions. The packaging of the sachet can be customized with local branding to include local language through international procurement. When entering into the country, MNPs should be registered as a ‘supplement’ and not medicine/pharmaceutical.

For all procurements, the manufacturer must be able to produce a high quality product that complies with the minimum requirements of relevant Nigerian Industrial Standards. In addition, the manufacturer must have a licence for food manufacturing, access to the micronutrient premix, and the following required certifications: Hazard Analysis and Critical Control Points (HACCP), Recommended International Code of Practice - General Principles of Food Hygiene of Codex Alimentarius and ISO 22000:2005 (Food Safety Management System). Furthermore, the manufacturers must have quality control checks in place as well as a certificate of Analysis (CoA).

5.3.1.1 Product Specification of MNP
As per WHO Guidelines and in practice in most countries around the world, the recommended formulation of MNP will contain 15 micronutrients that are designed to provide one Recommended Nutrient Intake (RNI) of each micronutrient per dose for children 6-59 month. However, where specific information is available that warrant the adjustment of the formulation this should be done.

Table 10: Recommended Nutrient Intake (RNI of each micronutrient per dose for children aged 6-59 months)

<table>
<thead>
<tr>
<th>Micronutrients</th>
<th>RNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A µg RE</td>
<td>400</td>
</tr>
<tr>
<td>Vitamin D µg</td>
<td>5</td>
</tr>
<tr>
<td>Vitamin E mg</td>
<td>5</td>
</tr>
<tr>
<td>Vitamin C mg</td>
<td>30</td>
</tr>
<tr>
<td>Thiamine (vitamin B₁) mg</td>
<td>0.5</td>
</tr>
<tr>
<td>Riboflavin (vitamin B₂) mg</td>
<td>0.5</td>
</tr>
</tbody>
</table>

10 Home Fortification-Technical Advisory Group Micronutrient Powder Program Guidance Brief (2011)
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niacin (vitamin B₃) mg</td>
<td>6 mg</td>
</tr>
<tr>
<td>Vitamin B₆ (pyridoxine) mg</td>
<td>0.5 mg</td>
</tr>
<tr>
<td>Vitamin B₁₂ (cobalamin) µg</td>
<td>0.9 µg</td>
</tr>
<tr>
<td>Folate µg¹¹</td>
<td>150 µg</td>
</tr>
<tr>
<td>Iron mg</td>
<td>10 mg</td>
</tr>
<tr>
<td>Zinc mg</td>
<td>4.1 mg</td>
</tr>
<tr>
<td>Copper mg</td>
<td>0.56 mg</td>
</tr>
<tr>
<td>Selenium µg</td>
<td>17 µg</td>
</tr>
<tr>
<td>Iodine</td>
<td>90 µg</td>
</tr>
</tbody>
</table>

For the moment, there are no guidelines available for the optimal formulation of MNP for children older than 59 months.

5.3.2 Service Delivery System

Distribution of MNPs can be done through either public, market based channels or both channels. Public channels consist of National health care systems or local NGOs. Market based channels can be pharmacies, health volunteers, sales officers, or specific outlets. Providing MNPs can be an incentive for caretakers to come to information sessions to learn about infant and young child feeding as well as appropriate use of MNPs.

However, the most successful MNP projects are ones that are integrated with an infant and young child feeding strategy since the primary aim is to improve nutrient intake from complementary foods by children of six months of age and above.

Distribution mechanism can also vary depending on the target group.

- Children from 6 to 23 months can usually be reached at the community level or through health visits at the health center. The immunization schedule, the growth monitoring, MNCHW and the activities of management of child illnesses are as many points of contact with the child where the MNP can be distributed.

¹¹ 150 µg folate is equivalent to 88 µg folic acid
• Older children can be reached through school feeding. Adding MNP to the school meal is an inexpensive and feasible intervention to increase vitamins and minerals intake in school age children and has already shown promising results.

The table below provides an overview of the criteria needed to sustain public and market-based distribution channels

**Table 11: Criteria for Delivery Selection**

<table>
<thead>
<tr>
<th>Public Distribution</th>
<th>Market Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Availability of funds</td>
<td>• Country ownership of the product</td>
</tr>
<tr>
<td>• Routine channels for non–interrupted provision.</td>
<td>• Established distribution system</td>
</tr>
<tr>
<td>• Political will and commitment</td>
<td>• Long-term approach to MNPs in-country</td>
</tr>
<tr>
<td>• Capacity building of health workers and community health volunteers on importance, approaches of distribution, internal monitoring, reporting</td>
<td>• Sustainability</td>
</tr>
<tr>
<td>• Commitment of health workers and community volunteer.</td>
<td>• Consumers willing to pay for the product</td>
</tr>
<tr>
<td>• Awareness of population, acceptance, demand.</td>
<td>• Effective communications campaign</td>
</tr>
<tr>
<td>• BCC and communication campaigns</td>
<td>• Wider reach</td>
</tr>
<tr>
<td>• Support from other partners (local authorities, gender, ethnic, religious groups).</td>
<td>• Follows public private partnership principles. Perhaps commercial distribution could partially subsidise public production</td>
</tr>
<tr>
<td>• Active advocacy of experts groups at national and local levels</td>
<td>• Available through local production</td>
</tr>
</tbody>
</table>

**5.3.2.1 Target groups**
The target group are those who are at risk of inadequate intake of micronutrients. Evidence from multiple countries suggests that the period of highest vulnerability is six to 23 months of age when food variety and quantity are limited. Children 24 to 59 months of age may also be at high risk of inadequate dietary intake of some nutrients. When home fortification is being introduced in a population for a period of several years, children aged 24-59 months will have been exposed to MNP when they were 6-23 months of age. In that case, prioritizing the age range of 6-23 months may be a good choice. However, when the problem of micronutrient deficiencies is widespread, or the program will be implemented for a limited period of time, it might be better to target a wider age range. More so, it is suitable for children 24-59 months as it provides 10 mg of iron, which is nearly the daily dose recommended by the WHO/FAO for young children 1-3 years of age.

5.3.2.2 Who should not use MNP?

- According to WHO guidelines, MNP should not be given to severely malnourished children during treatment of electrolyte imbalance (usually the first 7 days of treatment). It can be used effectively and safely after this initial period.
- The guidelines presented here are not applicable to children with specific conditions such as human immunodeficiency virus (HIV) infection or tuberculosis as the effects and safety of the intervention in these specific groups have not been evaluated.
- Children who are receiving Ready to use Therapeutic Foods (RUTF) such as Plumpy Nut for management of severe acute malnutrition (SAM) should not be given MNP as they are already getting the extra iron and vitamins they need.
- Products such as CSB++ (corn-soy blend) and RUSF/Supplementary Plumpy Nut also contain added iron and although the combined amounts are not toxic, MNP should be suspended during the period of treatment for malnutrition.
- Note: MNP can be safely provided in addition to twice-yearly high-dose Vitamin A capsule, iodized salt and general food fortification. In malaria-endemic areas, the provision of iron, including MNP, should be implemented in conjunction with measures to prevent, diagnose and treat malaria.
5.3.3. Dosage

The frequency and duration of using MNP should be such that it contributes enough of required micronutrients so that the combination of the diet and the MNPs satisfy the RNI for all micronutrients.

- Each sachets must contain one RNI for each micronutrient, giving
  - 90 sachets for a six month period (providing on average 15 per month, i.e. 3-4 per week) would result in an average dose of 50% of the RNI/day,
  - 60 sachets for a six month period (10 per month, i.e. 2-3 per week) would be equivalent to 33% of the RNI/day, and
  - 120 sachets for a six month period (20 per month, i.e. 4-5 per week) would provide 67% of RNI/day.

- Note that for some micronutrients the typical diet may contain 80% of the RNI, whereas for others, it may only contain 20-40%. In particular, the intake of vitamins and minerals are most abundant in animal source foods (vitamin B6, vitamin B12, zinc, iron) may be relatively low when these foods are consumed infrequently and in small amounts.

- The RNI has also been established for normal, healthy children, whereas children with micronutrient deficiencies or frequent illness may require a higher intake, above maintenance levels, in order to correct deficiencies and recover from illness.\(^\text{12}\) Also, the body stores some minerals and vitamins, whereas for others, when intake exceeds needs, the excess is excreted rather than stored for periods when needs exceed intake. For nutrients that are not stored in the body, additional intake should be on an ongoing basis

5.3.4 Potential Toxicity and Side Effects

Diarrhea is sometimes reported by caretakers when children start using MNP, usually by <1% of the population. When a new product or treatment is introduced, consumers may ascribe any health problems that concurrently arise to the product or treatment.

Communications messages when introducing the MNP should say that mild diarrhea may occur but one should not worry, that it should be treated as usual with increased liquids, and that MNP consumption does not need to be interrupted. When the diarrhea is severe, or is bloody or with mucous, care should be sought as it would have been without concurrent use of MNP.

5.3.5 Adherence:
There is need to ensure that the implementers distribute the supplements promptly. Similarly, the target group should be properly monitored on quarterly bases to ensure adherence.

5.4 TRAINING NEEDS

For effective implementation at all levels, various cadres of caregivers will be trained and updated on the guidelines and strategies for control. The groups that would require training include:

- Primary Health Care Providers (JCHEWs, CHEWs)
- Agricultural Extension Workers
- Nutritionists
- Dietitians
- Home Economists
- Staff of Regulatory Agencies
- Staff of Research Institutions
- Information & Education officers/groups
- Community Based Care givers (TBAs, VVHWs, Red Cross, First Aiders, CDDs, NGOs, CSOs, etc.)
- Doctors, Nurses, Pharmacists, School teachers and other relevant personnel

Note: A standard implementation and training manual for all mechanisms should be made available to institutions training relevant personnel including health workers for inclusion in their curriculum.

5.5 MONITORING AND EVALUATION:
It is important to assess provision, coverage, and adherence, changes of Infant and Young Child Feeding (IYCF) practices and impact on micronutrient intake (dietary diversity and MNP), status and function. Information on provision, coverage, and adherence should be collected regularly and in particular simultaneously with program initiation so that any issues that arise can be tackled immediately. Issues related to successful implementation, coverage and adherence should be resolved before assessing program effectiveness, i.e. before evaluating impact on biological outcomes such as micronutrient status, and morbidity. The issues identified, as well as how they have been addressed, need to be well documented.

The objectives of implementing a home fortification program should be clearly stated and program appropriate targets, consistent with program design, should be specified before implementation. Program monitoring and evaluation should be designed to ensure that key information collected to assess whether these targets are being met is included in a timely fashion.

5.6 RESEARCH NEEDS
There is a need for further studies on the following
- Acceptability and of the use of MNPs in Nigeria
- Effects and safety of MNP use on human immunodeficiency virus (HIV) infection or tuberculosis in children 6-59 months.
- Cost-effectiveness study to determine best delivery strategy for provision of MNPs for different implementation areas.
- Side-effects associated with home fortification with multiple MNPs in various settings where infection and malnutrition are common, with emphasis on the harmonization of outcome definitions to help to assess the harms and benefits of this intervention in various contexts, particularly in areas with high transmission of malaria;
- Safety and efficacy of the iron compounds (or combinations of compounds) used in multiple MNP formulations for children 6–59 months of age. If ferric sodium EDTA (FeNaEDTA) is included in clinical trials as a source of iron, the EDTA intake (including other dietary sources) should not exceed 1.9 g EDTA/day (20, 21);
- Determination of the safe amounts of folic acid in areas with high malaria endemicity.
• Periodic review of appropriate dose of zinc and other vitamins and minerals included in multiple micronutrient powders and the effects of these micronutrients on indicators of nutritional status other than iron deficiency and anaemia (e.g. improvement of iodine status, prevention of vitamin A deficiency, prevention of zinc deficiency) and on important functional outcomes including growth, and motor and cognitive skills

• The most effective mechanism for distribution and consumption of multiple MNPs, for example intermittent or flexible schemes as alternatives to daily provision of multiple micronutrient powders;

• Determination of the most appropriate available local foods to serve as vehicles for multiple MNPs to improve their bioavailability;

• Impact of the form of delivery (single-serving sachets) of multiple MNPs in areas with limited waste management strategies, to balance the benefits of this intervention against environmental concerns and overall health, that is, not only in terms of nutritional status.

• Formative research, including small scale distribution, to design large scale pilot programme. Based on the lessons learnt, national scale up plan will be developed and rolled out

• Local production for MNP will be explored with PPP approach