



NATIONAL STRATEGY ON PREVENTION AND CONTROL OF MICRONUTRIENT DEFICIENCIES, BANGLADESH (2015-2024)



স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

Institute of Public Health Nutrition
Directorate General of Health Services
Ministry of Health and Family Welfare
Government of the People's Republic of Bangladesh





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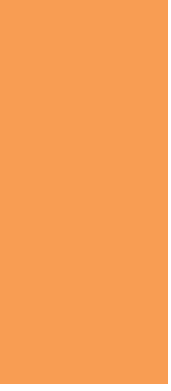
December 2015



স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়

Institute of Public Health Nutrition
Directorate General of Health Services
Ministry of Health and Family Welfare
Government of the People's Republic of Bangladesh





Mohammed Nasim, MP
Minister
Ministry of Health and Family Welfare
Government of the People's Republic of
Bangladesh



MESSAGE

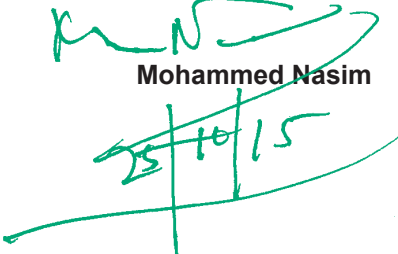
Micronutrient deficiencies are common in young children in developing countries with additional deleterious effects. It is also a common problem for Bangladesh as identified in the National Micronutrient Survey 2011-2012. Vitamin A deficiency increases the chances of infant and child mortality, zinc deficiency reduces protection against diarrhoea and respiratory infections, and iodine deficiency curtails cognitive development in infancy.

Generating political commitment and funding support to address vitamin and mineral deficiencies remains a challenge because the effects of micronutrient deficiencies in young children are not always obvious, even to parents. The Ministry of Health and Family Welfare has always been a nutrition pioneer and demonstrated commitment by addressing micronutrient deficiency problem in Bangladeshi population and developed the first ever comprehensive "National Strategy for Prevention and Control of Micronutrient Deficiencies in Bangladesh 2015-2024".

I appreciate the significant contributions of members of Expert Working Groups and other representatives from different organizations, development partners, research institute and academia for their continuous efforts to develop this very important strategy which will complement the implementation of National Nutrition Policy 2015 endorsed by the government.

Finally, I wish a great success for the implementation of this strategy.

Joy Bangla, Joy Bangabandhu.
Long live Bangladesh.


Mohammed Nasim
25/10/15

Mr. Zahid Maleque, MP
State Minister
Ministry of Health and Family Welfare
Government of the People's Republic of
Bangladesh



MESSAGE

This is my pleasure to learn that '**National Strategy on Prevention and Control of Micronutrient Deficiencies, Bangladesh, 2015-2024**' has been developed by **National Nutrition Services (NNS)**, Institute of Public Health Nutrition (IPHN) under the Ministry of Health and Family Welfare.

Bangladesh has made a good progress and widespread in reducing malnutrition in Bangladesh though micronutrient deficiency like iron and folic acid, vitamin-A, iodine, zinc, calcium, B-12 etc. A number of micronutrient deficiency control programme like supplementation of iron and folic acid, vitamin-A, MNP sachet and zinc is being implemented by the Ministry of Health and Family Welfare in collaboration with other Ministries. At the same time Ministry of Health and Family Welfare is also providing technical support to relevant ministries to implement food fortification with iodine, vitamin-A etc through National Nutrition Services (NNS) and IPHN.

I would like to congratulate Institute of Public Health Nutrition (IPHN) to take the lead in developing this national strategy and my sincere gratitude to all other concerns who were involved in formulating this.

Joy Bangla, Joy Bangabandhu.
Long live Bangladesh.


Mr. Zahid Maleque

Secretary
Ministry of Health and Family Welfare
Government of the People's Republic of
Bangladesh



MESSAGE

The National Micronutrient Survey 2011-12 documented multiple micronutrient deficiencies among the population, especially younger children, school-age children and women of reproductive age in Bangladesh. Dietary inadequacy is the primary cause of vitamin A deficiency disorders, zinc deficiency and iron deficiency anaemia; while poor iodine content of soil and water due to environmental iodine deficiency is the main determinant of IDD.

In Bangladesh, the National Nutrition Services (NNS) is being implemented to prevent these micronutrient malnutrition through short term supplementation like periodic mega dosing of vitamin A, distribution of iron and folic acid tablets, calcium, zinc etc and long term fortification program such as salt iodisation and Vitamin 'A' fortification of refined vegetable oil. Though these have been in operation for over many years, we are still facing these deficiencies due to some constraints.

This “**National Strategy for Prevention and Control of Micronutrient Deficiencies in Bangladesh 2015-2024**” is providing detailed integrated and multi-sectoral approaches to overcome all constraints and fill up the gaps in the implementation of recommended micronutrient interventions for Bangladesh.

I am confident that NNS in close collaboration with Directorate General of Health Services, Ministry of Health and Family Planning and other key stakeholders will facilitate operationalization of the strategy to combat malnutrition and micronutrient deficiencies in Bangladesh.

12/11/2015

Syed Monjurul Islam



FOREWORD

Micronutrients are essential nutrients which are required in very small amounts, but benefits human health and nutrition immensely. Vitamin 'A', iron, zinc, iodine, folate and B₁₂ are among some of the important micronutrients. Deficiencies of these micronutrients are associated with morbidity, blindness, lower protection from infection, growth limitation in children, impairment of brain development and lower intelligence. Addressing micronutrient deficiencies has a bearing on individual and family health, education and income outcomes and national productivity and development.

In Bangladesh, despite the significant improvements in the health and nutrition situation, the status of micronutrient deficiencies remains worrisome, particularly among vulnerable and disadvantaged population groups. Natural and human-made disasters compound the problem. Bangladesh needs to accelerate progress on key nutrition targets. A range of short, medium and long term approaches are in place in this national strategy for addressing micronutrient deficiencies.

A National Micronutrient Survey was undertaken in 2011-12 and the report was released in early 2013. The survey provided a valuable opportunity for a thorough review of the country landscape in relation to Micronutrient Deficiencies. Ministry of Health and Family Welfare guided to National Nutrition Services (NNS) for review of the national micronutrient survey report and also ongoing micronutrient interventions in collaboration with development partners, international and national NGOs working in the nutrition field especially with micronutrient interventions.

I appreciate the efforts made by the National Nutrition Services (NNS) for adding this national strategy in collaboration with UNICEF, MI, GAIN and other stakeholders and Ministries.

My special thanks to the eminent members of Expert Working Group and also sub-groups for steering the process and providing strategic guidance to the strategy.

IPHN with the support from the MoH&FW will develop a detail plan of action on implementation of the **“National Strategy for Prevention and Control of Micronutrient Deficiencies in Bangladesh”**.

I am confident that the multi-sectoral approach to addressing micronutrient deficiencies will deliver effective and efficient programs and significantly change nutrition status in Bangladesh.

Roxana Quader

Additional Secretary (PH & WH)
Ministry of Health and Family Welfare
Government of the People's Republic of Bangladesh.



MESSAGE

I am very happy to learn that National Nutrition Services (NNS), Institute of Public Health Nutrition (IPHN) has developed the first ever “**National Strategy on Prevention and Control of Micronutrient Deficiencies, Bangladesh, 2015-2024**”. This national strategy document was long overdue.

Bangladesh possesses a huge burden of deficiencies on a range of micronutrients including Iron and Folic Acid, Vitamin A, Iodine, Zinc, Calcium, Vitamin B₁₂ etc. Bangladesh is quite committed to address micronutrient deficiencies and working across Ministries including Health and Family Welfare, Industries, Agriculture etc. towards reducing micronutrient deficiency related problems. Directorate General of Health Services through its relevant Operational Plans has been contributing significantly to fight against the menaces of hidden hunger.

I congratulate the Institute of Public Health Nutrition (IPHN) to take the lead in conducting the national survey and developing this important strategy in close cooperation with UNICEF, MI, GAIN and other key stakeholders.

Let us dream for a country free from preventable menace of micronutrient deficiencies.

Professor Dr. Deen Mohd. Noorul Huq
Director General of Health Services
Ministry of Health and Family Welfare
Government of the People's Republic of Bangladesh



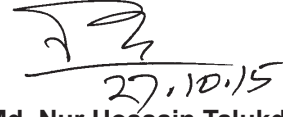
MESSAGE

Bangladesh has been acclaimed globally for its remarkable success in health, nutrition and population control programs. However, micronutrient malnutrition still poses a significant public health problem in Bangladesh. The National Micronutrient Survey was timely undertaking at a time when the Government was willing to strengthen its nutrition programming through updated strategies.

I appreciate the lead role of Institute of Public Health Nutrition and its collaborating organizations and agencies for their initiative to conduct this comprehensive National Strategy.

Bangladesh has been implementing a multi-sector program targeted towards control of micronutrient deficiencies. Directorate General of Family Planning through its relevant Operational plans has also been leading the program.

I am glad to know that “**National Strategy on Prevention and Control of Micronutrient Deficiencies, Bangladesh, 2015-2024**” is going to be published. I believe the days are not too far when we can effectively control the outcomes of essential and public health important micronutrients deficiencies.



27.10.15

Md. Nur Hossain Talukder
Director General of Family Planning
Ministry of Health and Family Planning
Government of the People's Republic of Bangladesh



ACKNOWLEDGEMENT

I am very delighted that under the leadership of the National Nutrition Services (NNS), Ministry of Health and Family Welfare (MoH&FW); the pioneering “National Strategy on Prevention and Control of Micronutrient Deficiencies, Bangladesh, 2014-2024” has been developed.

The Ministry of Health and Family Welfare, along with relevant Ministries, lead a number of micronutrient deficiency control programmes. National Nutrition Services (NNS) is providing technical leadership to the Ministry of industries to implement food fortification programmes to reduce iodine and vitamin A deficiencies in the country. The Ministries in the food and agriculture sector actively promote cultivation and consumption of micronutrient rich foods.

The Institute of public Health Nutrition (IPHN) in collaboration with UNICEF, GAIN and icddr,b conducted the National Micronutrient Survey 2011-12. This national survey provided strategic direction on the need and relevance of a national strategy. I express my sincere thanks to the member of the Expert Working Group and Technical Committee, Ministries and civil society for their valuable guidance and their continuous contribution for developing this national strategy document.

Specifically, I would like to thank UNICEF to recruit a consultant Mr. Faruk Ahmed, associate professor in public health nutrition for drafting the first draft

I would also like to thank MI, GAIN, icddr,b and other organizations for their technical support in developing the document.

I am quite optimistic that this national strategy wills prevention and controls the micronutrient deficiencies through effective programming and multisectoral coordination and collaboration.

Dr. Md. Quamrul Islam

Director, Institute of Public Health Nutrition
& Line Director National Nutrition Services
Directorate General of Health Services
Ministry of Health and Family welfare
Government of the people's Republic of Bangladesh

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List of **Acronyms**

ANC	Antenatal Care
BBF	Bangladesh Breastfeeding Foundation
BCC	Behaviour Change Communication
BDHS	Bangladesh Demographic and Health Survey
BMS	Breast-Milk Substitutes
BRRRI	Bangladesh Rice Research Institute
BSCIC	Bangladesh Small and Cottage Industries Corporation
BSTI	Bangladesh Standards and Testing Institution
CHT	Chittagong Hill Tract
CIP	Country Investment Plan
CSO	Civil Society Organisations
DAE	Department of Agriculture Extension
DGFP	Directorate General of Family Planning
DGHS	Directorate General of Health Services
DNA	Deoxyribonucleic Acid
DoF	Department of Food
DoL	Department of Livestock
DPs	Development Partners
EBF	Exclusive Breastfeeding
GAIN	Global Alliance for Improved Nutrition
GoB	Government of Bangladesh
H&FWC	Health and Family Welfare Centre
HFP	Homestead Food Production
HH	Household
HKI	Helen Keller International
HPNSDP	Health, Population and Nutrition Sector Development Programme
ICCIDD	International Council for the Control of Iodine Deficiency Disorders
icddr, b	International Centre for Diarrhoeal Disease Research, Bangladesh
IDA	Iron Deficiency Anaemia
IDD	Iodine Deficiency Disorders
IEC	Information, Education and Communication
IFA	Iron-folic Acid
IMCI	Integrated Management of Childhood Illnesses
IMCI&N Corners	Integrated Management of Childhood Illnesses & Nutrition Corners
IPHN	Institute of Public Health Nutrition

IQ	Intelligence Quotient
IYCF	Infant and Young Child Feeding
M&E	Monitoring and Evaluation
MI	Micronutrient Initiative
MMN	Multiple Micronutrients
MNP	Micronutrient Powder
MOHFW	Ministry of Health and Family Welfare
MOLGRDC	Ministry of Local Government and Rural Development and Cooperatives
MOWCA	Ministry of Women and Children Affairs
NFP	National Food Policy
NGO	Non-Government Organization
NHSDP	NGO Health Service Delivery Project
NMS	National Micronutrient Survey
NNS	National Nutrition Services
NPNL	Non-pregnant and Non-lactating
NSP	Nutrition Surveillance Project
NSPCMD	National Strategy on Prevention and Control of Micronutrient Deficiencies
NVAC	National Vitamin A Plus Campaign
ORS	Oral Rehydration Salts
PNC	Post-natal Care
PoA	Plan of Action
PSAC	Preschool Children
QA	Quality Assurance
QC	Quality Control
SAC	School-aged Children
SUZU	Scaling Up Zinc for Young Children
UIC	Urinary Iodine Concentration
UN	United Nations
UNHCPSDP	Unqualified Health Care Providers Skills Development Project
UNICEF	United Nations Children's Fund
USI	Universal Salt Iodization
VAC	Vitamin A Capsule
VAD	Vitamin A Deficiency
VGD	Vulnerable Group Development
VGf	Vulnerable Group Feeding
WFP	World Food Programme
WHO	World Health Organization

Introduction

Although Bangladesh has made significant progress in reducing undernutrition and is one of the countries likely to achieve the nutrition Millennium Development Goal, micronutrient deficiency remains prevalent at a high level and is a major public health problem. While several strategies have been implemented over the past decades in response to the on-going high prevalence of micronutrient deficiencies, it was felt this was the time to revisit those strategies and develop a comprehensive strategy.

The most recent National Micronutrient Survey (NMS), conducted in 2011-12, reported that the vast majority of young children and women in the country are still suffering from various micronutrient deficiencies. Thus, the Institute of Public Health Nutrition (IPHN), under the Ministry of Health and Family Welfare (MOHFW) and other stakeholders in this field, strongly felt the need to review current strategies and interventions in place. Following extensive consultation with various stakeholders, including relevant ministries, the National Strategy on Prevention and Control of Micronutrient Deficiencies (NSPCMD) was developed. This NSPCMD document provides a comprehensive and coordinated intervention plan to prevent and control micronutrient deficiencies in the country.

The purpose of the NSPCMD is to provide guidance on interventions and actions for a coordinated and comprehensive approach to prevent and control micronutrient deficiencies among the Bangladeshi population, with an emphasis on vulnerable population groups, including children under five years of age, school-age children, adolescent girls, and pregnant and lactating women. The strategy document will be the guide to the priority strategies the country will focus on for a period of ten years. It will be used by policy makers; stakeholders, including government; civil society and private sectors/corporate implementers; researchers; and UN and development partners, all of whom are involved in designing, implementing, monitoring and evaluating micronutrient-related programmes at the national, regional and community levels.

The strategy is divided into three main sections, as follows:

- Section 1:** Provides a brief overview of the problem of micronutrient deficiencies in global and Bangladesh contexts. This will also provide an overview of current policies and mandates, followed by the overall goal and objectives.
- Section 2:** Provides an insight into the current situation of micronutrient status among different population groups in the country, including trend analysis, possible causes and risk factors. It also presents existing intervention programmes for alleviating micronutrient deficiencies in the country, followed by an in-depth analysis of the strengths, weaknesses, opportunities and threats of the current micronutrient deficiency control programmes in the country.
- Section 3:** Highlights the recommended micronutrient deficiency prevention and control strategies to be executed in the next ten years, based on evidence, best practices and lessons learned. It also outlines the implementation plan for the recommended strategies and indicators for monitoring impact and the progress of implementation of the strategy through multiple and diversified modalities.

Section 1

Goal, Objectives and Background

1.1 **Goal and Objectives**

1.2 **Background**

1.2.1 **Global Context**

1.2.2 **Overall Micronutrient Deficiency Situation in Bangladesh**

1.2.3 **Policy and Strategy Background**

1.2.4 **Rationale for National Strategy on Prevention and Control of Micronutrient Deficiencies**

1 Goal, Objectives and Background

1.1 Goal and Objectives

1.1.1 Goal

The overall goal of the National Strategy on Prevention and Control of Micronutrient Deficiencies (NSPCMD) is to improve the overall health, nutritional status, survival, growth, development and productivity of the population by preventing and alleviating micronutrient deficiencies.

1.1.2 Objectives

- ▶ To provide guidelines on interventions and actions for improved access and affordability to micronutrients through increased consumption of micronutrient-rich foods, fortified foods and supplements and compliance to micronutrient guidelines and regulations
- ▶ To provide a common platform for resource mobilization for the implementation of the national micronutrient deficiency prevention and control programmes
- ▶ To promote efficient implementation and programme delivery of micronutrient interventions that can create impact among the marginalised through improved planning, capacity development, monitoring, coordination and collaboration of partners in the country
- ▶ To improve knowledge, awareness and utilisation of micronutrient deficiency control interventions through advocacy, social mobilisation and behaviour change communication
- ▶ To strengthen research and monitoring and evaluation of National Micronutrient Deficiency Prevention and Control programmes in the country

1.2 Background

1.2.1 Global Context

Micronutrients are vitamins and essential minerals required in minute amounts by the body for survival, health and development. The consequences of micronutrient deficiencies are far reaching, as they not only increase the risk of mortality but also compromise quality of life and impact development and productivity. In addition to the more obvious clinical manifestations, micronutrient deficiencies are responsible for a wide range of non-specific physiological impairments, resulting in compromised resistance to infections, reduced nutrient uptake and delayed or impaired physical, mental and psychomotor development. Micronutrient deficiency is one of the most prevalent global public health problems, affecting more than 2 billion people worldwide (UNICEF and MI 2004). Examples of the effects of micronutrient can be seen with vitamin A, iodine and iron deficiencies, as shown below.

Vitamin A deficiency (VAD) is the leading cause of preventable childhood blindness. It also places young children at a 23 per cent greater risk of death. Based on World Health Organization (WHO) estimates of vitamin A deficiency in preschool children and pregnant women for 1995-2005, globally 33.3 per cent of preschool children, or 90 million, are estimated

to have subclinical vitamin A deficiency and 15.3 per cent of pregnant women, or 19.1 million, have deficient serum retinol concentrations (WHO 2009a). Major strategies to address these deficiencies include improving food security, vitamin A supplementation, food fortification and dietary diversification. Since coverage of the last two interventions has not been systematically assessed, vitamin A supplementation is the primary programme indicator monitored at the global level.

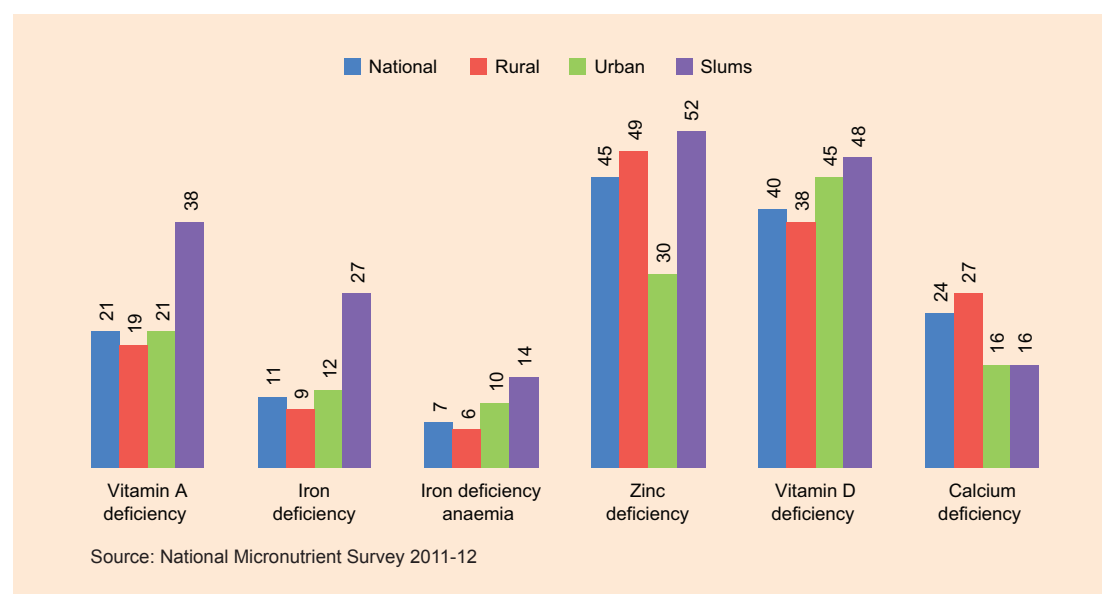
The 2013 Lancet series on maternal and child nutrition informed that globally 28.5 per cent of the world's population, or 1.9 billion individuals, is iodine deficient. While this figure largely represents those with mild deficiencies (defined as urinary iodine concentration of 50–99 ug/L), about 50 million people have some degree of mental impairment caused by iodine deficiency (WHO 2011c). In 2012, nearly 34 million newborns were unprotected from the lifelong consequences of brain damage associated with iodine deficiency (UNICEF Data). For the last 30 years, universal salt iodization has been the most widely used strategy to control and eliminate iron deficiency disorders (IDDs). The international target for universal salt iodization aims for more than 90 per cent of households worldwide to consume adequately iodized salt (WHO et al. 2007). However, the United Nations Children's Fund (UNICEF) estimates that globally only 76 per cent of all households consumed adequately iodized salt in 2012 (UNICEF Data).

Further, about 1.62 billion people are anaemic mainly due to iron deficiency (WHO 2008). The magnitude of the problem is much greater in developing countries, where multiple micronutrient deficiencies often occur concurrently, as a result of consuming diets of poor bio-availability and limited micronutrient content (Huffman et al. 1999). Micronutrient deficiencies are common throughout the lifespan, but especially in children and pregnant and lactating women, who experience increased micronutrient demands to support growth and reproduction.

1.2.2 Micronutrient Deficiency Situation in Bangladesh

In Bangladesh, the usual diets consumed are typically deficient in one or more micronutrients, notably vitamin A, iron, iodine and/or zinc (Jahan and Hossain 1998). Bioavailability of micronutrients, especially iron, zinc and vitamin A, in food usually eaten by the poor is low, because most of the food consumed is plant based. It is poor dietary quality, rather than quantity, that is considered to be the key determinant of impaired micronutrient status in this population. Young children and pregnant and lactating women are at particular risk of developing micronutrient deficiencies.

Figure 1: Micronutrient deficiencies among children aged 6-59 months

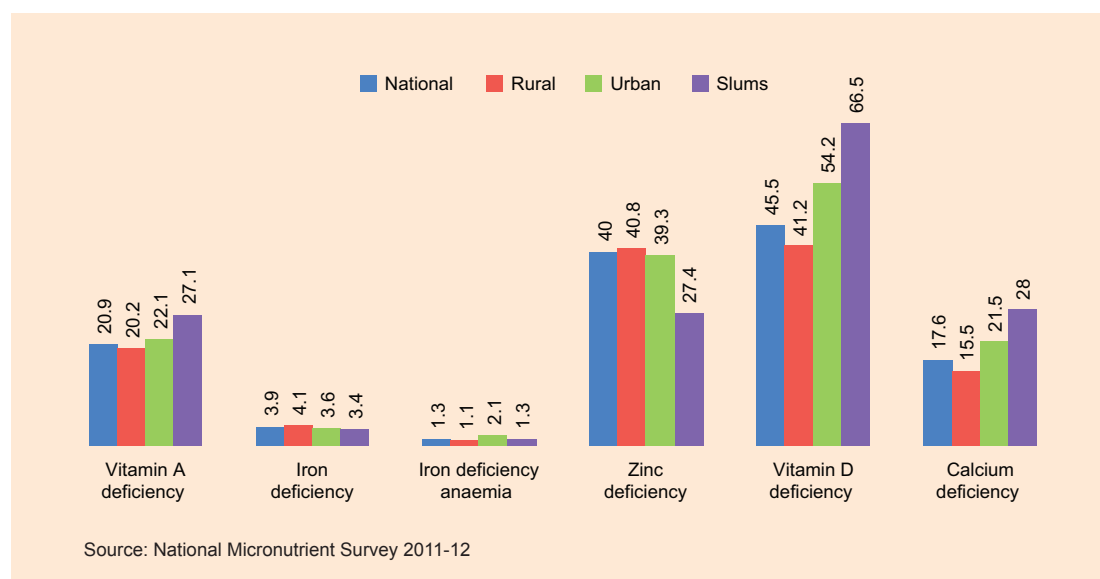


The National Micronutrient Survey (NMS) 2011-12 revealed that a significant proportion of preschool children live with multiple micronutrient deficiencies (see Figure 1); for example, one in five preschool children is living with vitamin A deficiency¹. The burden of zinc deficiency is high, with 44 per cent of preschool children suffering from zinc deficiency², while two in five preschool children live with vitamin D deficiency³. The prevalence of calcium deficiency⁴ among preschool children is 24.4 per cent and a further one-third of preschool children are suffering from anaemia⁵, with 7.2 per cent having iron deficiency anaemia⁶.

Amongst school-age children, the current prevalence of iodine deficiency⁷ is as high as 40 per cent (see Figure 2). Further, one in five school-age children also suffer from vitamin A deficiency and anaemia, while over 40 per cent of school-age children are living with vitamin D deficiency and about 20 per cent with calcium deficiency.

For non-pregnant and non-lactating (NPNL) women, Figure 3 shows that 42 per cent are suffering from iodine deficiency. About one in four NPNL women are also living with anaemia and vitamin B12 and calcium deficiencies, and large majority suffer from zinc deficiency (57 per cent) and vitamin D deficiency (71.5 per cent). While the prevalence of vitamin A deficiency is only about 5 per cent among NPNL women, nearly one-third are living with mild vitamin A deficiency⁸.

Figure 2: Micronutrient deficiencies among School-aged children aged 6-14 Years



¹ Vitamin A deficiency is defined as serum retinol level <0.70 µmol/L (WHO/IVACG).

² Zinc deficiency is defined as serum zinc level <9.9 mmol/l in preschool children and <10.1 mmol/l in NPNL women (International Zinc Nutrition Consultative Group (IZINCG)).

³ Vitamin D deficiency is defined as serum vitamin D level cut-off <50.0 nmol/L, as suggested by the Institute of Medicine (Ross AC et al. 2011).

⁴ Calcium deficiency is defined as total serum calcium level <8.8 mg/dL in preschool children and school-aged children and <8.4 mg/dL in NPNL women (Nelson Textbook of Paediatrics, 18th Edition, 2008).

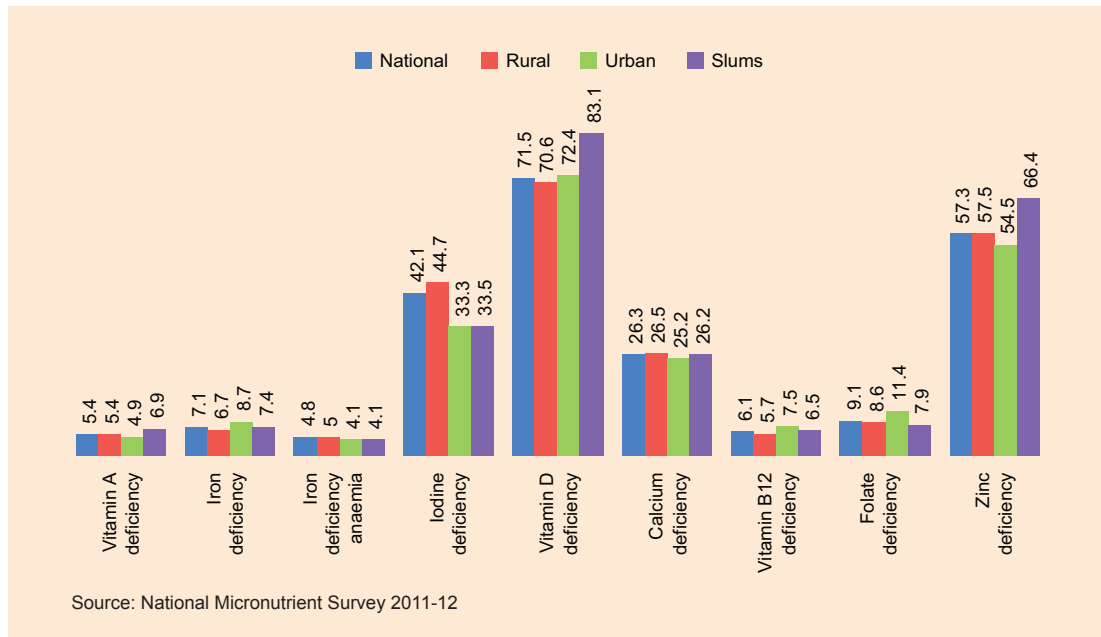
⁵ Anaemia is defined as haemoglobin level <11.5 gm/dl in children 6-11 years old and <12.0 gm/dl in children 12-14 years old. (WHO/UNICEF/UNU 2001)

⁶ Iron deficiency is defined as serum ferritin level <15.0 ng/ml (WHO 2001).

⁷ Urinary Iodine Concentration <100.0 µg/l. (WHO 2013)

⁸ Mild vitamin A deficiency is defined as serum retinol >= 0.7 - <1.05 µmol/L (ICDDRDB et al. 2014).

Figure 3: Micronutrient deficiencies among NPWL in Bangladesh




There is no recent national estimate of the prevalence of micronutrient deficiencies among pregnant and lactating women, nor amongst the adolescent population, especially adolescent girls in the country. However, previous studies have indicated that the prevalence of micronutrient deficiency is also quite high in these population groups. Overall, the prevalence of these micronutrient deficiencies is highest among populations living in slums and among lower socio-economic groups.

Overall, the major underlying causes of micronutrient deficiencies in all segments of the population are identified as household food insecurity, along with poor quality diet (predominantly plant-based foods and with minimum amount of animal foods); poor dietary diversity; lack of knowledge about food value and food diversity; intra- and inter-household disparity; gender inequality and inequity; and lack of social positioning of vulnerable and marginalised population. In addition, the predominant risk factors are identified as increase of rural to urban migration and population density, accompanied by a lack of basic living standards (water, sanitation, etc.); being a slum dweller or rural resident; poor knowledge about micronutrient-rich foods; lack of affordable diversified foods, especially animal food sources; and lack of awareness about the consequences of deficiencies and of the health benefits of adequate micronutrient intake.

1.2.3 Policy and Strategy Background

The Government committed itself to addressing malnutrition among children and women in the VISION 2021 and the Sixth Five-Year Plan 2011-2015. In the Sixth Five-Year Plan, the Government of Bangladesh (GoB) addressed the problem of micronutrient deficiencies and provided strategic guidance for addressing the deficiencies, notably VAD, IDD and iron deficiency anaemia (IDA). Under the Health, Population and Nutrition Sector Development Programme 2011-2016 (HPNSDP), the mainstreamed nutrition programme aims to deliver nutrition services country wide through the existing Directorate General of Health Services (DGHS) and Directorate General of Family Planning (DGFP). The Government has placed the institutional home for nutrition with the Institute of Public Health Nutrition (IPHN) of DGHS. The National Nutrition Service (NNS) is an operational plans under the HPNSDP and implemented



by IPHN to ensure implementation of the mainstreaming of nutrition. The NNS operational plan includes a number of programmes to control micronutrient deficiencies in the country. These are programmes for the control of VAD and for the prevention and control of anaemia, IDD and other micronutrient problems of public health importance (zinc, vitamin D, calcium, etc.). The Government of Bangladesh has endorsed National Nutrition Policy 2015 (MOHFW 2015). This strategy will complement the National Nutrition Policy 2015 for implementation of micronutrient intervention.

Commitments at the government level are also seen through other policies implemented by different ministries, such as the National Food Policy (NFP) 2006 and its Plan of Action (PoA) 2008-2015 (FPMU 2006) and the Bangladesh Country Investment Plan (CIP), in which micronutrient deficiency control strategies are on the priority list (FPMU/Food Division 2011). The NFP places micronutrient deficiency prevention and control strategies in the context of a life-cycle framework and identifies three main approaches to be used in order to successfully address micronutrient deficiencies for the people at different stages of the life cycle: (1) dietary diversification, including nutrition education, food fortification and supplementation; (2) awareness campaigns; and (3) using multiple inclusion of pro-poor targeted and market-based interventions.

1.2.4 Rationale for National Strategy on Prevention and Control of Micronutrient Deficiencies

The National Micronutrient Survey 2011-12 was the first-ever-created benchmark in Bangladesh for some important micronutrients, such as zinc, iron, B12, folate, vitamin D, and calcium. It also updated the status of vitamin A and iodine nutrition among the Bangladeshi population. The survey documented multiple micronutrient deficiencies among the population, especially younger children, school-age children and women of reproductive age.

Addressing multiple micronutrient deficiencies requires clear policies, comprehensive strategies, actions and investment. At present the Health, Nutrition and Population Sector Programme (HNPS) 2011-16, NNS-Operational Plan 2011-2016, the National Strategy for Anaemia Prevention and Control in Bangladesh 2007, and the Infant and Young Child Feeding (IYCF) Strategy 2007 only provide strategic directives for control and prevention of vitamin A, iron and iodine. Thus, the Institute of Public Health Nutrition and other stakeholders felt the need to review the current strategies and develop a comprehensive national micronutrient deficiency control strategy.

This NSPCMD seeks to provide a comprehensive and coordinated strategy for preventing and controlling micronutrient deficiencies in Bangladesh. It will also provide an outline for an implementation plan, with clear strategies and actions for the next ten years, so that the policy makers and stakeholders who are involved in designing, implementing and evaluating micronutrient-related programmes at national, regional and community levels can implement the programme effectively.

Section 2

Micronutrient Deficiencies: Situation Analysis, Associated Risk Factors, Current Interventions

- 2.1 **Dietary Diversification**
- 2.2 **Vitamin A Deficiency**
- 2.3 **Iodine Deficiency Disorders**
- 2.4 **Anaemia and Iron Deficiency**
- 2.5 **Zinc Deficiency**
- 2.6 **Vitamin B12 Deficiency**
- 2.7 **Vitamin D Deficiency**
- 2.8 **Calcium Deficiency**

2 Micronutrient Deficiencies: Situation Analysis, Associated Risk Factors, Current Interventions

2.1 Dietary diversification

2.1.1 Infant Young Child Feeding (IYCF) Practices

In infants and young children, proper breastfeeding and complementary feeding, which together comprise Infant Young Child Feeding (IYCF), will meet all micronutrient requirements. The global recommendation for optimum infant feeding from birth to 24 months of age is i) initiation of breastfeeding within one hour of birth; ii) exclusive breastfeeding up to 6 months; iii) appropriate complementary feeding from 6 months; and iv) continued breastfeeding up to 2 years (WHO and UNICEF 2003).

Promotion of breastfeeding

Breastfeeding is the gold standard of infant feeding.¹ Breast milk contains over 200 components, characteristics of many which are yet to be known. The impact of breastfeeding within one hour of birth reduces 31 per cent of neonatal mortality (Lawn et al. 2005); exclusive breastfeeding up to six months reduces infant mortality by 13 per cent (Jones et al. 2003). Breast milk of a healthy mother contains all the micronutrients necessary for an infant. The iron in breast milk is better absorbed than that from other sources. As well, the vitamin C and high lactose levels in breast milk aid in iron absorption. Healthy, full-term babies have enough iron and other micronutrients stores in their bodies. The current research indicates that a baby's iron stores should last between six and twelve months.²

Current status of breastfeeding practice up to 2 years

In Bangladesh, 47 per cent of newborns receive breastfeeding within one hour of birth, 64 per cent are exclusively breastfed up to 6 months of age and 90 per cent of children continue breastfeeding up to 2 years of age, according to the Bangladesh Demographic and Health Survey (BDHS) 2011 (Mitra 2011).

Promotion of complementary feeding:

It is recommended that complementary foods be introduced at six months of age, with a variety of nutrient-rich foods to meet nutrient needs. When the desired nutrient densities from complementary feeding were compared with the actual nutrient densities of the typical complementary food diets consumed in various population of the world, iron, zinc and vitamin B6 were found to be deficient (WHO 1998, and Dewey and Brown 2001). "Problem nutrients" as they are termed by the Pan American Health Organization (PAHO), include certain nutrients that are in short supply in some populations, such as niacin, thiamine, calcium, vitamin A and vitamin C.

¹ [Bangladesh Journal of Child Health](#) > Vol 35, No 3 (2011)

² Is Iron-Supplementation Necessary? AUGUST 2, 2011. Posted in: [VITAMINS/ SUPPLEMENTS](#)

Vitamin C is likely to be a particular problem in the complementary food of children in Bangladesh. Others such as vitamin E, iodine and selenium may also be problem nutrients in certain settings.

To promote appropriate complementary feeding, it is preferable to develop population-specific dietary guidelines for complementary foods based on the food composition of locally available foods (PAHO, 2003). The answer to the issue of “problem nutrients” is to diversify food production in the country and diversify food intake by infants and young children, as well as all members in the family.

It is best if infants and young children receive all their nutrients through a balanced diet of food, rather than micronutrient supplementation. A complete diet needs to be ensured for the infants and young children to cure and prevent micronutrient malnutrition. Promotion of breastfeeding and homemade complementary feeding are crucial for the prevention of micronutrient deficiency.

Current status of complementary feeding

In Bangladesh, 62 per cent of children start complementary feeding at 6 to 8 months of age, but only 21 per cent receives a minimum acceptable diet while under 2 years of age (Mitra 2011). Even in the highest wealth quintile families, only 30 per cent of children receive appropriate complementary feeding. Accordingly, the promotion of IYCF is a priority component of Bangladesh’s nutrition programmes.


2.1.2 Promotion of Diversified Food Rich in Micronutrients

Improving dietary diversification by increasing the variety and consumption of micronutrient-rich foods through the increased production of agriculture, horticulture, livestock and fisheries and supported by comprehensive nutrition education strategies has been shown to be effective in many settings (Darnton-Hill I et al., 2005 and Bushamuka VN et al., 2005).

2.1.2.1 Review of intake of micronutrient rich foods

Based on the 2010 Household Income and Expenditure Survey, 35 per cent of the population have mean dietary diversity scores of less than 6 out of 12 food groups and are therefore considered to be at risk of micronutrient deficiency (Ezzati et al. 2004). Quantification of dietary micronutrient intakes among young children and their mothers in rural Bangladesh show an overall mean prevalence of micronutrient inadequacy for children at 43 per cent and for women at 26 per cent. For children, the prevalence of adequate intakes for each of 11 micronutrients ranged from a mean of 0 for calcium to 95 per cent for vitamin B6 (Arsenault et al. 2013). The per capita dietary intake of four selected micronutrients (notably folic acid, vitamin A, iron and calcium) was found to be no more than 60 per cent of the reference nutrient intakes. There are also inadequate iron and folic acid intakes, which are linked with an anaemia prevalence. The degree of micronutrient inadequacy is primarily explained by diets low in energy and with little diversity of foods.

In order to scale up nutrition-sensitive agriculture (horticulture, fisheries and livestock), the availability of nutritious, diversified foods need to be promoted through better inputs for its production – supplies, tools, technologies – and more sustainable livelihood opportunities for rural women. At the same time, there needs to be better knowledge on nutrition and changes in behaviour to use the new knowledge, especially with regards to infant and young children feeding. Integrated agriculture, including household farming interventions, needs to be increased to promote sustainable diets and nutrition. Extensive household gardening and fish, poultry and cattle farming which address access issues to nutritious foods should be encouraged to ensure adequate supplies of protein, calcium, iron, vitamin A, vitamin C, and other essential nutrients. Training on agricultural practices and ensuring high yielding varieties



of seeds, fertilisers, pesticides, irrigation and machinery at reasonable price are central to these efforts. In rural areas, 75 per cent of the households have a homestead garden [Khan 2011]. In 2011/12, Food Security and Nutrition Surveillance Project estimated 42 per cent of households have both homestead gardens and backyard poultry, 14 per cent have only homestead gardens, 20 per cent have only backyard poultry and 24 per cent have neither (JPGSPH and HKI 2012).

The Integrated Horticulture and Nutrition Development Programme implemented by the Department of Agriculture Extension (DAE) demonstrated significant improvements through community-based nutrition programmes, which led to major improvements in nutritional knowledge, skills and technologies of rural communities across 15 districts. A Dietary Impact Assessment showed substantially higher energy, protein and micronutrient intake among project households.

Schools provide a setting for introducing the community to nutrition information and technologies, leading to community advocacy of nutrition improvement policies and services. Girls, in particular, reached through schools will benefit from good nutrition, which is also beneficial later during pregnancy, lactation and nourishment of children.

2.1.2.2 **Current interventions**

The Bangladesh Country Investment Plan (CIP) is the investment arm of the National Food Policy–2006 (NFP-2006) and its Plan of Action (PoA, 2008-2015) and is a road map towards investment in agriculture, food security and nutrition. The CIP has identified twelve investment programmes to ensure implementation of the PoA (FPMU/Food Division 2011). Some of the CIP investment programmes include sustainable and diversified agriculture, fisheries and aquaculture development; livestock development, with a focus on poultry and dairy production; and community-based nutrition programmes and services. The CIP, under the community-based nutrition programmes and services, supports community-based homestead gardening, the rearing of small livestock and aquaculture and awareness building, which complement the national nutrition programme of Bangladesh. These programmes aim to increase household access to food in general, but especially to micronutrient-rich foods, and also generate income from the sale of the products. These programmes generally focus on women, recognizing their critical role in ensuring household food security and their tendency to invest in their children's health, nutrition and education.

To optimize the potential of these programmes to deliver micronutrient interventions, improvements are needed in targeting, monitoring outcomes, including identifying additional interventions, and improving the quality of implementation of the nutrition education component of the programme. Bangladesh has already implemented health education as part of health promotion and protection. The Bureau of Health Education, under the Director General of Health Services, is implementing the Health Education and Promotion Operational Plan, while the Director General of Family Planning (DGFP), through its Operational Plan for Information, Education and Motivation, under the HPNSDP, is carrying out comprehensive behaviour change communication (BCC) to target populations at all levels. The NNS has implemented a mass media campaign, social mobilization and BCC activities at the national and sub-national levels. In addition to traditional BCC tools (TV, radio, sports venues, posters, etc.), they have introduced digital health tools. There is a need to valorise the role of national applied nutrition institutions in BCC programmes (e.g., Bangladesh Institute of Research and Training on Applied Nutrition (BIRTAN), Bangladesh Agricultural Research Institute (BARI), Institute of Nutrition and Food Sciences (INFS) and Bangladesh Agricultural University (BAU)) to strengthen the on-going initiatives under the Ministry of Agriculture.

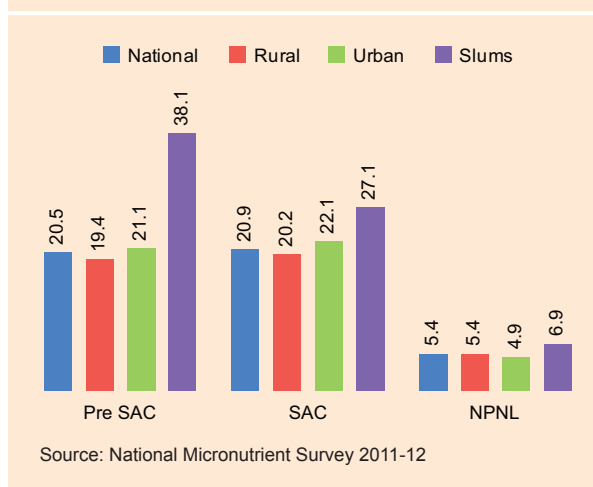
Finally, in order to make the BCC strategy more effective, it is essential that providers and staff are well trained and highly motivated. To this end there is a need to enhance the capacity for nutrition knowledge and leadership for implementation, along with strengthening the interface at the national, sub-national and union levels.

2.2. Vitamin A Deficiency

2.2.1. Situation Analysis

Vitamin A deficiency had been documented as a public health problem in Bangladesh since the 1960s. Although the severity of the problem has declined remarkably, the prevalence of sub-clinical VAD (serum retinol level $<0.70 \mu\text{mol/L}$) has not changed much over the past decade, especially among preschool children (PSAC) (6-59 months) and school-aged children (SAC). Currently one in five children is living with subclinical VAD¹ (see Figure 4) (ICDDR et al. 2014). The prevalence is highest among children living in slums. Subclinical VAD among severely acute malnourished children is 80 per cent (Sattar et al. 2012), while there is a lack of information on the burden of VAD among moderately acute malnourished children. Also, while the current prevalence of night blindness is not available, night blindness in children under five years reduced from 3.76 per cent in 1983 (IPHN and HKI 1985) to 0.04 per cent in 2005 (IPHN and HKI 2005) and is being maintained well below the WHO-recommended one per cent threshold level.

Figure 4: Prevalence of Vitamin A deficiency



According to the National Micronutrient Survey 2011-12, only 5.4 per cent of non-pregnant and non-lactating women have low serum retinol concentrations (ICDDR et al. 2014), which is similar to what was reported in 1997-98 National Vitamin A Survey. The survey in 2011-12 also reported about 34 per cent of NPNL women have inadequate vitamin A status (Serum retinol $<1.05 \mu\text{mol/L}$), an increase from 29 per cent in 1997-98 (IPHN and HKI 1999). There is no current data on the prevalence of VAD among adolescent girls, pregnant and lactating women.

Associated Risk Factors of vitamin A Deficiency

- Poor household expenses, lack of awareness
- Low intake of animal sources of vitamin A, specially by households with severe food insecurity
- Predominant share of plant-based vitamin A with low bioavailability
- Burden of vitamin A deficiency is higher among the food insecure and slum populations
- Lack of mother's knowledge about vitamin A-rich food and/or their health benefits associated with the intake of dietary vitamin A in children

2.2.2. Current interventions

2.2.2.1. Vitamin A supplementation in children aged 6-59 months

In 1973, the Government of Bangladesh commenced the Nutritional Blindness Prevention Programme with the distribution of vitamin A capsules (VAC) to children 6 to 72 months old

¹ Vitamin A is important for promoting growth and development, and maintenance of immune function. VAD is associated with visual impairment (night blindness) and/ or increase the risk of morbidity and mortality from childhood infections such as measles and those causing diarrhoea (Sommer and West 1996, Villamor and Fazwi 2000).

during routine service and domiciliary visits¹. In 1995, the distribution of VAC among children 12 to 59 months old was linked with the National Immunization Days for polio at over 120, 000 fixed sites in the country. This change in strategy resulted in an increase in coverage from 56 per cent in 1993 (Mitra 1993) to 80 per cent in 1999 (Mitra 1999).

Since 2011, the Government of Bangladesh has been implementing a National Vitamin A plus Campaign, covering all children 6 to 59 months old. This programme provides VAC (100, 000 IU retinol equivalent) to children 6 to 11 months of age and VAC (200, 000 IU) to children 12 to 59 months of age. Global evidence suggests that vitamin A reserves in individuals with VAD can fall below optimal levels in three to six months following a high-dose vitamin A supplementation; however, dosing at four to six-month intervals is considered sufficient to prevent serious consequences of VAD (WHO 2011b). Indicators are that this strategy has been effective, as the coverage rate of VAC distribution has increased to more than 90 per cent since 2006 (DGHS 2006). While the major strength of the programme is a very good distribution system, there are still indications of poor recording and monitoring of VAC distribution coverage. Consequently, although national VAC distribution maintains a high coverage rate, there appears to be some discrepancy in coverage rates by level of urbanization, food insecure category and wealth status of the households (JPGSPH/HKI 2012). The IPHN is also implementing Hard-To-Reach strategy to reach vulnerable groups of children in 36 sub-districts of nine low performing districts.

The only source of vitamin A for exclusively breastfed infants aged 6 months is breast milk. The Government of Bangladesh endorsed the Infant and Young Child Feeding Strategy 2007 to improve the early initiation of breastfeeding (start breastfeeding within one hour of birth)² and exclusive breastfeeding (EBF) from birth to six months of age (IPHN 2007). EBF for the first six months has increased from 43 per cent in 2007 (Mitra 2007) to 64 per cent in 2011 (Mitra 2011). Bangladesh has adopted paid maternity leave for 6 months in the public sector, but most in the private sector are not usually following the government policy, and there are often no crèches in work places.

2.2.2.2. **Vitamin A supplementation in postpartum women**

In 1995, the Government initiated the postpartum supplementation policy. As per this policy, a single dose of vitamin A (200, 000 IU) was to be provided to all post-partum women within two weeks of delivery. Because of high rates of home delivery (> 90 per cent), it was very difficult for Health Assistants and Family Welfare Assistants to contact all the new mothers at home within two weeks of delivery. In 2001, the Government revised the policy to allow supplementation within 6 weeks (42 days) after delivery, providing wider opportunity of supplementation. Despite this change, the coverage of post-partum vitamin A supplementation in 2012 was only 36 per cent, having remained steady since 2005 (DGHS 2012). While WHO guidelines does not recommend vitamin A supplementation in post-partum women as a public health intervention³ (WHO 2011b), the Bangladesh government continues providing post-partum vitamin A supplementation within 6 weeks of delivery, in consideration of the health benefits to the mothers in absence of any Bangladesh-specific evidence to the contrary.

2.2.2.3. **Fortification of foods with vitamin A**

Bangladesh has made a breakthrough in the fortification of edible oil with vitamin A, which it launched in December 2011, with the aim to reduce subclinical VAD among vulnerable groups

¹ Vitamin A supplementation in children 6 to 59 months of age living in developing countries is associated with a reduced risk of all-cause mortality and a reduced incidence of diarrhoea (Imdad et al. 2010).

² The Lancet series in 2003 estimated that 13 per cent of all deaths of children under 5 years of age could be prevented through universal coverage of appropriate breast feeding (Jones et al. 2003).

³ Recent evidence on the impact of post-partum vitamin A supplementation showed no significant changes in maternal mortality, maternal morbidity and cause specific infant mortality and morbidity. (WHO 2011)

of the population¹. Through the fortification project, Government supported sixteen edible oil refineries to establish fortification plants and produce vitamin-A-fortified edible oil. It is expected that with edible oils fortified with vitamin A at 15-30 ppm levels, the population, irrespective of age and socio-economic status, will receive maximum 20 per cent of the daily estimated average requirement of vitamin A. As a medium- to long-term strategy, this is to provide a sustainable solution for the whole population.

With the passage by Parliament of the 'National Edible Oil Fortification Law 2013', 100 percent refined edible oil are to be fortified with vitamin A. Now the challenge is to ensure all groups in society consume adequate amounts of fortified oil, especially by the poorest of the poor groups. While the National Micronutrient Survey 2011-12 showed per capita edible oil consumption is 24.4 gm/day, rural populations and food insecure household members consume much lesser amounts of the oil (16.4 gm/capita/day) than members of food secure households (ICDDR et al. 2014). In addition to the need for adequate consumption, there is a need to develop a central quality control and assurance system.

In another strategy to fortify foods with micronutrients in 2013, the Bangladesh Government, with technical support from World Food Programme (WFP) conducted an acceptability trial for rice fortification, with six micronutrients – vitamins A, B1 and B12, zinc, folic acid and iron – and using existing government social safety net programmes in two Sadar upazilas in Satkhira and Kurigram districts. The government safety net programmes include the Vulnerable Group Development (VGD) and the Vulnerable Group Feeding (VGF) programmes implemented by the Ministry of Women and Children Affairs (MOWCA) and Ministry of Disaster Management and Relief. In general, the report indicated a high level of acceptability of fortified rice by the programme participants.

In January 2014, the Ministry of Women and Children Affairs started distributing fortified rice among VGD households and reached around 60,000 beneficiaries in five upazilas. The objective of rice fortification is to improve access by the poorest of the poor to essential micronutrients. The poorest of the poor live with multiple micronutrient deficiencies and without access to other sources of micronutrient-rich food or fortified food. The MOWCA has planned to gradually expand fortified rice distribution among VGD beneficiaries, using Government funds. In 2015, the Government expands fortified rice distribution to five more upazilas.

2.3 Iodine Deficiency Disorders

2.3.1. Situation Analysis

In Bangladesh, iodine deficiency disorders have been recognized as a public health problem for several decades, but it is difficult to get an accurate picture. The national prevalence of iodine deficiency, measured by using mean urinary iodine concentration (UIC) below 100 µg/L, in school-age children is as high as 40 per cent (see Figure 5) (ICDDR et al. 2014), a prevalence that has remained essentially unchanged since 1999. However, while there is no data on the current prevalence of severe iodine deficiency (goitre rates) in school-age children, previous surveys indicated a substantial decrease in goitre prevalence from 50 per cent in 1993 (Dhaka University et al. 1993) to 6.3 per cent in 2004-05 (Yusuf et al. 2007). The National Micronutrient Survey 2011-12 reported a fairly high median UIC in school-age children² (145.7 µg/L) with the only exception being among the poorest segment of the population (ICDDR et al. 2014). Thus, while at a population level, Bangladesh may have adequate iodine intake, a significant proportion of school-age children are still at risk of developing iodine deficiency. Iodine deficiency in children is associated with poor growth and impaired intelligence quotient

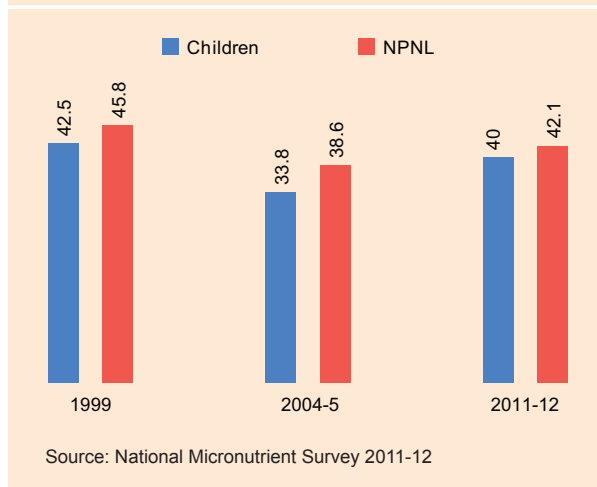
¹ For the majority of many populations, the fortification of foods with micronutrients has been shown to be a technologically, programmatically and economically effective method of increasing micronutrient intakes in populations (Darnton-Hill 1998).

² The median UIC in school age children has been used to assess approximate iodine status of the general population in the countries where iodized salt is the primary vehicle for iodine consumption (WHO et al. 2007)

(IQ) and cognitive functions (Hetzel 1983). There is no national-level data on iodine deficiency in adolescent girls.

The National Micronutrient Survey 2011-12 reported a 42 per cent prevalence of iodine deficiency in NPNL women, a rate which was 45.6 per cent in 1999 (Dhaka University et al. 1999) and 38.6 per cent in 2004-5 (Yusuf et al. 2007). The national survey of IDD in 2004-05 reported goitre rates of 11.7 per cent and 14.6 per cent in NPNL women and pregnant women, respectively (Yusuf et al. 2007). Moderate to severe iodine deficiency in pregnant women is linked with impaired mental development and growth retardation of the offspring, a condition called cretinism, and mild iodine deficiency is associated with impaired foetal neurological development (Bielsalski 2013). Further, the National Micronutrient Survey 2011-12 reported a median UIC of 122.6 µg/L for NPNL women (ICDDR et al. 2014), while it was 111.5 µg/L in 1999 (Dhaka University et al. 1999) and 139.9 µg/L in 2004-5 (Yusuf et al. 2007). Overall, in comparing the prevalence of the risk of iodine deficiency and median UIC of the NPNL women, the situation has not changed significantly since 1999.

Figure 5: Prevalence of iodine deficiency (UIE <100ug/L) in school aged children and women in 1996, 2004-5 and 2011-12



As for iodized salt, the most recent estimates show that the coverage of adequately iodized salt at the household level (defined as ≥ 15 ppm) is 57.6 per cent overall, with rural, urban and slum levels at 51.8 per cent, 75.4 per cent and 76.9 per cent, respectively (ICDDR et al. 2014). Currently about a quarter of the households buy open salt; 84 per cent of these households do not buy iodized salt packets due to their higher prices, and about one fourth of them do not buy salt packets because they are not available. Further, only 27.5 per cent of the retailers know about the salt law; of this percentage, 20 per cent do not know about the punishment for violating the salt law (ICDDR et al. 2014). Overall, there appears to be an absence of mass level awareness of the universal salt iodization (USI) programme; more attention to an iodized salt marketing strategy could play an important role in alleviating the IDD problem in the Bangladeshi population.

2.3.2. Current interventions

2.3.2.1. Universal salt iodization programme

The Government of Bangladesh adopted the Universal Salt Iodization Strategy in 1989 and endorsed the Salt Iodization Act 1989, making it mandatory for edible salt to be iodized. Accordingly, during 1995, under the Ministry of Industries, the Bangladesh Small and Cottage Industries Corporation (BSCIC) initiated the Control of Iodine Deficiency Disorders through a USI project and focused on establishing salt iodization plants in all salt factories in the country with the financial assistance of UNICEF. In 1998, salt iodization regulation was endorsed and substantial investments were made for the development of infrastructure for salt iodization. An evaluation survey of USI in 1999 reported that nearly 99 per cent of the edible salts at the factory level were iodized; however not all salts were adequately iodized (IPHN et al. 1999).

Addressing IDD is a national priority, and the government has established a National Salt Committee, with district and sub-district level entities. However, there are gaps and challenges

in the existing strategies to prevent and control IDD in Bangladesh. While modern iodized salt industries cover at least 60 per cent of the salt market, the current national coverage of adequately iodized salt at the retailer's level (≥ 20 ppm) is 66.4 per cent (ICDDR et al. 2014). Although quality assurance (QA) /quality control (QC) monitoring systems, including testing laboratories, are established, there are inadequate technical personnel in laboratories at the production level.

The USI project has a strong potential to alleviate IDD in the country; however, its effectiveness is limited by several weaknesses. First, the National Salt Law 1989 did not include the use of iodized salt in the food industries and/or for livestock. According to WHO and UNICEF's definition, USI refers to "the iodization of all human and livestock salt, including salt used in the food industry" (WHO et al. 2007). When one of these three types of salt is non-iodized, it can leak into the market for direct human consumption relatively easily, as all are food-grade salts. Second, the lack of information on the actual production of edible and industrial salts, a weak monitoring system and insufficient law enforcement at all levels (factory, retail and community levels), higher prices for iodized salt and the availability of low quality crude salt all contribute to non-compliance. Third, there was inadequate preparation for transforming the USI project into a national programme and a lack of commitment and engagement at the regional level. Finally, there is an inadequate use of mass communication, leading to poor consumer awareness that they should demand iodized salt.

Other challenges include controlling fraud entrepreneurs packaging industrial salt in the guise of edible salt, controlling the importation of iodized salt, preventing syndicate and monopoly business of bigger industries, and law enforcement at the retailer level.

Associated Risk Factors of Iodine Deficiency

- In Bangladesh, soil has been deprived of iodine because of the leaching effects of heavy rainfall and floods
- Household food insecurity, high cost of iodized packet salt
- Lack of awareness about health benefits of iodine/iodized salts, preservation of iodized salts at household level
- Use of industrial salt (non-iodized) as edible salt
- Low quality crude salts and importing edible salt without quality checking
- Lack of law enforcement and monitoring at retailers level
- Lack of internal quality control at factory level

2.4. Anaemia and Iron Deficiency

2.4.1. Situation Analysis

Studies on the levels of anaemia in Bangladesh report levels that range widely, but all indicate actions still need to be taken. According to the National Micronutrient Survey 2011-12, anaemia affects 33 per cent of preschool children, 19.1 per cent of children aged 6 to 11 years, 17 per cent of children aged 12 to 14 years and 26 per cent of NPWL women¹ (ICDDR et al. 2014), with rural predominance. When compared with previous surveys conducted by the Nutrition Surveillance Project of Helen Keller International (HKI) in 2001 (IPHN and HKI 2002) and 2004 (Haas and T Brownlie 2001), there appears to be a significant reduction in the prevalence of anaemia among preschool children and NPWL women in the country over the past decade. However, the Bangladesh Demographic and Health Survey (BDHS) conducted in 2011 (Mitra 2011) found a 51 per cent prevalence of anaemia in preschool children and 40 per cent in NPWL women. The National Micronutrient Survey 2011-12 and BDHS 2011 were conducted within one year, thus the differences in prevalence between the two surveys might be largely attributed to the methodological differences and emphasizes the difficulties in comparing prevalence

¹ Anaemia has been found to be associated with increased maternal and peri-natal mortality (Ezzati et al. 2004).

across different surveys. However, it is important to recognize that at least one in every three preschool children and one in every four NPWL women is still anaemic, and this warrants a review and perhaps change in the existing public health programmes and strategies.

There is no recent data on the prevalence of anaemia among adolescent girls. However, previous surveys have indicated 30-40 per cent prevalence of anaemia in this segment of the population (IPHN and HKI 2002 and 2006). Further, the National Micronutrient Survey in 2011-12 did not include pregnant and lactating women. According to BDHS in 2011, nearly half of pregnant (49.6 per cent) and lactating (48 per cent) women were anaemic (Mitra 2011). In 2004, the prevalence of anaemia in pregnant women was 39 per cent (IPHN and HKI 2006), but it was 47 per cent in 2001 (IPHN and HKI 2002).

Associated Risk Factors of Anemia and Iron Deficiency

- Household food insecurity along with poor quality diet (predominantly plant-based food and with minimum amounts of animal food)
- Lack of knowledge about food value and food diversity
- Poor literacy, being a female and slum dweller
- Infectious morbidity and worm infestations
- Poor caring practice, including poor breastfeeding inappropriate weaning and low quality complementary foods
- Low coverage and compliance of IFA supplementation
- Weak monitoring and lack of coordination of IFA supplementation programme

The National Micronutrient Survey 2011-12 revealed that the current national prevalence of iron deficiency, based on serum ferritin concentration, is only 10.7 per cent in preschool children and 7.1 per cent in NPWL women. Further, the prevalence of IDA¹ is 7.2 per cent in preschool children and 4.8 per cent in NPWL women. In school-aged children, prevalence of IDA is even lower, indicating that iron deficiency may not be the primary cause of anaemia in Bangladeshi population. Current evidence suggests that iron deficiency still contributes to anaemia in Bangladesh, although it may not be the largest contributor. The cause of anaemia in Bangladesh needs further investigation.

The National Micronutrient Survey 2011-12 reported that dietary iron provides only 41 to 82 per cent of the recommended daily allowance across different population groups. Although consumption of animal-source foods has increased in the country (Bangladesh Bureau of Statistics 2010), it constitutes only a small share of the total dietary iron (ICDDR et al. 2014). Further, the survey reported that there is no association between serum ferritin levels (reflects body iron store) and dietary iron consumption, while it has shown a significant association with ground water iron levels² in areas of residence of the study participants. The same survey also reported a significantly higher mean serum ferritin level in all the studied population groups living in areas with high ground water iron.

Further analysis of the National Micronutrient Survey 2011-12 data revealed that the serum ferritin levels³ of NPWL women living in areas with low ground water iron ranged from 4.9 to 256.9 µg/dL, with 4.6 per cent having iron overload (a threshold of >150 µg/l for a serum ferritin concentration is used to define iron load for women (WHO et al. 2001)). For women living in areas with high ground water iron, it ranged from 4.9 to 269.3 µg/dL, with 10.5 per cent of the women having iron overload (ICDDR et al. 2014). During pregnancy, iron requirements increase significantly and an increase in body water results in haemodilution. Thus it is very unlikely

¹ Iron deficiency anaemia is associated with poor growth and cognitive impairment in children, and increased susceptibility to infection, loss of productivity from impaired work capacity (Haas and T Brownlie 2001), which also exerts a substantial economic burden (Horton et al. 2003).

² Iron content in groundwater appears to be high in some parts of Bangladesh (Merrill et al., 2010), and it is pre-dominantly in ferrous (Fe²⁺) form, which is more bioavailable than ferric form (Merrill et al., 2010 and Hallberg 1991).

³ After excluding the subjects with infection or inflammation based on high CRP and AGP level (NMS 2011-2012 Raw data analysis, Unpublished).

that by giving routine iron-folic acid (IFA) supplements, these pregnant women will suffer from haemoconcentration and/or iron over load. On the other hand, without IFA supplements, a large majority of these women may not sustain normal iron status. Folic acid is also required to prevent neural tube defects during pregnancy. Therefore, further research is required before recommending any change in the IFA supplementation policy and programme.

Since 90 to 95 per cent of anaemia cases could not be explained by iron deficiency, it is crucial to examine further other possible causes of anaemia in this population¹. The National Micronutrient Survey in 2011-12 reported a significant positive association of haemoglobin with serum ferritin, retinol and zinc in preschool children and a negative association with household food insecurity after controlling for potential confounders. Similarly, in NPNL women, serum ferritin, serum folate, serum retinol and the dietary intake of animal source iron are positively associated with haemoglobin, while household food insecurity is negatively associated with haemoglobin (ICDDR et al. 2014). These findings reinforce the role of other haematopoietic micronutrients in anaemia control and prevention. The risk of malaria is low in Bangladesh, being restricted to hilly areas, so is probably not a factor. While there is no national data on thalassaemia prevalence, it is possible that a part of the anaemia problem may be due to genetic disorders².

2.4.2. Current interventions

2.4.2.1. Iron-folic acid supplementation programme for pregnant women

In Bangladesh, an IFA supplementation programme³ for pregnant women has been implemented for several decades. The current IFA supplementation programme has several potentials, which include a government-approved national anaemia strategy and IFA supplementation guidelines, functionally integrated health and family planning wings under the NNS operational plan, increased coordination and utilization of public and private facilities, and a good supply chain system, along with service delivery network.

The IPHN, under the MOHFW, developed national guidelines for the prevention and treatment of IDA in 2001 (IPHN 2001), when IFA supplementation, dietary improvement, food fortification and parasite control in preschool children, school-aged children, adolescent girls, and women of reproductive age were recommended. However, anaemia prevention and control activities only focused on IFA supplementation and have not paid adequate attention to address the other causes of anaemia. In 2007, the MOHFW developed and approved the National Strategy for Prevention and Control of Anaemia (WHO et al. 2001), in which the IFA supplementation programme was identified as a critical intervention needed to address anaemia in pregnant women. Under the current policy, pregnant women are provided IFA supplements, with a daily dose of 60 mg of elemental iron and 400 µg folic acid throughout pregnancy and onwards until 90 days after delivery⁴.

The IFA supplementation is one of the components of the NNS operational plan of HPNSDP and is implemented by the DGHS and DGFP as part of the antenatal care services. Since July 2011, the NNS is responsible for the iron supplementation programme for the whole country under HPNSDP. The most recent report indicates that 37 per cent of women never received IFA

¹ Besides iron deficiency, anaemia is caused by malaria, worm infestation, chronic infections, genetic disorders (haemoglobinopathies) and deficiencies of vitamins B-6, B-12, A, and C, folic acid, and riboflavin (Mejia et al. 1992, Powers et al. 1983, Leklem 1997, Fishman et al. 2000, Dreyfuss et al. 2000, Jansson et al. 1986, and Linpisarn et al. 1996).

² A study among women in a northern rural Bangladeshi area reported 28 per cent prevalence of thalassaemia and found an association between the prevalence of thalassaemia and risk of anaemia (Merrill et al. 2012).

³ Daily IFA supplementation is strongly recommended for pregnant women as part of antenatal care to reduce the risk of low birth weight, maternal anaemia and iron deficiency (WHO 2012).

⁴ In settings where anaemia in pregnant women is a severe public health problem (≥ 40 per cent), such as it is in Bangladesh, a daily dose of 60 mg elemental iron instead of a low dose (30 mg) and 400 µg folic acid is recommended (WHO 2012).

supplements during pregnancy. Among those who took the IFA supplements, more than half started taking them in the third trimester and only 16 per cent took them during first. Further, coverage rates vary widely by divisions and regions and by level of urbanization. Adherence to IFA supplements is also related to the wealth and education level of pregnant women (JPGSPH and HKI 2012). Ensuring nutrient needs in the early stage of pregnancy is critical. It has been known for decades that adequate folate status during pregnancy is essential in preventing neural tube defects. While antenatal care (ANC) coverage increased dramatically from 31 per cent in 1993 (Mitra 1993) to 77 per cent in 2011 (JPGSPH and HKI 2012), only 26 per cent of pregnant women obtained at least four ANC visit in 2011.

Inadequate and irregular supplies of IFA tablets at the ANC service centres result in inadequate distribution of IFA tablets to the pregnant women who visit ANC clinics. Because there is a lack of harmonization between the policy on ANC and IFA timing, women do not receive adequate dosage through ANCs. Further, for each ANC service centre, IFA supplies are fixed and are not based on local targets or estimations of need. In addition, weak monitoring and supervision, lack of awareness among service providers about the need of IFA, and inadequate training of the service providers are also evident. Among the beneficiaries, the level of education, lack of awareness about the benefits of IFA supplements and absence of adequate counselling are some of the key contributing factors to the low coverage rate.

Further, existing programmes do not encompass all of the high-risk target groups. For example, children aged less than five years are not routinely given any interventions to prevent and control anaemia, and adolescent girls and NPWL women are not included in nationwide efforts.

Some of the key challenges identified for the current programme include increasing political commitments, ensuring regular supplies of IFA tablets by reducing its procurement process time and reducing central dependency, reaching vulnerable groups in hard-to-reach areas and reducing public misconception.

2.4.2.2. Iron-folic acid supplementation programme for NPWL women and adolescent girls

In population groups where the prevalence of anaemia among women of reproductive age is above 20 per cent and mass fortification programmes of staple foods with iron and folic acid are not in place, WHO recommends weekly IFA supplementation as a strategy to prevent iron deficiency, improve pre-pregnancy iron reserves and improve folate status in some women (WHO 2009b). In Bangladesh, the national guidelines for the prevention and treatment of IDA recommend weekly supplementation with two tablets, each having 60 mg elemental iron and 400 µg folic acid, for adolescent girls and NPWL women (IPHN 2001). From 2005 to 2010, a programme ran for adolescent girls where once-weekly IFA capsules were distributed to those students of government and non-government schools of selected areas outside Dhaka city. However, this programme was limited to only those districts that had school health clinics. In addition, the NNP, in its programme areas, also provided IFA supplements and anthelmintic treatment to adolescent girls, newly wed women and post-partum women through their Community Nutrition Promoters. The NNP ended in 2011 and was replaced by the NNS. Currently, there is no nation-wide IFA supplementation programme for NPWL women and adolescent girls. However, the current NNS programme does recommend weekly IFA supplementation, with a dose of two tablets, each having 60 mg elemental iron and 400 µg folic acid, for adolescent girls.

2.4.2.3. Anaemia control programme for children aged 6 to 59 months

Nationwide, children aged less than five years old are not routinely given any intervention to prevent and control anaemia. Inadequate attention is given to parasitic disease control, dietary improvement and food fortification. De-worming of children aged 24-59 months with Albendazole, as part of the country's anaemia control programme, is included during the semi-

annual National Vitamin A Plus Campaign (NVAC). In 2011, the national coverage rate for de-worming was 77 per cent (JPGSPH and HKI 2012). To combat anaemia, children in some of the Dhaka urban slums and Chittagong Hill Tract (CHT) also received multiple micronutrient powder (MNP), with UNICEF support. More recently, under the Maternal and Young Child Nutrition Security Initiative in Asia supported by UNICEF, the DGHS and DGFP have been implementing IYCF and MNP supplementation in children aged 6 to 23 months of age to reduce anaemia in that age group in selected sub-districts. The MNP powder contains five nutrients, including iron and folic acid.

2.4.2.4. **Micronutrient Powder (MNP) supplementation for young children**

The National Strategy for Prevention and Control of Anaemia has recommended the use of MNP¹ in the diet of 6- to 23-months-old children and for children 24 to 59 months of age, if resources are available, to prevent anaemia and other micronutrient deficiencies (IPHN 2007). In settings where anaemia in children under two or under five years of age is 20 per cent or higher, one sachet of MNP containing 12.5 mg of elemental iron (preferably as encapsulated ferrous fumarate), 300 µg of retinol (vitamin A) and 5 mg of elemental zinc (preferably as zinc gluconate) is recommended daily. In addition to iron, vitamin A and zinc, MNP may contain other vitamins and minerals at RDA doses for the target population (WHO 2011a); however, evidence of the effectiveness of multiple (more than five) micronutrients in MNP is still lacking.

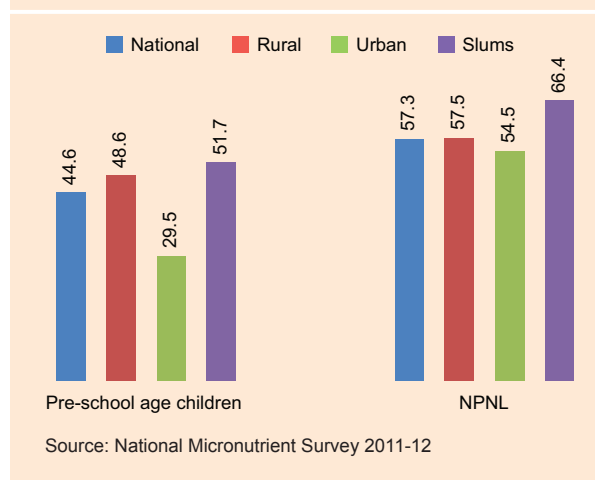
In 2011, MOHFW, with technical support from UNICEF, started implementing MNP supplementation for children 6 to 23 months old in 18 upazilas in seven districts and later expanded to a few more upazilas.

2.5. Zinc Deficiency

2.5.1. Situation Analysis

Zinc is an essential component of a large number of enzymes and plays a crucial role in food intake regulation and nutrient metabolism, Deoxyribonucleic acid (DNA) and protein synthesis, growth and development, and immune functions. The National Micronutrient Survey in 2011-12 provided for the first time nationally representative data on zinc status, based on serum zinc concentration², but only in preschool children and NPNL women (ICDDR et al. 2014). As shown in Figure 6, the prevalence of zinc deficiency in preschool children³ is 44.6 per cent, with the highest rate being among children living in slums. While there is no na-

Figure 6: Prevalence of Zinc deficiency



¹ WHO has strongly recommended home fortification of foods with MNP for infants and children 6-23 months of age for improving iron status and reducing anaemia (WHO 2011).

² Serum zinc level is a reasonable indicator of the relatively severe state of zinc deficiency and is commonly used for population assessment (WHO & FAO 2006).

³ Zinc deficiency increases the risk of diarrhoea, pneumonia and malaria in children (Walker and Black 2004, Sazawal et al. 2007 and Brooks et al. 2004).

tional level data on the prevalence of zinc deficiency in infants¹, a study in a rural community in Bangladesh found 50 per cent prevalence of zinc deficiency in infants (Eneroth et al. 2010). The national prevalence of zinc deficiency in NPNL women is 57.3 per cent, with the highest rate being for women living in slums. While there is no national-level data on the prevalence of zinc deficiency in pregnant women, a study in a rural sub-district reported 55 per cent prevalence of zinc deficiency in pregnant women² (Lindström et al. 2011).

Associated Risk Factors of Zinc Deficiency

- Household food insecurity, low socio-economic status
- Low intake of animal sources of zinc and high intake of plant sources of zinc
- Consume a diet with a very high content of phylate, an inhibitor of zinc absorption
- Drinking tube well water containing high level of iron is found to be negatively associated with zinc status in preschool children
- Zinc and iron interact with each other if appropriate iron to zinc ratio is not maintained

According to the National Micronutrient Survey 2011-12, the median daily consumption of zinc by preschool children is 2.67 mg for those living in slums and is 3.23 mg in urban areas, while the RDA for zinc is 3-5 mg for this age group. Overall, nearly 39 per cent of children aged 2-3 years and only 11.5 per cent of children aged 4-5 years met the RDA. In NPNL women, mean consumption of zinc is 54.7 per cent and 47.0 per cent of RDA in the urban and slum areas respectively. Further, a large majority of dietary zinc is from plant source foods which are poorly bio-available. It is worth noting that mean animal source zinc consumption varies with levels of urbanization, wealth and food security; it is lowest among people living in slums and in poor and food-insecure households (ICDDR et al. 2014).

2.5.2 Current interventions

2.5.2.1 Treatment with zinc during diarrhoea management for younger children

In 2004, WHO and UNICEF recommended the use of oral rehydration saline (ORS) for the correction and prevention of dehydration and 10–20 mg of zinc for 10–14 days as treatment for all episodes of diarrhoea (Lindström et al. 2011). The MOHFW, with the help of two governmental committees, developed a policy for a zinc therapy programme during diarrhoea for young children³ that was approved by the Government in 2006. The MOHFW, in collaboration with International Centre for Diarrhoeal Disease Research, Bangladesh (icddr, b) and Acme Laboratories, Bangladesh, conducted the Scaling Up Zinc for Young Children (SUZY) Programme in the same year, which is one of the first national efforts to expand zinc treatment coverage for childhood diarrhoea in the world. In addition, the MOHFW revised the national Integrated Management of Childhood Illnesses (IMCI) guidelines to include zinc therapy for diarrhoea.

While the zinc supplementation programme has now been incorporated into the NNS and is using health service delivery facilities in both rural and urban areas, the current coverage rate is only 34 per cent. Lack of awareness, inadequate production by pharmaceutical companies (due to inadequate demand), inadequate supply in the mainstream, and poor monitoring systems are some of the weaknesses of the programme. Although social marketing campaigns have led to early successes of the programme, it is still suffering from a range of challenges. One of the key challenges is weak consumer awareness of zinc tablets for treating diarrhoea. More worryingly, there appears to be lack of demand for zinc by health care providers.

¹ Zinc deficiency in early childhood is believed to be a cause for developmental disorders (Cole and Lifshitz 2008).

² Zinc supplementation in pregnancy showed a 14 per cent reduction in the risk of preterm delivery among supplemented women (Chaffee and King 2012).

³ Zinc supplementation during an episode of diarrhoea in children can reduce the duration and severity of the episode and lower the incidence of diarrhoea in the following 2–3 months (Baqui et al. 2002 and Bhutta et al. 2000).

2.5.2.2. Zinc supplementation through MNP and rice fortification

As mentioned in the previous discussion on home fortification with MNP, Government is implementing an area-based programme for MNP supplementation, containing 5 mg zinc, among children aged 6 to 23 months, integrated with IYCF counselling. At the same time rice fortification will contain zinc, which will be distributed among the poorest of the poor groups of the population through VGF and VGD. However, both of these programmes will still not cover all groups of people living with zinc deficiency in Bangladesh. WFP has also supported the implementation of *atta* fortification in the past and is continuing to distribute biscuit fortification, which also contain zinc, for school children.

2.6 Vitamin B12 Deficiency

2.6.1. Situation Analysis

Vitamin B12 is needed for synthesis of DNA, and hence, cell division, and normal function of nervous tissue. Its deficiency affects rapidly dividing cells, such as those forming red blood cells¹. To date, there is no data available on national level estimates of vitamin B12 deficiency among infant and children. However, a study in a rural community in Bangladesh reported 31 per cent prevalence of vitamin B12 deficiency in infants² (Eneroth et al. 2010).

According to the National Micronutrient Survey in 2011-12, one in four NPWL women suffers from some degree of vitamin B12 deficiency (ICDDR et al. 2014). Maternal vitamin B12 status is strongly associated with the vitamin B12 status of newborns (Bjørke Monsen et al. 2001). There is no current data on vitamin B12 deficiency among pregnant and lactating women³, but a study in a rural sub-district in Bangladesh reported 46 per cent prevalence of vitamin B12 deficiency in women at their early pregnancy (Lindström et al. 2011).

Associated Risk Factors of Vitamin B12 Deficiency

- Poor dietary intake
- Low intake of animal source, where products from herbivorous animals (i.e. meat, eggs, milk) are the only source of vitamin B12 for humans
- Low socio-economic status and household food insecurity

2.6.2 Current interventions

Currently there is no national strategy or programme for preventing vitamin B12 deficiency among high-risk population groups in the country.

2.7 Vitamin D Deficiency

2.7.1. Situation Analysis

Vitamin D plays important roles in our bodies by maintaining normal levels of calcium and phosphate in the blood, which in turn facilitates bone mineralization, contraction of muscles, nervous system activities and cellular functions (WHO 2004). The National Micronutrient Survey 2011-12 provided for the first time nationally representative data on vitamin D status, based on serum vitamin D concentration, but only in preschool children, school-age children and NPWL

¹ Vitamin B12 deficiency can cause macrocytic anaemia (Fishman et al. 2000).

² Vitamin B-12 deficiency can cause cognitive impairment and memory loss (Allen et al. 1999).

³ Infants fed with breast milk from vitamin B₁₂-deficient mothers exhibits a failure to thrive, poor brain development and, in some cases, mental retardation (Allen 2002).

women. The prevalence of vitamin D deficiency, based on serum vitamin D level <50.0 nmol/L, is 39.6 per cent in preschool children and 45.5 per cent in school-age children¹, with the highest rate among children living in slums. When a more stringent cut-off is used to define for vitamin D deficiency², 7.5 per cent of preschool children and 6.5 per cent of school-age children are found to be vitamin D deficient. Further, female school-age children appear to have higher burden of the problem than the boys, although the difference is not statistically significant.

In preschool children, the prevalence of vitamin D deficiency is highest among the poorest and the severe food insecure households. On the contrary, for school-age children it is highest among the richest and the food secure households (ICDDR et al. 2014). Further, the National Rickets Survey in 2008 reported a one per cent prevalence of rickets among children aged between 1 and 15 years, with the highest rate, 62 per cent, among the rachitic cases were children aged under five (ICDDR 2009).

According to the National Micronutrient Survey 2011-12, nearly three-quarters (71.5 per cent) of NPNL women are vitamin D deficient³, based on serum vitamin D level <50.0 nmol/L. Using a stricter cut-off to define for vitamin D deficiency, serum vitamin D level <25 nmol/L, 21.0 per cent of NPNL women are found to be vitamin D deficient (ICDDR et al. 2014). There is no national level data on the prevalence of vitamin D deficiency in pregnant women, although maternal vitamin D status during pregnancy is important for the vitamin D status of the child during early childhood (Hollies and Wagner 2004).

Associated Risk Factors of Vitamin D Deficiency

- Poor dietary intake of vitamin D rich foods along with high of phylate
- Limited outdoor exposure conditioned to modern life style and urbanization
- Lack of adequate research and lack of national strategy on vitamin D
- Poor antenatal vitamin D status in mother adversely affecting the young infant
- Lack of access to information on vitamin D

2.7.2. Current interventions

At present, there is no national strategy or programme for preventing vitamin D deficiency among the high-risk population groups in the country. Several opportunities are identified for possible interventions, including Government's willingness to work with stakeholders, enough sunlight across the country, adequate water bodies to culture fish, a homogenous society, the presence of common fortification food vehicles, women's empowerment and a prospective school feeding programme. However, for improving population-level vitamin D status, strong political commitment is required. It is important to note that currently vitamin D supplementation during pregnancy, as part of routine antenatal care, is not recommended by the WHO (WHO 2012b).

2.8 Calcium Deficiency

2.8.1 Situation analysis

In addition to its role in maintaining bone health, calcium is involved in a large number of metabolic processes, including blood clotting, muscle contraction, hormone release, and cellular proliferation and differentiation. According to the National Micronutrient Survey 2011-

¹ Vitamin D deficiency is associated with rickets in children and in areas where vitamin D deficiency is endemic, rickets are diagnosed soon after birth (ICDDR 2009).

² The cut-off to define vitamin D deficiency were serum vitamin D level <25 nmol/L used by UK National Diet and Nutrition Surveys (Gregory et al., 2000; Henderson et al., 2002).

³ In adults, vitamin D deficiency is associated with osteomalacia and bone fracture, and chronic diseases, such as diabetes and heart disease (Gröber et al., 2013)

12, one in four preschool children and nearly one in five school-age children in Bangladesh are suffering from calcium deficiency¹ (ICDDR et al. 2014). The national prevalence of calcium deficiency among NPNL women is 26.3 per cent. The problem is equally prevalent across the residential strata and socio-economic status categories. There is no national level data on the prevalence of calcium deficiency in pregnant women².

Associated Risk Factors of Calcium Deficiency

- Poor dietary intake of calcium rich foods, along with high intake of phylate
- Lack of awareness of need for calcium and how to get it
- Lack of adequate research and national strategy/intervention

2.8.2. Current intervention

The current WHO recommendation for all pregnant women (particularly those are at risk of gestational hypertension) is to supplement with calcium tablets, with a total daily dosage of 1.5 to 2.0 g elemental calcium/day, divided into three doses, from 20 weeks of gestation (WHO 2013). At present, no population-based intervention to address calcium deficiency is in place. Several opportunities are identified for possible interventions, including government's willingness to work with stakeholders, adequate water bodies to culture fish, presence of common fortification food vehicles, women's empowerment and a prospective school feeding programme. However, there are challenges, such as ensuring equity, reaching the hard-to-reach, addressing people's cultural taboos, and mobilising resources for fortification: finances, technology, skills, and a sustainable and effective marketing model.

¹ Calcium deficiency was defined as total serum calcium level <8.8 mg/dL in preschool children and school-aged children and <8.4 mg/dL in NPNL women (Nelson Textbook of Pediatrics, 18th Edition, 2008).

² Calcium supplementation during pregnancy is associated with a reduction in risk of gestational hypertension, pre-eclampsia, preterm delivery and increase in birth weight (Imdad and Butta 2012).

Section 3

Recommended Strategy for Prevention and Control of Micronutrient Deficiencies

- 3.1. **Strategic Areas**
- 3.2. **Strategy Implementation Plan**
- 3.3. **Indicator Matrix**

3

Recommended Strategy for Prevention and Control of Micronutrient Deficiencies

3.1 Strategic Areas

This section focuses both on improving and reviewing the existing strategies and on developing new strategies for alleviating and preventing various micronutrient deficiencies. To ensure that the recommended strategies are comprehensively laid out, six strategic areas are identified with key objectives as described in Table 1.

Table 1: Strategic Areas for Prevention and Control of Micronutrient Deficiencies with Key Objectives

Strategic Area	Objective
1. Policy, Guidelines & Legislation	To ensure that relevant policies, guidelines and legislation are developed or revised and enacted for improving the micronutrient status of the population by 2016.
2. Intervention Programme	To implement appropriate long-term (dietary diversification and modification), medium-term (Fortification) and short-term (supplementation), intervention programmes for preventing and controlling micronutrient deficiency through pro-poor targeted and market-based interventions. Depending on the intervention, Total Quality Management (TQM) will be applicable,
3. Partnership & Coordination	To promote efficient implementation and effective coverage of various intervention programmes through improved planning, monitoring, coordination and collaboration among policy makers, GoB, civil society organisations (CSO), the United Nations (UN), researchers and private sectors.
4. Capacity Building	To improve knowledge, technical and service delivery skills of health care managers and frontline workers on micronutrient deficiency control. To improve knowledge, technical and monitoring skills of relevant government institutes responsible for monitoring and enforcement of mandatory and voluntary food fortification programmes
5. Advocacy and Communication	To increase awareness and demand by targeted populations for micronutrient deficiency control programmes and to ensure that evidence is disseminated and used to inform nutrition policy making.
6. Monitoring, Evaluation & Research	To strengthen institutional frameworks, guidelines and the reporting of monitoring and evaluation of micronutrient deficiency control activities at all levels. To increase new knowledge and review current programme through operational research.

3.1.1. Strategic Area 1: Policy, Guidelines and Legislation

This strategic area focuses on the development and/or modification of specific policies, guidelines and legislation that are necessary to provide the framework for implementation of evidence-based and effective NSPCMD programmes. The focus areas of actions are outlined in Table 2.

Table 2: Priority Focus Areas of Policy, Guidelines and Legislation for NSPCMD by Micronutrients

Micronutrient	Priority Areas of Action
Vitamin A	<ol style="list-style-type: none"> 1. Strengthening VAC supplementation strategy for children aged 6-59 months, especially those living in hard-to-reach areas and moderately malnourished children. 2. Revisiting existing policy for post-partum VAC supplementation programme in the context of recent WHO recommendation. 3. Reinforcing compliance by private sectors as key players in the vitamin A fortification program.
Iodine	<ol style="list-style-type: none"> 1. Revising existing Salt Law to implement the use of iodized salt in livestock and processed food. 2. Declaring USI as a programme of national importance and intervening in a mission mode (Salt Mission). 3. Transforming USI project into a sustainable programme and mainstreaming USI activities within NNS. 4. Initiating a Market Intervention Operation (MIO) to determine the right price for consumers. 5. Introducing iodized salt into safety net programmes. 6. Taking strong administrative action against non-performing mills. 7. Imposing restriction on import of refined edible salt, with proper quality checks and with the exception of emergency situations.
Iron	<ol style="list-style-type: none"> 1. Reviewing policy on IFA supplementation guidelines for adolescent girls and NPWL women; consider adding other micronutrients to supplements. 2. Considering policy on multiple micronutrient supplementation during pregnancy. 3. Need based targeted MNP supplementation programme for young children aged 6-23 months.
Zinc	<ol style="list-style-type: none"> 1. Developing and implementing policy on rice fortification with zinc as one of the multiple micronutrients for the poorest group through government safety net programmes and other groups (open market sale, rationing, etc.). 2. Considering bio-fortification of rice with zinc for mass populations.
Vitamin B12	<ol style="list-style-type: none"> 1. Considering possibility of adding animal source foods in appropriate form for vulnerable groups through safety net and food security programme. This can also increase consumption of other micronutrients, such as vitamins A, D, B12, iron and zinc.
Vitamin D and Calcium	<ol style="list-style-type: none"> 1. Developing and implementing policy on food fortification with vitamin D (such as edible oil – consider double fortification). 2. Strengthening calcium supplementation during pregnancy, as per WHO guideline.

3.1.2. **Strategic Area 2: Micronutrient Intervention Programmes**

This strategic area focuses on the key interventions that are recommended for controlling micronutrient deficiencies in the country. Some of these interventions have been implemented for many years, and mainly require strengthening, while other interventions are new in the country and require adaptation to the country context and systems development. These interventions are divided into three broad categories:

- First, supplementation as a short-term approach. However, some of these supplementation programmes hardly merit being seen as short-term, and many would argue that the need will be there for many years yet, such as for a vitamin A supplementation programme in the country.
- Second, food fortification with micronutrients as a medium- to long-term approach. Probably the most cost-effective food-based approach to improving nutrient availability and accessibility is fortification, with the provision that the fortified foods must reach those who most need them.
- Third, improving dietary diversification as a long-term approach through increasing the variety and frequency of MN-rich food sources through homestead food production (HFP), nutrition education and horticultural approaches (crop diversification, bio-technology and bio-fortification).

Tables 3.1, 3.2 and 3.3 outlines the focus areas for each of the intervention strategies including target population and target micronutrient (s).

Of the six recommended supplementation intervention programmes (Table 3.3), five programmes have been already running for years at variable scales: VAC distribution; IFA supplementation for pregnant women; weekly IFA supplementation for adolescent girls and NPNL women; MNP supplementation for young children; and zinc therapy with ORS in management of diarrhoea for young children at variable scales. Targeted supplementation of calcium through multiple micronutrient supplementation programmes are the new intervention recommended.

Among the five recommended fortification programmes (Table 3.2), two programmes are already in place: fortification of edible oil with vitamin A and USI. Four new fortification programmes have been recommended, such as rice fortification with zinc, bio fortification of rice with zinc, and adding vitamin D in edible oil fortification.

For dietary diversification and modifications, several innovative programmes are recommended (Table 3.1), such as strengthening policies on nutrition-sensitive agriculture and food systems, strengthening integrated household farming systems; promoting animal foods, livestock and fisheries; and promoting nutrition-specific programmes, including home-based traditional practices for improving micronutrient intake through the bio-fortification of zinc and micronutrient fortification through crop processing.

Table 3.1: Recommended Dietary Diversification Programmes Strategies, with Micronutrient (s) of Interest, Target Group (s) and Priority Areas

Intervention Strategy	Micronutrient (s)	Target Group	Priority Areas of Action
Strengthen infant and young child feeding promotion, protection and support activities	All essential	Whole population	<ul style="list-style-type: none"> Quality counselling at facilities and communities Supporting breastfeeding at work places Ensuring maternity protection in the public and private sectors Enforcing Breast-Milk Substitutes (BMS) Law
Strengthen policies on nutrition-sensitive agriculture and food systems	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Promoting food security and agriculture policies to enhance availability, affordability, diversity and quality, including food safety Supporting nutrition-oriented agriculture research on crops, livestock and production systems Researching and promotion of nutrient dense product development, food-to-food enrichment, processing and transport Scaling up homestead and school gardens
Strengthening integrated household farming systems	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Strengthening HFP programme and integrated farming systems by improved inputs and enhanced technology transfer to ensure adequate supply of a variety of safe and nutritious foods Increasing crop and food diversity through agriculture (e.g., mixed cropping, raised beds systems) Promoting the growing of micronutrient rich horticulture, small livestock and fisheries produce
Promotion of animal foods, livestock and fisheries	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Promoting animal sources of foods for pregnant and lactating women through ANC and PNC services Promoting animal sources of food for children through IYCF counselling Promoting the production and consumption of small fish as source of calcium and vitamin A Promoting the consumption of oily fish as a source of vitamin D Common messaging across sectors on the consumption of diversified diets, focusing on the first 1,000 days of life, should be delivered through the extension services of core sectors Enhancing the food basket to include a wider range of foods (e.g., eggs) through the safety net programmes, particularly for vulnerable groups



Intervention Strategy	Micronutrient (s)	Target Group	Priority Areas of Action
Home-based traditional practices for improving Micronutrient Intake	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Promoting soaking practice for staple food such as rice and pulses Promoting roasting and soaking for such foods like rice and lentils Exploring the availability of local and/or indigenous foods rich in micronutrients throughout the county, with a focus on coastal and CHT regions and considering factors of seasonality and climate Enhancing nutrition awareness through nation-wide BCC campaign, including mass media
Bio-fortification of zinc	Zinc, vitamin A	Whole population	<ul style="list-style-type: none"> Consider cross breeding of high zinc-containing mega variety of rice with indigenous varieties Establishing quality control for fertilizers in terms of zinc content and minimizing adulteration of Zn fertilizers Promoting the production and consumption of high β-carotene-containing sweet potato (komola sundari) Promoting a new variant of zinc-enriched rice developed in Bangladesh

Table 3.2: Recommended Fortification Programmes Strategies, with Micronutrient (s) of Interest, Target Group (s) and Priority Areas

Strategy	Target Group	Priority Areas of Action
Fortification of edible oil with vitamin A	Whole population	<ul style="list-style-type: none"> • Ensuring adequate consumption of fortified oil, especially by the vulnerable groups • Increasing awareness through mass communication to increase demand • Ensuring quality production of vitamin A-fortified edible oil through strengthening regulatory monitoring and enforcement
Strengthen USI programme	Whole population	<ul style="list-style-type: none"> • Strengthening production by upgrading the technology for both crude and iodized salts • Ensuring registration of all salt brands by name to control fake brands and introducing different colour packaging for iodized and non-iodized salts • Introducing reward system for best performing salt mills. Encouraging the transformation of small salt mills into medium-scale mills, and medium-scale mills into large mills • Supporting affordable prices for iodized salt for all level of population • Strengthening awareness at population and retail levels to increase consumption of iodized salt • Implementing Retailer Rapid Test Kit strategy to prevent marketing of non-iodized salt for human consumption
Rice fortification with micronutrient	Whole / targeted population	<ul style="list-style-type: none"> • Mainstreaming fortified rice through GoB safety net programme and others (open market sale, rationing, etc.), in addition to the diversification of food basket • Scaling up fortified rice through the Public Food Distribution System • Exploring scale up of bio-fortification of rice with zinc • Developing and endorsing standards and guidelines
Food Fortification with vitamin D.	Whole population	<ul style="list-style-type: none"> • Exploring the scope for double fortification of edible oil with vitamin A and vitamin D

Table 3.3: Recommended Supplementation Programmes Strategies, with Micronutrient (s) of Interest, Target Group (s) and Priority Areas

Strategy	Target Group	Priority Areas of Action
VAC supplementation	Children, 6-59 months	<ul style="list-style-type: none"> • Sustaining high effective coverage of VAC supplementation • Strengthening coverage of VAC supplementation in hard-to-reach areas • Strengthening therapeutic use of VAC during measles, diarrhoea and severe acute malnutrition
IFA supplementation	Pregnant women	<ul style="list-style-type: none"> • Providing IFA supplementation to newly wed women to ensure pre-pregnancy IFA status • Strengthening effective coverage of IFA during pregnancy, by providing adequate dose of IFA in ANC 1 (90 tablets – 3 months' supply) and ANC 2 (90 tablets) and monitoring compliance in next ANC visits • Special packaging of IFA tablets to include a reminder tool and key messages for women • Ensuring systematic anaemia screening, using appropriate technology for all pregnant women at their first ANC visit • Strengthening referrals for severe cases of anaemia for treatment • Improving supply forecasting and monitoring of IFA supplies, by changing to a needs-based supply system
	Adolescent girls and NPWL women	<ul style="list-style-type: none"> • Providing IFA supplementation (weekly), deworming (twice yearly) to adolescent girls 13-19 years through schools and adolescent community clubs • Strengthening partnership with Ministry of Education and Ministry of Women and Children Affairs to deliver nutrition promotion and supplementation to adolescent girls through these delivery platforms
Need based targeted MNP supplementation for young children as home-based food fortification	Children 6-23 months	<ul style="list-style-type: none"> • MNP supplementation and monitoring of compliance for targeted children 6-23 months • Integrating MNP programme with emergency programme
Zinc supplementation with ORS in management of diarrhoea	Children < 5 years	<ul style="list-style-type: none"> • Improving coverage of ORS with zinc in management of diarrhoea, by strengthening the supply of zinc based on estimated/targeted diarrhoea case load and contingency stock for seasonal peaks of incidence • Supporting primary health care centres and satellite clinics in urban slum areas in zinc supply provision and monitoring for case management of diarrhoea • Strengthening awareness programme on zinc supplementation in management of diarrhoea
Targeted Calcium supplementation	Pregnant women	<ul style="list-style-type: none"> • Implementing calcium supplementation for pregnant women through ANC as per WHO guideline
	Children at risk	<ul style="list-style-type: none"> • Screening for rickets and supplementation of calcium for children in high risk areas (e.g., south-east coastal districts)

3.1.3. Strategic Area 3: Partnership & Coordination

For successful implementation of all strategic areas, it is essential that there are sufficient resources and also working partnerships and coordination systems. Table 4 provides an outline of the focus action areas in partnership and coordination.

Table 4: Priority Areas of Partnership and Coordination

Strategy	Priority Areas of Action
Dietary diversification	<ul style="list-style-type: none"> Enhancing partnership with other relevant departments (DAE, DoF, DoL) for increasing productivity in horticulture, livestock, poultry and fisheries to contribute to sustainable diets Ensuring coordination with other programmes, especially agriculture and fisheries sectors Integrating nutrition in school curriculum
IFA supplementation	<ul style="list-style-type: none"> Increasing coordination between MOHFW, other ministries and partner organizations
USI programme	<ul style="list-style-type: none"> Strengthening coordination by mainstreaming with NNS all activities related to iodized salt Strengthening DGHS and DGFP under MOHFW's countrywide health service network for community awareness and monitoring of supply of iodized salt
Need based targeted MNP supplementation for young children as home based food fortification	<ul style="list-style-type: none"> Increasing coordination between MOHFW and other organizations, including CSOs and private sectors involved
Strengthen IYCF activities	<ul style="list-style-type: none"> Strengthening counselling services at facilities and communities Advocating and coordinating between authorities and private organizations to implement government policy of 6 months maternity leave in private sectors Advocating and partnering between private and public organizations for crèches in work places
Zinc fortification in agriculture	<ul style="list-style-type: none"> Establishing inter-ministerial coordination between ministries of Health, Agriculture and Food Establishing complementary collaborative efforts between research institutes, extension services and private sectors
Vitamin D and calcium supplementation	<ul style="list-style-type: none"> Exploring and strengthening through multi-sector collaboration
Coordination committees	<ul style="list-style-type: none"> Reorganizing relevant ministry and DG level committees (specific micronutrient based, e.g., vitamin A) to a generic overarching committee on micronutrients

3.1.4. Strategic Area 4: Capacity Building

Capacity building is critical for successful public health nutrition intervention programmes. The NSPCMD will be implemented through health care providers at different levels – national, regional, district and community. During the next ten years, MOHFW, in collaboration with other partners, will focus on building the capacity of these health workers to ensure quality service delivery, accurate monitoring and reporting, for improved outcomes in relation to the micronutrient status of targeted groups. A list of the focus areas for capacity building are outlined Table 5.

Table 5: Priority Areas for Capacity Building

Level	Priority Areas of Action
National	<ul style="list-style-type: none"> • Developing high-profile communication campaigns on micronutrient prevention and control to target policy makers, stakeholders, academia, private sectors and the general population • Advocating and influencing other relevant sector policies and programmes in supporting implementation of national strategy (e.g. Ministry of Finance, Ministry of Industry, Ministry of Agriculture, etc.) • Enhancing supply chain management • Strengthening enforcement of relevant laws and regulations and quality assurance. Conduct analysis on food and pharma laws to formulate recommendations which would protect and support national strategy
Regional	<ul style="list-style-type: none"> • Providing technical support, as per agenda of each partner, to the salt manufacturing mills to improve production, QC/QA and monitoring • Building capacity of implementing and monitoring bodies, e.g.. BSCIC, IPHN, BSTI, etc. • Ensuring coordination and capacity of CSOs and private sectors for reach and compliance.
District	<ul style="list-style-type: none"> • Integrating planning and monitoring of micronutrient prevention and control interventions into district coordination • Supporting and facilitating multi-sector district coordination and joint evaluation for the implementation of the national strategy
Facility	<ul style="list-style-type: none"> • Increasing knowledge and skills of service providers through appropriate and adequate training • Equipping service providers with effective job aids, monitoring tools and communication materials
Community	<ul style="list-style-type: none"> • Increasing knowledge and awareness in populations about micronutrient deficiencies through social mobilisation involving community and religious leaders • Supporting effective community-outreach and promotion to influence behaviour change and attitudes to increase demand of micronutrient interventions and consumption of nutrient-rich, fortified foods

3.1.5. Strategic Area 5: Advocacy and Communication

Increasing the demand for and use of micronutrient intervention services and improving the utilisation of recommended micronutrient supplements, fortified products and food-based approaches are the key objectives of the overall strategy. Behaviour change to improve the intake of micronutrients is an essential part of whatever intervention method is being used and requires communications, using mass media, social and political facilitation, social marketing and nutrition education. Therefore, in this strategy document, priority has been given to designing and implementing evidence-based and pro-poor interventions targeted at the general population and, in some cases, depending on the intervention needs, specific population groups, including pregnant women and under-five children. The MOHFW on a regular basis should review the current policies, legislations and enforcement measures. Based on the reviews, the Ministry shall initiate actions to develop/amend new policies and legislations that are relevant to the context.

In this section, a list of focus areas for advocacy and communication are presented in Table 6.

Table 6: Priority Areas for Advocacy and Communication

Target Audience	Priority Areas of Action
Policy makers	<ul style="list-style-type: none"> • Developing user friendly communication and information products to inform and influence policymakers on micronutrient prevention and control • Developing communication plans, guidelines and tools on micronutrients • Amending, strengthening and enforcing laws and regulations
Key ministries (Agriculture, Livestock, Fisheries, Education, Welfare, Finance, etc.)	<ul style="list-style-type: none"> • Advocating to develop sector policies and programmes that are nutrition sensitive and support implementation of the national strategy • Developing and utilising adapted and consistent information, education and communication (IEC) materials and messages
Private sector	<ul style="list-style-type: none"> • Engaging in the ethical marketing and social marketing of micronutrients, nutritious and fortified foods • Integrating fortified food products (salt and edible oil) with other national health programmes for media publicity to create people's demand • Motivating producers to reduce the price of fortified food products (salt and edible oil), which will lead to more sales and consumption in the community • Avoiding conflict of interest
General population and communities	<ul style="list-style-type: none"> • Improving understanding and awareness among the general population and targeted populations, including school children, through mass media and community media and inclusion in curriculums • Developing effective and innovation communication channels • Strengthening quality of and scaling up of targeted counselling and communication services to mothers and adolescent girls • Identifying creative communication platforms – through mother support networks, peer-to-peer support, community forums, etc.
Service Providers	<ul style="list-style-type: none"> • Ensuring service providers understand their role and responsibility in the implementation of micronutrient deficiency prevention and control interventions • Promoting consistent messages • Increasing public demand by providing information to physicians through medical representatives and organizing seminars/ workshops for village doctors, Shaystha Shebikas, and health workers
Development partners	<ul style="list-style-type: none"> • Mobilising resources for research for new interventions and technologies and scaling up of evidence-based interventions • Ensuring nutrition development programmes align with objectives and strategies in national micronutrient deficiency prevention and control strategy • Advocating for joint monitoring of implementation and achievement of results of the strategy

3.1.6. Strategic Area 6: Monitoring, Evaluation and Research

Monitoring and evaluation (M&E) and research are critical components of the NSPCMD and necessary for the delivery of high quality intervention products through the continuous improvement of the programme. M&E and research have been identified as major weaknesses in all the existing programmes. This section outlines the focus areas of M&E which would need to run in the recommended intervention programmes (Table 7). The M&E framework will ensure standard nutrition indicators are monitored and measured periodically to assess effective coverage of these interventions. Further, a number of operation research areas have been identified to gain new knowledge and thus will help to modify the current programmes if needed.

Table 7: Priority Areas for Monitoring, Evaluation and Research

Micronutrient	Research / M&E	Priority Areas of Action
VAC supplementation programme	M&E	<ul style="list-style-type: none"> Strengthening the monitoring system to ensure quality coverage by providing training to national and sub-national level staff Monitoring the receipt of two doses of vitamin A supplementation at individual level to ensure adequate protection
IFA supplementation in pregnancy	Research	<ul style="list-style-type: none"> Operation researching to decide modification of current programme, as for example, the issue of iron intake from groundwater and its effects on anaemia and other micronutrients Further etiological researching on anaemia Exploring possibility of adding multiple micronutrients during pregnancy
	M&E	<ul style="list-style-type: none"> Strengthening monitoring and supervision through adequate training of service providers Establishing monitoring of supply chain system
IFA supplementation for at-risk groups (adolescent girls, newly wed women)	M&E	<ul style="list-style-type: none"> Establishing monitoring system and supply chain management
Need based targeted MNP supplementation for young children as home-based food fortification	Research	<ul style="list-style-type: none"> Evaluating efficacy of the programme, especially for anaemia, iron and zinc, and vitamin A status Conducting operation research on safety issues/ side effects of MNP
	M&E	<ul style="list-style-type: none"> Strengthening M&E system
Zinc supplementation with ORS in management of diarrhoea	M&E	<ul style="list-style-type: none"> Strengthening M&E system

Micronutrient	Research / M&E	Priority Areas of Action
USI programme	M&E	<ul style="list-style-type: none"> Enforcing external monitoring by government regulatory bodies Involving local government agencies, including elected public representatives (e.g., chairperson, members) in monitoring of retailers Developing crude salt specification by BSCIC and monitoring of crude salt quality Introducing QC labs in all salt industries
Strengthen fortification of edible oil with vitamin A	M&E	<ul style="list-style-type: none"> Strengthening the development of a strong monitoring and evaluation system in private sector and government services
Fortification with zinc	Research	<ul style="list-style-type: none"> Exploring rice and wheat flour fortification with zinc Establishing a monitoring system on the effectiveness of rice fortification
Bio-fortification of zinc	Research M&E	<ul style="list-style-type: none"> Researching further newly developed zinc bio-fortified rice varieties (such as BRRI 62) and the necessary extension initiative Monitoring and quality control of zinc content in food
Improving zinc content in food /agriculture	Research	<ul style="list-style-type: none"> Exploring using powdered fish as a sprinkle in the food Exploring Zn-Fertilizer Developing foliar spraying technique Exploring zinc enrichment of rice at the processing stage (soaking)
All food fortification programmes	M&E	<ul style="list-style-type: none"> Ensuring quality control programme is endorsed by the government regulatory body
Promote diversified safe food	Research	<ul style="list-style-type: none"> Identifying low-cost high-micronutrient containing animal sources of food Ensuring diversified and safe food
All micronutrient interventions	M&E Governance	<ul style="list-style-type: none"> Overarching multi-sectoral committees would be in place for guiding and monitoring nutrition programmes including micronutrients in line with National Nutrition Policy.

3.2 Strategy Implementation Plan

This section is dedicated to the implementation plan framework for the NSPCMD for the next ten years. The implementation plan framework outlined in Tables 8 to 15 is structured according to the six strategic areas described in Table 1 and includes intervention, priority areas, responsible organizations and service delivery channels/platforms.

Table 8: Implementation Plan Framework for Strategic Area 1: Policy, Guidelines and Legislation

Micronutrient	Priority Areas of Action	Responsible Organization		Time Frame
		Lead	Partner	
Vitamin A	1. Strengthening VAC supplementation strategy for children aged 6-59 months, especially those living in hard-to-reach areas and moderately malnourished children.	MOHFW	UN System, Development Partners, International Research Centre	By 2016
	2. Revisiting existing policy for post-partum VAC supplementation programme in the context of recent WHO recommendation.	MOHFW	UN System, Development Partners, International Research Centre	By 2016
	3. Reinforcing compliance by private sectors as key players in the vitamin A fortification program.	Ministry of Industries	UN System, Development Partners, Edible Oil Refineries	By 2016
Iodine	1. Revising existing Salt Law to implement the use of iodized salt in livestock and processed food.	Ministry of Industries	Ministry of Law, MOHFW	By 2016
	2. Declaring USI as a programme of national importance and intervening in a mission mode (Salt Mission).	MOHFW	Ministry of Industries, Ministry of Commerce	By 2016
	3. Transforming USI project into a sustainable programme and mainstreaming USI activities within NNS.	Ministry of Industries	MOHFW	By 2017
	4. Initiating a Market Intervention Operation (MIO) to determine the right price for consumers.	Ministry of Commerce	MOHFW, Ministry of Industries	By 2016
	5. Introducing iodized salt into safety net programmes.	MOWCA	MOF, MOHFW, Ministry of Social Welfare	By 2017
	6. Taking strong administrative action against non-performing mills.	Ministry of Industries	Ministry of Law	On-going
	7. Imposing restriction on import of refined edible salt, with proper quality checks and with the exception of emergency situations.	Ministry of Industries	Ministry of Law, Ministry of Commerce	On-going

Micronutrient	Priority Areas of Action	Responsible Organization		Time Frame
		Lead	Partner	
Iron	1. Reviewing policy on IFA supplementation guidelines for adolescent girls and NPNL women; consider adding other micronutrients to supplements.	MOHFW	UN System, Development Partners, International Research Centre	By 2016
	2. Considering policy on multiple micronutrient supplementation during pregnancy.	MOHFW	UN System, Development Partners, International Research Centre	By 2016
	3. Need based targeted MNP supplementation programme for young children aged 6-23 months.	MOHFW	UN System, Development Partners, National NGOs	On-going
Zinc	1. Developing and implementing policy on rice fortification with zinc as one of the multiple micronutrients for the poorest group through government safety net programmes and other groups (open market sale, rationing, etc.).	MOWCA, MOF	MOHFW, UN System	By 2016
	2. Considering bio-fortification of rice with zinc for mass populations.	MOA	MOHFW	By 2018
Vitamin B12	1. Considering possibility of adding animal source foods in appropriate form for vulnerable groups through safety net and food security programme. This can also increase consumption of other micronutrients, such as vitamins A, D, B12, iron and zinc.	MOWCA	MOF, MOHFW, Ministry of Fisheries and Livestock, UN System	By 2018
	1. Developing and implementing policy on food fortification with vitamin D (such as edible oil -consider double fortification).	Ministry of industries	MOHFW, Edible Oil Refineries	By 2017
Vitamin D and Calcium	2. Strengthening calcium supplementation during pregnancy, as per WHO guideline.	MOHFW		By 2016

Table 9: Implementation Plan Framework for Strategic Area 2: Micronutrient Intervention/ Programme (Dietary Diversification)

Intervention Strategy	Micronutrient (s)	Target Group	Priority Areas of Action	Responsible Organization		Time Frame
				Lead	Partner	
Strengthen infant and young child feeding promotion, protection and support activities	All essential	Whole population	<ul style="list-style-type: none"> Quality counselling at facilities and communities Supporting breastfeeding at work places Ensuring maternity protection in the public and private sectors Enforcing Breast-Milk Substitutes (BMS) Law 	MOHFW	Ministry of Education, MoWCA, Ministry of Information, UN System, National Foundation and Alliance	On-going
Strengthen policies on nutrition-sensitive agriculture and food systems	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Promoting food security and agriculture policies to enhance availability, affordability, diversity and quality, including food safety Supporting nutrition-oriented agriculture research on crops, livestock and production systems Researching and promotion of nutrient dense product development, food-to-food enrichment, processing and transport Scaling up homestead and school gardens 	Ministry of Agriculture	Ministry of Food, UN System	By 2018
Strengthening integrated household farming systems	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Strengthening HFP programme and integrated farming systems by improved inputs and enhanced technology transfer to ensure adequate supply of a variety of safe and nutritious foods Increasing crop and food diversity through agriculture (e.g., mixed cropping, raised beds systems) Promoting the growing of micronutrient rich horticulture, small livestock and fisheries produce 	Ministry of Agriculture, Ministry of Livestock and Fisheries	Ministry of Women and Children Affairs, UN System	By 2018

Intervention Strategy	Micronutrient (s)	Target Group	Priority Areas of Action	Responsible Organization		Time Frame
				Lead	Partner	
Promotion of animal foods, livestock and fisheries	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Promoting animal sources of foods for pregnant and lactating women through ANC and PNC services Promoting animal sources of food for children through YCF counselling Promoting the production and consumption of small fish as source of calcium and vitamin A Promoting the consumption of oily fish as a source of vitamin D Common messaging across sectors on the consumption of diversified diets, focusing on the first 1,000 days of life, should be delivered through the extension services of core sectors Enhancing the food basket to include a wider range of foods (e.g., eggs) through the safety net programmes, particularly for vulnerable groups 	MOHFW	Ministry of Livestock and Fisheries, MoWCA, Ministry of Food	By 2018
Home-based traditional practices for improving Micronutrient Intake	Vitamin A, vitamin D, iron, zinc, calcium, vitamins B-2, B-6 & B-12	Whole population	<ul style="list-style-type: none"> Promoting soaking practice for staple food such as rice and pulses Promoting roasting and soaking for such foods like rice and lentils Exploring the availability of local and/or indigenous foods rich in micronutrients throughout the county, with a focus on coastal and CHT regions and considering factors of seasonality and climate Enhancing nutrition awareness through nation-wise BCC campaign, including mass media 	Ministry of Food	Ministry of Agriculture, MOHFW, Ministry of Information, UN System	By 2018

Intervention Strategy	Micronutrient (s)	Target Group	Priority Areas of Action	Responsible Organization		Time Frame
				Lead	Partner	
Bio-fortification of zinc	Zinc, vitamin A	Whole population	<ul style="list-style-type: none"> Consider cross breeding of high zinc-containing mega variety of rice with indigenous varieties Establishing quality control for fertilizers in terms of zinc content and minimizing adulteration of Zn fertilizers Promoting the production and consumption of high β-carotene-containing sweet potato (komola sundari) Promoting a new variant of zinc-enriched rice developed in Bangladesh 	Ministry of Agriculture	Ministry of Food, UN System	By 2019

Table 10: Implementation Plan Framework for Strategic Area 2: Micronutrient Intervention/ Programme (Fortification)

Micronutrient	Target Group	Priority Areas of Action	Responsible Organization		Service Delivery Channel		Time Frame
			Lead	Partner	Facility	Community	
Fortification of edible oil with vitamin A	Whole population	<ul style="list-style-type: none"> Ensuring adequate consumption of fortified oil, especially by the vulnerable groups Increasing awareness through mass communication to increase demand Ensuring quality production of vitamin A-fortified edible oil through strengthening regulatory monitoring and enforcement 	MOI	MoHFW, Ministry of Information, Edible Oil Industry Development Partners, International Research Centre, NGOs	Open Market	Open Market, NGOs	On going
Strengthen USI programme	Whole population	<ul style="list-style-type: none"> Strengthening production by upgrading the technology for both crude and iodized salts Ensuring registration of all salt brands by name to control fake brands and introducing different colour packaging for iodized and non-iodized salts Introducing reward system for best performing salt mills. Encouraging the transformation of small salt mills into medium-scale mills, and medium-scale mills into large mills Supporting affordable prices for iodized salt for all level of population Strengthening awareness at population and retail levels to increase consumption of iodized salt Implementing Retailer Rapid Test Kit strategy to prevent marketing of non-iodized salt for human consumption 	Ministry of Industry and BSCIC	Salt Producers, MOHFW, Development Partners, UN System, NGOs	Open Market	Open Market NGOs	On going



Micronutrient	Target Group	Priority Areas of Action	Responsible Organization		Service Delivery Channel		Time Frame
			Lead	Partner	Facility	Community	
Rice fortification with micronutrient	Whole / targeted population	<ul style="list-style-type: none"> Mainstreaming fortified rice through GoB safety net programme and others (open market sale, rationing, etc.) in addition to the diversification of food basket Scaling up fortified rice through the Public Food Distribution System Exploring scale up of bio-fortification of rice with zinc Developing and endorsing standards and guidelines 	MOF, MOWCA	MOI, UN System, Development Partners, NGOs			By 2017
Food Fortification with vitamin D.	Whole population	<ul style="list-style-type: none"> Exploring the scope for double fortification of edible oil with vitamin A and vitamin D 	Ministry of Industries	Development Partners, Edible Oil Refineries	Open Market	Open Market	On going

Table 11: Implementation Plan Framework for Strategic Area 2: Micronutrient Intervention Programme (Supplementation)

Micronutrient	Target Group	Priority Areas of Action	Responsible Organization		Service Delivery Channel		Time Frame
			Lead	Partners	Facility	Community	
VAC supplementation	Children, 6-59 months	<ul style="list-style-type: none"> Sustaining high effective coverage of VAC supplementation Strengthening coverage of VAC supplementation in hard-to-reach areas Strengthening therapeutic use of VAC during measles, diarrhoea and severe acute malnutrition 	IPHN/NNS	DGHS, DGFP, UN System, Development Partners, NGOs, MOLRDC/UPHCPSDP, NHSDP	Health Centres	NVAC campaigns, EPI outreach sites, Promotion by health workers in courtyard sessions and HH visits	By 2016
IFA supplementation	Pregnant women	<ul style="list-style-type: none"> Providing IFA supplementation to newly wed women to ensure pre-pregnancy IFA status Strengthening effective coverage of IFA during pregnancy, by providing adequate dose of IFA in ANC 1 (90 tablets – 3 months' supply) and ANC 2 (90 tablets) and monitoring compliance in next ANC visits Special packaging of IFA tablets to include a reminder tool and key messages for women Ensuring systematic anaemia screening using appropriate technology for all pregnant women at their first ANC visit Strengthening referrals for severe cases of anaemia for treatment Improving supply forecasting and monitoring of IFA supplies, by changing to a needs-based supply system 	IPHN/NNS	DGHS, DGFP, UN System, Development Partners, NGOs, MOLRDC/UPHCPSDP, NHSDP	Health Centres (ANC/PNC)	Promotion on use and compliance by health workers during courtyard sessions and HH visits	By 2017



Micronutrient	Target Group	Priority Areas of Action	Responsible Organization		Service Delivery Channel		Time Frame
			Lead	Partners	Facility	Community	
	Adolescent girls and NPNL women	<ul style="list-style-type: none"> • Providing IFA supplementation (weekly), deworming (twice yearly) to adolescent girls 13-19 years through schools and adolescent community clubs • Strengthening partnership with Ministry of Education and Ministry of Women and Children Affairs to deliver nutrition promotion and supplementation to adolescent girls through these delivery platforms 	IPHN/NNS, DGFP, DGHS	MOPME/ MoE, MOWCA, NGOs, MOLGRDC/ UPHCPSDP, NHSDP, Development Partners, UN System	Health Centres, Schools	Adolescent clubs, Promotion by school teachers, health workers, peer leaders, etc.	By 2016
Need based targeted MNP supplementation for young children as home-based food fortification	Children 6-23 months	<ul style="list-style-type: none"> • MNP supplementation and monitoring of compliance for targeted children 6-23 months, • Integrating MNP programme with emergency programme. 	DGFP, DGHS	Relevant Ministries, UN System, Development Partners, NGOs	Health Centres	Promotion on use and compliance by health workers during courtyard sessions and HH visits, Local markets	By 2017

Micronutrient	Target Group	Priority Areas of Action	Responsible Organization		Service Delivery Channel		Time Frame
			Lead	Partners	Facility	Community	
Zinc supplementation with ORS in management of diarrhoea	Children < 5 years	<ul style="list-style-type: none"> Improving coverage of ORS with zinc in management of diarrhoea, by strengthening the supply of zinc based on estimated/ targeted diarrhoea case load and contingency stock for seasonal peaks of incidence Supporting primary health care centres and satellite clinics in urban slum areas in zinc supply provision and monitoring for case management of diarrhoea Strengthening awareness programme on zinc supplementation in management of diarrhoea 	DGHS, MOLGRDC/ UPHCPSDP	DGFP, UN System, Development Partners, International Research Centre, NGOs, NHSDP	Health Centres	Promotion on use and compliance by health workers during courtyard sessions and HH visits	By 2017
Targeted calcium supplementation	Pregnant women	<ul style="list-style-type: none"> Implementing calcium supplementation for pregnant women through ANC as per WHO guideline 	IPHN/NNS, DGFP, DGHS	MOWCA, UN System, Development Partners, NGOs	Health Facilities	Promotion on use and compliance by health workers during courtyard sessions and HH visits	By 2016
	Children at risk	<ul style="list-style-type: none"> Screening for rickets and supplementation of calcium for children in high risk areas (e.g., south-east coastal districts) 	IPHN/NNS	DGHS, DGFP	Health Facilities		By 2017



Table 12: Implementation Plan Framework for Strategic Area 3: Partnership and Coordination

Micronutrient/ Coordination Committees	Priority Areas of Action	Responsible Organization		Time Frame
		Lead	Partner	
Dietary diversification	<ul style="list-style-type: none"> Enhancing partnership with other relevant departments (DAE, DoF, DoL) for increasing productivity in horticulture, livestock, poultry and fisheries to contribute to sustainable diets Ensuring coordination with other programmes, especially agriculture and fisheries sectors Integrating nutrition in school curriculum 	MOHFW	Ministries of Fisheries, Agriculture and Livestock	By 2016
IFA supplementation	<ul style="list-style-type: none"> Increasing coordination between MOHFW, other ministries and partner organizations 	MOHFW	UN System, Development Partners	By 2016
USI programme	<ul style="list-style-type: none"> Strengthening coordination by mainstreaming with NNS all activities related to iodized salt Strengthening DGHS and DGFP under MOHFW's countrywide health service network for community awareness and monitoring of supply of iodized salt 	Ministry of Industries	NNS, Development Partners	On-going
Need based targeted MNP supplementation for young children as home based food fortification	<ul style="list-style-type: none"> Increasing coordination between MOHFW and other organizations, including CSOs and private sectors involved 	MOHFW	DGFP, DGHS, UN System, Development Partners, NGOs	By 2016
Strengthen IYCF activities	<ul style="list-style-type: none"> Strengthening counselling services at facilities and communities Advocating and coordinating between authorities and private organizations to implement government policy of 6 months maternity leave in private sectors Advocating and partnering between private and public organizations for crèches in work places 	MOHFW	Rights-based Organisations, Chamber of Commerce	By 2017
Zinc fortification in agriculture	<ul style="list-style-type: none"> Establishing inter-ministerial coordination between ministries of Health, Agriculture and Food Establishing complementary collaborative efforts between research institutes, extension services and private sectors 	MOA	MOHFW, MOF	By 2017
Vitamin D and calcium supplementation	<ul style="list-style-type: none"> Exploring and strengthening through multi-sector collaboration 	MOA	MOHFW, MOF	By 2017
Coordination committees	<ul style="list-style-type: none"> Reorganizing relevant ministry and DG level committees (specific micronutrient based, e.g., vitamin A) to a generic overarching committee on micronutrients 	MOHFW	IPH/NNS, Mol, MoA, MoFL, MoF	By 2016

Table 13: Implementation Plan Framework for Strategic Area 4: Capacity Building

Level	Priority Areas of Action	Responsible Organization		Time Frame
		Lead	Partner	
National	<ul style="list-style-type: none"> Developing high-profile communication campaigns on micronutrient prevention and control to target policy makers, stakeholders, academia, private sectors and the general population Advocating and influencing other relevant sector policies and programmes in supporting implementation of national strategy (e.g. Ministry of Finance, Ministry of Industry, Ministry of Agriculture, etc.) Enhancing supply chain management Strengthening enforcement of relevant laws and regulations and quality assurance. Conduct analysis on food and pharma laws to formulate recommendations which would protect and support national strategy 	IPHN/NNS	DGHS, DGFP, DPE, UN System, Development Partners, INGO & NGO	On-going
Regional	<ul style="list-style-type: none"> Providing technical support, as per agenda of each partner, to the salt manufacturing mills to improve production, QC/QA and monitoring Building capacity of implementing and monitoring bodies, e.g.. BSCIC, IPHN, BSTI, etc. Ensuring coordination and capacity of CSOs and private sectors for reach and compliance. 	IPHN/NNS	DGHS, DGFP, INGO/ NGO, Private Sector	On-going
District	<ul style="list-style-type: none"> Integrating planning and monitoring of micronutrient prevention and control interventions into district coordination Supporting and facilitating multi-sector district coordination and joint evaluation for the implementation of the national strategy 	BSCIC, IPHN/ NNS	BSTI, Salt Millers Association, UN System, Development Partners, Others	On-going
Facility	<ul style="list-style-type: none"> Increasing knowledge and skills of service providers through appropriate and adequate training Equipping service providers with effective job aids, monitoring tools and communication materials 	IPHN/NNS	DGHS, DGFP, UN System, Development Partners, INGO/NGO, Private Sector	On-going
Community	<ul style="list-style-type: none"> Increasing knowledge and awareness in populations about micronutrient deficiencies through social mobilisation involving community and religious leaders Supporting effective community-outreach and promotion to influence behaviour change and attitudes to increase demand of micronutrient interventions and consumption of nutrient-rich, fortified foods 	IPHN/NNS	DGHS, DGFP, DAE, INGO/NGO, Development Partners, Private Sector	On-going



Table 14: Implementation Plan Framework for Strategic Area 5: Advocacy and Communication

Target Audience	Priority Areas of Action	Responsible Organization		Time Frame
		Lead	Partner	
Policy makers	<ul style="list-style-type: none"> Developing user friendly communication and information products to inform and influence policymakers on micronutrient prevention and control Developing communication plans, guidelines and tools on micronutrients Amending, strengthening and enforcing laws and regulations 	MoHFW/ Ministry of Information	UN System, development Partners	2016 onwards
Key ministries (Agriculture, Livestock, Fisheries, Education, Welfare, Finance, etc.)	<ul style="list-style-type: none"> Advocating to develop sector policies and programmes that are nutrition sensitive and support implementation of the national strategy Developing and utilising adapted and consistent information, education and communication (IEC) materials and messages 	MoHFW (IPHN/ NNS/DGHS/DGFP), UPHCSDP, Ministry of Information, Ministry of Education, MoWCA	UN System/ DPs/ INGOs/ NGOs/Civil Societies and PPP	2016 onwards
Private sector	<ul style="list-style-type: none"> Engaging in the ethical marketing and social marketing of micronutrients, nutritious and fortified foods Integrating fortified food products (salt and edible oil) with other national health programmes for media publicity to create people's demand Motivating producers to reduce the price of fortified food products (salt and edible oil), which will lead to more sales and consumption in the community Avoiding conflict of interest 	Ministry of Information, Ministry of Industries, Private Sector	MOHFW, Ministry of Commerce, UN System, Development Partners	By 2016
General population and communities	<ul style="list-style-type: none"> Improving understanding and awareness among the general population and targeted populations, including school children, through mass media and community media and inclusion in curriculums Developing effective and innovation communication channels Strengthening quality of and scaling up of targeted counselling and communication services to mothers and adolescent girls Identifying creative communication platforms – through mother support networks, peer-to-peer support, community forums, etc. 	Government (MoHFW/ Local Government/ Ministry of Information, Ministry of Education, MoWCA)	UN System/ DPs/ INGOs/ NGOs/ SMC/ Producers	2016 onwards

Service providers	<ul style="list-style-type: none"> • Ensuring service providers understand their role and responsibility in the implementation of micronutrient deficiency prevention and control interventions • Promoting consistent messages • Increasing public demand by providing information to physicians through medical representatives and organizing seminars/ workshops for village doctors, Shaystha Shebikas, and health workers 	MoHFW (IPHN/ NSIDGHS/DGFP), UPHCSDP, MOI, MOE, MoWCA	Foundation/ Other NGOs	2016 onwards
Development partners	<ul style="list-style-type: none"> • Mobilising resources for research for new interventions and technologies and scaling up of evidence-based interventions • Ensuring nutrition development programmes align with objectives and strategies in national micronutrient deficiency prevention and control strategy • Advocating for joint monitoring of implementation and achievement of results of the strategy 	MoHFW, Local Governments	UN System, NGOs	2016 onwards

Table 15: Implementation Plan Framework for Strategic Area 6: Monitoring, Evaluation, and Research

Micronutrient	Priority Areas of Action	Responsible Organization		Time Frame
		Lead	Partner	
VAC supplementation programme	<ul style="list-style-type: none"> Strengthening the monitoring system to ensure quality coverage by providing training to national and sub-national level staff Monitoring the receipt of two doses of vitamin A supplementation at individual level to ensure adequate protection 	MohFW through DGHS & DGFP, IPHN	UN System, DPs, Academic Institutes, International Research Centre, NGOs	By 2017
IFA supplementation in pregnancy	<ul style="list-style-type: none"> Operation researching to decide modification of current programme, as for example, the issue of iron intake from groundwater and its effects on anaemia and other micronutrients Further etiological researching on anaemia Exploring possibility of adding multiple micronutrients during pregnancy Strengthening monitoring and supervision through adequate training of service providers Establishing monitoring of supply chain system 	MohFW through DGHS & DGFP, IPHN	Academic Institutes, Foundations, International Research Centre, UN System, DPs	By 2017
IFA supplementation for at-risk groups (adolescent girls, newly wed women)	<ul style="list-style-type: none"> Establishing monitoring system and supply chain management 	MohFW through DGHS & DGFP, IPHN	NA	By 2017
Need based targeted MNP supplementation for young children as home-based food fortification	<ul style="list-style-type: none"> Evaluating efficacy of the programme, especially for anaemia, iron and zinc, and vitamin A status Conducting operation research on safety issues/ side effects of MNP micronutrients Strengthening M&E system 	MohFW through IPHN	Academic Institutes, International Research Centre, Foundations, UN System, DPs	By 2018
Zinc supplementation with ORS in management of diarrhoea	<ul style="list-style-type: none"> Strengthening M&E system 	MohFW through IPHN		By 2016

USI programme	<ul style="list-style-type: none"> Enforcing external monitoring by government regulatory bodies Involving local government agencies, including elected public representatives (e.g., chairperson, members) in monitoring of retailers Developing crude salt specification by BSCIC and monitoring of crude salt quality Introducing QC labs in all salt industries 	Mol,	CIDD, BSCIC LGD, IPHN, BSTI, IFST, INFS, FBCCI (including salt producers and retailers), UN System, DPs, NGOs	By 2017
Strengthen fortification of edible oil with vitamin A	<ul style="list-style-type: none"> Strengthening the development of a strong monitoring and evaluation system in private sector and government services 	Ministry of Industries	UN System, Development Partners	By 2016
Fortification with zinc	<ul style="list-style-type: none"> Exploring rice and wheat flour fortification with zinc Establishing a monitoring system on the effectiveness of rice fortification 	Ministry of Food	MOWCA, Academic Institutes, International Research Centre, UN System, Development Partners	By 2016
Bio-fortification of zinc	<ul style="list-style-type: none"> Researching further newly developed zinc bio-fortified rice varieties (such as BRRI 62) and the necessary extension initiative Monitoring and quality control of zinc content in food 	Ministry of Agriculture	Ministry of Food, MoHFW (IPHN), MoI (BSTI), UN System, DPs, R-BRRI and International Research Centre	By 2016 On-going
Improving zinc content in food / agriculture	<ul style="list-style-type: none"> Exploring using powdered fish as a sprinkle in the food Exploring Zn-Fertilizer Developing foliar spraying technique Exploring zinc enrichment of rice at the processing stage (soaking) 	MOFL, MoA	MOHFW, Ministry of Food, UN System, Development Partners, INGOS	By 2017
All food fortification programmes	<ul style="list-style-type: none"> Ensuring quality control programme is endorsed by the government regulatory body 	Ministry of Food (proposed Food Safety Authority)	MoA, MoHFW, Ministry of Industries, MoFL, IPHN, BSTI, UN System, Development Partners, NGOs	By 2016
Promote diversified safe food	<ul style="list-style-type: none"> Identifying low-cost high-micronutrient containing animal sources of food Ensuring diversified and safe food 	MOFL, Ministry of Food	MoHFW	By 2017
All micronutrient interventions	<ul style="list-style-type: none"> Overarching multi-sectoral committees would be in place for guiding and monitoring nutrition programmes including micronutrients in line with National Nutrition Policy 	MoHFW/ IPHN	Ministry of Industries, Ministry of Food, Ministry of Agriculture, Ministry of Women & Children Affairs, MOI,	By 2016



3.3 Indicator Matrix

Table 16: Indicators (Impact level)

	Indicator	Target Group	Baseline (year)	Target by 2019 (reduction by 15%)	Target by 2024 (reduction by 25%)	Means of Verifications
Impact level						
1	Prevalence of Vitamin A deficiency ¹	Preschool-age children (6-59 months)	20.5% (NMS 2011-12)	17%	15%	National Micronutrient Survey
		School-age children (6-14 years)	20.9% (NMS 2011-12)	18%	16%	
2	Prevalence of Iron deficiency ²	Preschool-age children (6-59 months)	10.7% (NMS 2011-12)	9%	8%	National Micronutrient Survey
3	Prevalence of Iodine deficiency ³	School-age children (6-14 years)	40% (NMS 2011-12)	34%	30%	National Micronutrient Survey
		NPNL women (15-49 years)	42.1% (NMS 2011-12)	36%	32	National Micronutrient Survey
4	Prevalence of Zinc Deficiency ⁴	School-age children (6-14 years)	44.6% (NMS 2011-12)	38%	33%	National Micronutrient Survey
		NPNL women (15-49 years)	57.3% (NMS 2011-12)	49%	43%	
5	Prevalence of Vitamin D deficiency ⁵	Preschool-age children (6-59 months)	39.6% (NMS 2011-12)	34%	30%	National Micronutrient Survey
		NPNL women (15-49 years)	71.5% (NMS 2011-12)	61%	54%	
6	Prevalence of Calcium Deficiency ⁶	Preschool-age children (6-59 months)	24.4% (NMS 2011-12)	21%	18%	National Micronutrient Survey
		NPNL women (15-49 years)	26.3% (NMS 2011-12)	22%	20%	

¹ Vitamin A deficiency is defined as serum retinol level <0.7 mmol/l (WHO/IVACC).

² Iron deficiency is defined as serum ferritin level <12.0 mg/ml in preschool age children (WHO, 2001).

³ Iodine deficiency is defined as urinary iodine concentration <100.0 µg/l in school age children and NPNL (WHO 2013).

⁴ Zinc deficiency is defined as S. Zinc level <9.9 mmol/l in preschool age children and 10.1 mmol/l in NPNL women (International Zinc Nutrition Consultative Group (IZiNCG) 2004).

⁵ Vitamin D deficiency is defined as serum vitamin D level <50.0 nmol/L, as suggested by the Institute of Medicine (Ross AC et al. 2011)

⁶ Prevalence of calcium deficiency is defined as serum calcium level <8.8 mg/dL for preschool and school age children and <8.4 mg/dL for NPNL women.

Table 17: Indicators (Outcome level)

	Indicator	Target Group	Baseline (year)	Target by 2019	Target by 2025	Means of Verifications
Outcome level indicators						
1	% of children 6-59 months receiving at least one dose of vitamin A supplementation within six months	Children aged 6-11 months	83% (2012, EPI CES 2013)	>90%	>95%	EPI Coverage Evaluation Survey
		Children aged 12-59 months	92% (2012, EPI CES 2013)	>92%	>95%	National Micronutrient Survey
2	% of woman who consumed at least 100 IFA tablets during pregnancy	Pregnant women	15% (IPHN/HKI 2006)	>50%	>75%	Food Security Nutrition Surveillance Project
3	% of children 6-23 months receiving micronutrient powders within last 24 hours	Children aged 6-23 months	1.3% (NMS 2011-12)	15%	30%	National Micronutrient Survey
4	% of children aged under 5 years with diarrhoea who are treated with zinc supplements	Children aged 0-59 months	40.8% (BDHS 2011)	47%	56%	BDHS
5	Percentage of households consuming iodized (> 5 ppm) salts	Households	80.3% (NMS 2011-12)	92%	100%	National Micronutrient Survey
6	Percentage of households consuming adequately iodized (> 15 ppm) salts	Households	57.6%	75%	90%	National Micronutrient Survey
7	Number of households consuming Vitamin A-fortified edible oil	Households	0%	75%	90%	National Micronutrient Survey

References

- Allen LH, Penland JG, Boy E, DeBaessa Y, and Rogers LM. Cognitive and neuromotor performance of Guatemalan schoolers with deficient, marginal and normal plasma vitamin B12. *FASEB Journal*. 1999; 13: A544.
- Allen LH. Impact of vitamin B-12 deficiency during lactation on maternal and infant health. *Advances in Experimental Medicine and Biology*. 2002; 503: 57-67.
- Arsenault JE, Yakes EA, Islam MM, Hossain MB, Ahmed T, Hotz C, Lewis B, Rahman AS, Jamil KM, and Brown KH. Very Low Adequacy of Micronutrient Intakes by Young Children and Women in Rural Bangladesh is Primarily Explained by Low Food Intake and Limited Diversity. *Journal of Nutrition*. 2013; doi: 10.3945/jn.112.169524.
- Bangladesh Bureau of Statistics. Report of the Household Income and Expenditure Survey (HIES) 2010. Planning Division, Ministry of Planning, Government of the People's Republic of Bangladesh, 2010.
- Baqui AH, Black RE, El Arifeen S, Yunus M, Chakraborty J, Ahmed S, and Vaughan JP. Effect of zinc supplementation started during diarrhoea on morbidity and mortality in Bangladeshi children: community randomised trial. *BMJ*. 2002; 325 (7372): 1059-62.
- Bhutta ZA, Bird SM, Black RE, Brown KH, Gardner JM, Hidayat A, et al. Therapeutic effects of oral zinc in acute and persistent diarrhoea in children in developing countries: pooled analysis of randomized controlled trials. *American Journal of Clinical Nutrition*. 2000; 72 (6): 1516–22.
- Bielsalski HK. *Hidden Hunger*, 13th ed. Berlin Heidelberg: Springer-Verlag, 2013; pp. 25-50.
- BjørkeMonsen AL, Ueland PM, Vollset SE, Guttormsen AB, Markestad, T, Solheim E, and Refsum H. Determinants of cobalamin status in newborns. *Pediatrics*. 2001; 108: 624–630.
- Brooks WA, Yunus M, Santosham M, Wahed MA, Nahar K, Yeasmin, S, and Black RE. Zinc for severe pneumonia in very young children: double-blind placebo-controlled trial. *Lancet*. 2004; 363 (9422): 1683–1688.
- Bushamuka VN, de Pee S, Talukder A, Keiss L, Panagides D, Taher A, Bloem MW. Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh. *Food Nutr Bull*. 2005; 26: 17-25.
- Chaffee BW and King JC. Effect of zinc supplementation on pregnancy and infant outcomes: a systematic review. *Paediatric and Perinatal Epidemiology*. 2012; 26 (Suppl. 1), 118-137.
- Cole CR and Lifshifz F. Zinc nutrition and growth retardation. *Paediatrics Endocrinology Review*. 2008; 5 (4): 889-96.
- Darnton-Hill I. Overview: Rationale and elements of a successful food fortification program. *Food and Nutrition Bulletin*. 1998; 19 (2): 92-100.
- Darnton-Hill I, Webb P, Harvey PWJ, Hunt JM, Dalmiya N, Chopra M, Ball MJ, Bloem MW and de Benoist B. Micronutrient deficiencies and gender: social and economic costs. *Am J Clin Nutr*. 2005, 819 Suppl: 1198S-1205S.
- Dewey KG, Brown KH. 2002. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food Nutr Bull*, in press at the time.
- Dhaka University, ICCIDD and UNICEF. Report of the national iodine deficiency survey of Bangladesh, 1993. Dhaka: Institute of Nutrition and Food Science, Dhaka University, 1993.
- Dhaka University, IPHN, BSCIC, UNICEF and ICCIDD. Report of the national iodine deficiency survey of Bangladesh, 1999. Dhaka: Institute of Nutrition and Food Science, Dhaka University, 1999.
- DGHS (Directorate General of Health Services). EPI coverage evaluation survey 2006. Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh; 2006.

- DGHS (Directorate General of Health Services). EPI coverage evaluation survey 2012. Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh; 2012.
- Dreyfuss ML, Stoltzfus RJ, Shrestha JB, Pradhan EK, LeClerq SC, Khatry SK, Shrestha SR, Katz J, and Albonico M. Hookworm, malaria and vitamin A deficiency contribute to anaemia and iron deficiency among pregnant women in the plains of Nepal. *Journal of Nutrition*. 2000; 130 (10): 2527–2536.
- Eneroth H, El Arifeen S, Persson LA, Lönnerdal B, Hossain MB, Stephensen CB, and Ekström EC. Maternal multiple micronutrient supplementation has limited impact on micronutrient status of Bangladeshi infants compared with standard iron folic acid supplementation. *Journal of Nutrition*. 2010.140 (3): 618-24.
- Ezzati M, Lopez AD, Rodgers A and Murray CJL. Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors. Geneva: World Health Organization, 2004.
- Fishman SM, Christian P, and West KP Jr. The role of vitamins in the prevention and control of anaemia. *Public Health Nutrition*. 2000; 3 (2): 125–150.
- (FPMU) Food Planning and Monitoring Unit. Bangladesh National Food Policy – Plan of Action (2008-2015). Dhaka: Food Planning and Monitoring Unit, Ministry of Food and Disaster Management, Government of the People's Republic of Bangladesh, 2006.
- FPMU/Food Division. Bangladesh Country Investment Plan: A road map towards investment in agriculture, food security and nutrition. Ministry of Food and Disaster Management, Government of the People's Republic of Bangladesh, 2011.
- Gregory J, Lowe S, Bates CJ, Prentice A, Jackson LV, Smithers G. National Diet and Nutrition Survey of People Aged 4-18 Years. Vol. 1. Report of the Diet and Nutrition Survey. London: The Stationery Office; 2000
- Gröber U, Spitz J, Reichrath J, Kisters K, and Holick MF. Vitamin D Update 2013: From rickets prophylaxis to general preventive healthcare. *Dermatoendocrinol*. 2013; 5 (3): 331–347.
- Haas J and Brownlie T 4th. Iron deficiency and reduced work capacity: a critical review of the research to determine a causal relationship *Journal of Nutrition*. 2001; 131 (2S-2): 676S-688S.
- Hallberg L. Bioavailability of dietary iron in man. *Annual Review of Nutrition*. 1981; 1: 123–47
- Henderson L, Gregory J, Swan G. National diet and nutrition survey: adults aged 19-64 years. Vol. 1: types and quantities of foods consumed. London: The Stationery Office; 2002.
- Hetzl BS. Iodine deficiency disorders (IDD) and their eradication. *Lancet*. 1983; 2 (8359): 1126-29.
- Hollies BW and Wagner CL. Vitamin D requirements during lactation: high-dose maternal supplementation as therapy to prevent hypovitaminosis D for both the mother and the nursing infant. *American Journal of Clinical Nutrition*. 2004; 80 (Suppl): 1752S-1758S.
- Horton S and Ross J. The economics of iron deficiency. *Food Policy*. 2003; 28 (1), 51–75.
- Huffman SL, Baker J, Shumann J, and Zehner ER. The case for promoting multiple vitamin/mineral supplements for women of reproductive age in developing countries. Washington, DC: The LINKAGES Project, Academy for Educational Development, 1998.
- ICDDR, B (International Centre for Diarrhoeal Disease Research), GAIN (Global Alliance for Improved Nutrition), and UNICEF (United Nations Children's Fund). The National Micronutrient Survey 2011-12. UNICEF, June 2014.
- ICDDR, B. National Rickets Survey, Bangladesh 2008. ICDDR., B Health and Science Bulletin. 2009; 7 (1): 7-11.
- Imdad A and Butta ZA. Effects of calcium supplementation during pregnancy on maternal, fetal and birth outcomes. *Paediatric and Perinatal Epidemiology*. 2012; 26 (Suppl. 1), 138-152.
- Imdad A, Herzer K, Mayo-Wilson E, Yakoob MY, and Bhutta ZA. Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. *Cochrane Database of Systematic Reviews*.2010; (12): CD008524.

International Zinc Nutrition Consultative Group Technical Document #1; Food and Nutrition Bulletin. 2004; 25 (suppl 2).

IPHN and HKI (Institute of Public Health Nutrition and Helen Keller International). Bangladesh nutritional blindness study, 1982-83; Dhaka: Helen Keller International, 1985.

IPHN and HKI (Institute of Public Health Nutrition and Helen Keller International). Nutritional Surveillance Project 2005; Dhaka: Helen Keller International, 2005.

IPHN and HKI (Institute of Public Health Nutrition and Helen Keller International). Vitamin A status throughout the life cycle in rural Bangladesh: National Vitamin A Survey 1997-98. Dhaka: Helen Keller International, 1999.

IPHN and HKI (Institute of Public Health Nutrition and Helen Keller International). Anaemia is a serious public health problem in pre-school children and pregnant women in rural Bangladesh. Nutrition Surveillance Project Bulletin. No.10. Helen Keller International, 2002.

IPHN and HKI (Institute of Public Health Nutrition and Helen Keller International). The burden of anaemia in rural Bangladesh: An urgent need for action. Nutrition Surveillance Project Bulletin. No.16. Helen Keller International; 2006.

IPHN (Institute of Public Health Nutrition). National Guidelines: Prevention and Treatment of Iron Deficiency Anaemia. Dhaka: IPHN 2001.

IPHN (Institute of Public Health Nutrition). National strategy for anaemia prevention and control in Bangladesh. Dhaka: IPHN, 2007.

IPHN (Institute of Public Health Nutrition). National Strategy for Infants and Young Child Feeding in Bangladesh. IPHN, Directorate General of Health Services, Ministry of Health and family welfare, Government of the People's Republic of Bangladesh, 2007.

IPHN, BSCIC, UNICEF and ICCIDD (Institute of Public Health Nutrition, Bangladesh Small and Cottage Industries Corporation, United Nations Children's Fund and International Council for the Control of Iodine Deficiency Disorders). Evaluation of universal salt iodization (USI) in Bangladesh, 1999. Institute of Public Health Nutrition, 1999.

Jahan K. and Hossain M. Nature and extent of malnutrition in Bangladesh. Bangladesh National Nutrition Survey, 1995-96, Institute of Nutrition and Food Science, University of Dhaka, July, Part1. 1998; 116: 134.

Jansson LT, Kling S, and Dallman PH. Anemia in children with acute infection seen in a primary care pediatric outpatient clinic. Paediatrics Infectious Diseases. 1986; 5 (4): 424-427.

Jones G, Steketee R W, Black RE, Bhutta ZA, Morris SS, and the Bellagio Child Survival Study Group. How many child deaths can we prevent this year? Lancet 2003; 362 (Vol 362): 65-71

JPGSPH and HKI (James P Grant School of Public Health and Helen Keller International). State of food security and nutrition in Bangladesh 2011. JPGSPH, Helen Keller International, and Government of the People's Republic of Bangladesh, 2012.

Khan KU. Homestead gardening in Bangladesh: enhancing the nutritional and economic status of the rural population. Khulna, Bangladesh: Khulna University, 2011.

Lawn JE, Cousens S, Zupan J: 4 million neonatal deaths: When? Where? Why? Lancet 2005, 365 (9462):891-900.

Leklem JE. Vitamin B-6. In: Ziegler EE, Filer LJ Jr, editors. Present Knowledge in Nutrition. 7th ed. Washington, DC; 1997. International Life Sciences Institute Press: 174-183.

Lindström E, Hossain MB, Lönnerdal B, Raqib R, El Arifeen S, and Ekström EC. Prevalence of anaemia and micronutrient deficiencies in early pregnancy in rural Bangladesh, the MINI Mat trial. Acta Obstetrica et Gynecologica Scandinavica. 2011; 90 (1): 47-56.

Linpisarn S, Tienboon P, Promtet N, Putsyaninunt P, Santawanpat S, and Fushs GJ. Iron deficiency and anaemia in children with a high prevalence of haemoglobinopathies: implications for screening. International Journal of Epidemiology. 1996; 25 (6): 1262-1266.

- Mejia LA. Role of vitamin A in iron deficiency anaemia. In: Fomon SF, Zlotkin S, editors. *Nutritional Anaemias*. Nestle Nutrition Workshop Series. Vevey: Nestle Ltd. New York: Raven Press. 1992; 30: 93–101.
- Merrill RD, Labrique AB, Shamim AA, Schulze KJ, Christian PK, Merrill RK and West KP Jr. Elevated and variable groundwater iron in rural north western Bangladesh. *Journal of Water and Health*. 2010; 8 (4): 818–825.
- Merrill RD, Shamim, Ahmed A; Hasmot A, Labrique, Alain B, Schulze, Kerry; Christian, Parul and West, Keith P. High prevalence of anaemia with lack of iron deficiency among women in rural Bangladesh: a role for thalassemia and iron in groundwater. *Asia Pacific Journal of Clinical Nutrition*. 2012; 21 (3); 416-424.
- MOHFW (Ministry of Health and Family Welfare). *Bangladesh National Nutrition Policy 2015*. Dhaka: Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh, 2013.
- Mitra and Associates and Macro International. *Bangladesh Demographic and Health Survey*. National Institute of Population Research and Training (NIPORT); 1993.
- Mitra and Associates and Macro International. *Bangladesh Demographic and Health Survey*. National Institute of Population Research and Training (NIPORT); 1999.
- Mitra and Associates and Macro International. *Bangladesh Demographic and Health Survey*. National Institute of Population Research and Training (NIPORT); 2007.
- Mitra and Associates and Macro International. *Bangladesh Demographic and Health Survey*. National Institute of Population Research and Training (NIPORT); 2011.
- Ones G, Steketee RW, Black RE, Bhutta ZA, Morris SS: How many child deaths can we prevent this year? *Lancet* 2003, 362 (9377): 65 –71.
- PANO and WHO (Pan American Health Organization and World Health Organization). *Guiding principles for complementary feeding of the breastfed child*, PAHO, 2003.
- Powers HJ, Bates CJ, and Duerden JM. Effects of riboflavin deficiency in rats on some aspect of iron metabolism. *International Journal for Vitamin and Nutrition Research*. 1983; 53 (4): 371–376.
- Ross AC, Taylor CL, Yaktine AL, Del Valle HB, Editors. *Committee to Review Dietary Reference Intakes for Vitamin D and Calcium; Chapter 5. Dietary reference intakes for adequacy: Calcium and Vitamin D*. Institute of Medicine, National Academy of Sciences (USA); 2011.
- Sattar S, Ahmed T, Rasul CH, Saha D, Salam MA and Hossain MI. Efficacy of a high-dose in addition to daily low-dose vitamin A in children suffering from severe acute malnutrition with other illnesses. *PLoS ONE*. 2012; 7 (3): e33112. doi: 10.1371/journal.pone.0033112.
- Sazawal S, Black RE, Ramsan M, et al. Effect of zinc supplementation on mortality in children aged 1–48 months: a community-based randomised placebo-controlled trial. *Lancet*. 2007; 369 (9565): 927–934.
- Sommer A and West KP Jr. *Vitamin A deficiency: health, survival and vision*. New York: Oxford University Press; 1996.
- UNICEF (United Nations Children's Fund). *UNICEF Data: Monitoring the situation of children and women*; <http://data.unicef.org/nutrition/iodine>.
- UNICEF and MI (United Nations Children's Fund and Micronutrient Initiative). *Vitamin and mineral deficiency: a global progress report*. Ottawa, Canada: Micronutrient Initiatives, 2004.
- Villamor E and Fazwi WW. Vitamin A supplementation: implications for morbidity and mortality in children. *Journal of Infectious Diseases*. 2000; 182 (Suppl 1): S122-S133.
- Walker CF and Black RE. Zinc and the risk for infectious disease. *Annual Review of Nutrition*. 2004; 24: 255–275.
- WHO& FAO (World Health Organization and Food and Agricultural Organization of the United Nations). *Guideline for food fortification with micronutrients*. 2006, 57.

WHO and UNICEF (World Health Organization and United Nations Children's Fund). Global Strategy for Infant and Young Child Feeding. Geneva: World Health Organization, 2003.

WHO, UNICEF and ICCIDD (World Health Organization, United Nations Children's Fund and International Council for the Control of Iodine Deficiency Disorders). Assessment of iodine deficiency disorders and monitoring their elimination. A guide for programme managers. 3rd edition. Geneva: World Health Organization, 2007.

WHO, UNICEF and UNU (World Health Organization, United Nations Children's Fund and United Nations University). Iron deficiency anaemia: assessment, prevention, and control. A guide for programme managers. Geneva: World Health Organization, 2001.

WHO (World Health Organization). Global prevalence of vitamin A deficiency in populations at risk 1995–2005: WHO Global Database on Vitamin A Deficiency. Geneva: World Health Organization, 2009.

WHO (World Health Organization). Guideline: Calcium supplementation in pregnant women. Geneva: World Health Organization, 2013.

WHO (World Health Organization). Guideline: Daily iron and folic acid supplementation in pregnant women. Geneva: World Health Organization, 2012.

WHO (World Health Organization). Guideline: Use of multiple micronutrient powders for home fortification of foods consumed by infants and children 6–23 months of age. Geneva: World Health Organization, 2011.

WHO (World Health Organization). Guideline: Vitamin A supplementation in infants and children 6–59 months of age. Geneva: World Health Organization, 2011.

WHO (World Health Organization). Guideline: Vitamin D supplementation in pregnant women. Geneva: World Health Organization, 2012.

WHO (World Health Organization). Guideline: Vitamin A supplementation in postpartum women. Geneva: World Health Organization, 2011.

WHO (World Health Organization). Iodine status worldwide: WHO Global Database on Iodine Deficiency. Geneva: World Health Organization, 2011.

WHO (World Health Organization). Vitamin and Mineral Requirements in Human Nutrition, 2nd edition. Geneva: World Health Organization, 2004.

WHO (World Health Organization). Weekly iron–folic acid supplementation (WIFS) in women of reproductive age: its role in promoting optimal maternal and child health. Position statement. Geneva: World Health Organization, 2009.

WHO (World Health Organization). Worldwide prevalence of anaemia 1993-2005: WHO Global Database on Anaemia. Geneva: World Health Organization, 2008.

WHO/NUT/98.1, 1998. Complementary feeding of young children in developing countries; a review of current scientific knowledge. World Health Organization, Geneva.

WHO/UNICEF/UNU 2001. Iron Deficiency Anaemia: Assessment, Prevention, and Control-A Guide for Programme Manager

Yusuf HK, Khatun F and Rahman AKMM. National survey on iodine deficiency disorders and universal salt iodization survey of Bangladesh 2004-5. Dhaka: Institute of Public Health Nutrition; 2007. p. 158.

Annexes

Annex 1: **Strategy Development Process**

This document has been developed following a consultative process that started after dissemination of the National Micronutrient Survey 2011-12. The Institute of Public Health Nutrition initially formed a technical committee to identify a process of consultation to formulate a national micronutrient deficiency control strategy. In order to ensure that the NSPCMD accurately reflects the views of its stakeholders, an extensive consultation process was undertaken from October 2013 to April 2014. The consultation process included participants from relevant ministries, academia, research institutions, international and national organizations and UN organizations.

The consultation process involved group discussion meetings with various stakeholders and then a series of workshops for each of concerned micronutrients. The workshop outputs and recommendations were compiled along with extensive literature support and distributed among all relevant stakeholders' for comments and feedback.

The Ministry of Health and Family Welfare constituted an "Expert Working Group", incorporating members from different ministries, agencies, institutions, etc. (Annex2) to provide technical leadership for the development of the National Strategy on Prevention and Control of Micronutrient Deficiencies. The Expert Working Group was also responsible for identifying critical issues to be addressed and build synergy between existing legislation, policies, protocols and guidelines.

The following table provides major events in the process of developing the Strategy.

Table: Milestones in the NSPCMD Development process

Time Period	Event
September 9, 2013	IPHN formed a Technical Committee First Technical Committee Meeting
October 8, 2013	Second Technical Committee Meeting
November 2013 to March 2014	Five Sub-group Consultation Workshops on Vitamin A, Iodine Nutrition, Iron and Anaemia, Zinc/B12 Deficiency and Vitamin D/Calcium
February 16, 2014	Development of First Draft NSPCMD and disseminated among stakeholders for review
February 16-19, 2014	Bilateral discussion with experts of different stakeholders on First Draft
March 13, 2014	MOHFW Formulate Expert Working Group
April 15, 2014	Incorporate comments and developed Second Draft
April 18, 2014	Expert Working Group meeting to review Second Draft
April 24, 2014	Broader workshop for intensive review of the proposed Strategy
May 2014	Incorporation of comments and Final Draft developed
September 2014	Expert Working Group meeting, decision to incorporate further recommendations
March 2015	Expert Working Group meeting, finalization of the strategy
May 2015	Approval by MOHFW

Annex 2: **Expert Working Group: List of Members**

Chair

Roxana Quader, Additional Secretary (PH & WH), MOHFW

Members (In no particular order)

Ministry of Health and Family Welfare

Niru Shamsur Nahar, Joint Chief (Planning)
Subash Chandra Sarker, Joint Secretary (Public Health)
Iffat Ara Mahmood, Deputy Secretary (Public Health-2)

Directorate General of Health Services (DGHS)

Dr. Syed Abu Zafar Md. Musa, Director, Primary Health Care and Line Director (MNC &AH)

Directorate General of Family Planning (DGFP)

Dr. Mohammed Sharif, Director, MCH-Services Unit and Line Director (MC-RAH)

Ministry of Industries

Abu Taher Khan, Director (Technology) and Project Director, CIDDD Project, Bangladesh Small and Cottage Industries Corporation (BSCIC)
Md. Abdus Sabur Chowdhury, Deputy Secretary

Ministry of Food

Ruhul Amin Talukder, Director, FPMU

Ministry of Children & Women Affairs

Md. Alamgir Hussain, Deputy Chief

Ministry of Agriculture

Sams-e-Ara Binte Huda, Deputy Secretary

Ministry of Fisheries & Livestock

M. Saiful Hassan, Deputy Secretary

Ministry of Education

Sakeun Nahar Begum, Deputy Secretary

Ministry of Information

Md. Robiul Islam, Deputy Secretary Budget

Institute of Public Health Nutrition (IPHN)

Dr.Md. Shah Nawaz, Director-IPHN and Line Director-NNS, DGHS
Dr. Md. Abdul Jalil, Deputy Director, IPHN & Programme Manager, NNS
Dr. Moudud Hossain, Programme Manager, NNS
Dr. Taherul Islam Khan, Programme Manager, NNS
Dr. Nasreen Khan, Deputy Program Manager, NNS

University of Dhaka

Dr. Aleya Mowlah, Professor of Director, Institute of Nutrition and Food Science
Dr. ABM Faruque, Professor, Department of Pharmacy, SSMC & Mitford Hospital

Sir Salimullah Medical College and Hospital

Prof. Dr. Ferdousi Begum, Professor, Department of Obstetrics and Gynaecology

Ministry of Disaster Management

Amena Begum, Deputy Secretary

Directorate General of Drug Administration

Md. Altaf Hossain

UNICEF, Bangladesh

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Dr. Ireen Akhter Chowdhury, Nutrition Officer (Micronutrient)

Dr. Mohsin Ali, Nutrition Specialist

Global Alliance for Improved Nutrition (GAIN)

Basanta Kumar Kar, Country Manager

International Centre for Nutrition and Food Security (icddr, b)

Dr. Tahmeed Ahmed, Senior Scientist and Director, Centre for Nutrition and Food Security

Micronutrient Initiatives

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BRAC University

Dr. Zeba Mahmud, Director Nutrition, BRAC Institute of Global Health (BIGH)

Food and Agriculture Organization (FAO)

Lalita Bhattacharjee, Nutritionist

World Health Organization (WHO)

Farzana Bilkes, National Professional Officer -Nutrition & Food Safety, WHO, Bangladesh

Bangladesh Breastfeeding Foundation (BBF)

Dr. S. K. Roy, Chairman

Helen Keller International (HKI)

Shirin Afroz, Programme Coordinator



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