EFFECTIVENESS OF NUTRITION INTERVENTIONS IN LOW AND MIDDLE INCOME COUNTRIES:

CONTEXUALISATION REPORT

OVERVIEW OF REVIEW OF SYSTEMATIC REVIEWS, [MAY, 2018]

The authors of this report are:

Kavitha Menon, PhD Professor, School of Biological Sciences, Symbiosis International University, Lavale, Pune, India

Pooja Panchal, MSc Research Assistant, Indian Institute of Public Health Gandhinagar (IIPHG), Ahmedabad, Gujarat, India

Anal Ravalia, BAMS, MSc Senior Research Fellow, Public Health Foundation of India (PHFI), Ahmedabad, Gujarat, India

Ritu Rana, PhD Assistant Professor, Indian Institute of Public Health Gandhinagar (IIPHG), Ahmedabad, Gujarat, India

Sabuj Kanti Mistry, MPH Senior Research Associate, Research and Evaluation Division, BRAC Centre, Dhaka, Bangladesh

Pei-Ching Tseng, MSc Research Assistant, Department of Clinical Education and Leadership & Institute for Health Research, University of Bedfordshire, Bedfordshire, UK

Shuby Puthussery, DrPH
Senior Lecturer in Public Health, Department of Clinical Education and Leadership & Institute for Health Research, University of Bedfordshire, Bedfordshire, UK

Janine Bhandol, MCLIP
Librarian, University of Bedfordshire, Bedfordshire, UK

Dileep Mavalankar, MD, DrPH
Director, & Vice-president (Western region), Indian Institute of Public Health, Gandhinagar (IIPHG), Ahmedabad, Gujarat, India

Funding

This is an independent report commissioned under the DFID Systematic Review Programme for South Asia. This material has been funded by South Asia Research Hub, Research and Evidence Division, Department for International Development, Government of UK. The views expressed do not necessarily reflect the UK Government's official policies.

Acknowledgments

We acknowledge the Indian Institute of Public Health Gandhinagar, the Public Health Foundation of India, University of Bedfordshire, UK and BRAC Bangladesh for logistics support, the UK Department for International Development for the grant to conduct the present work, the EPPI-Centre and LIRNEasia for technical support and PricewaterhouseCoopers Private Limited (PwC, India) for managing the DFID Systematic Review Programme for South Asia.

Conflicts of interest

None declared

Use of maps

Maps used in this report serve a purely descriptive purpose. The representation of political boundaries in the maps do not necessarily reflect the position of the Government of UK.

Contributions

The opinions expressed in this publication are not necessarily those of the DFID, EPPI-Centre or PwC. Responsibility for the views expressed remains solely with the authors.

Citation

This report should be cited as: Menon K, Ravalia A, Panchal P, Rana R, Mistry S, Tseng P, Puthussery S, Bhandol J, Mavalankar D (2017), *Effectiveness of nutrition interventions in low and middle income countries: Contextualisation report*. Indian Institute of Public Health Gandhinagar; Public Health Foundation of India; University of Bedfordshire, UK and BRAC, Bangladesh.

CONTENTS

EXECUTIVE SUMMARY

Nutrition interventions in the Low and Middle Income Countries (LMICs) are conceptualised to improve the nutritional status of communities and to alleviate different forms of malnutrition. Nutrition-specific programmes together with nutrition-sensitive programmes that improve the access to nutrient-rich foods that are locally available to support dietary diversity at an affordable cost would be a sustainable solution for achieving the World Health Assembly (WHA) targets.

ABOUT THIS SUMMARY

This contextualisation document presents the findings of the review into the context of the South Asian region and for specific South Asian countries, Bangladesh and India. This document will assist policy-makers and researchers in assessing the evidence in this field in the context of regional setting and conditions. Additionally, the document presents current evidence regarding effectiveness of interventions in particular contexts, which should be interpreted in the form of potential policy implications but not policy recommendations. The evidence-based recommendations indicated in this document are likely to work in the context of Bangladesh and India.

APPROACH

The present contextualisation document was prepared as a narrative summary, potentially identifying the different factors that are highly context-specific for the South Asian countries Bangladesh and India. We identified some factors from SRs and other published literature specific to these two countries. We also found that the models used to evaluate the different paradigms of interventions/ programmes were less suitable for the contextualisation of the present evidence summary results. Furthermore, we identified that there is limited information available regarding the potential barriers and facilitators of successful interventions in different contexts from LMICs in the SRs included in the evidence summary process.

SUMMARY OF CONTEXTUALISATION ANALYSIS

The present analysis to contextualise the findings of results from the evidence synthesis was conducted on the basis of following assumptions. Firstly, we assumed that interventions that were successful in one setting could be replicated effectively in another setting with due consideration of the contextual factors; secondly, the delivery, implementation and uptake of the programmes would remain consistent despite the variations across the contexts; and finally, this was based on the context specific factors available in the literature- either from the SRs used for the evidence summary or any other published literature.

The results from evidence summary conducted on the nutrition interventions of LMICs was contextualised to South Asia, Bangladesh and India. The process was intended to provide the policy makers an overview of the evidence available that could be used for informed policy and decision making to achieve the five WHA targets by 2025. The document primarily focuses on the context specific factors that may have an influence on the transferability of the evidence harnessed to these specific countries. Additionally, this report would be expected to initiate and stimulate the discussion of what works and what does not work in the South Asian contexts.

Considerable disparities in terms of geographical, social, political, cultural, socio-economic and ecological scenarios exist in South Asia. Such factors influences the design, implementation and uptake of the nutrition interventions/ programmes in these complex settings which need to be duly accounted for while designing effective nutrition interventions for countries in this region.

Results from the evidence summary showed positive impact of the following interventions on the WHA targets:

No	Outcomes	Interventions
1	Stunting	1. Dietary diversity and complementary feeding
2	Anemia	1. Iron supplementation with or without folic acid 2. Fortification of staple foods with iron 3. Vitamin A and Carotenoids supplementation
3	EBF	1. Peer group led breastfeeding programs 2. Community interventions for the promotion of EBF 3. Kangaroo mother care
4	LBW	1. Multiple micronutrients/ food fortifications 2. Vitamin D supplementation to pregnant women 3. Dietary diversity and supplementary feeding
5	Wasting	N/A

Stunting: Efforts to reduce the prevalence of stunting could be partially achieved through ensuring adequate dietary diversity and appropriate Infant and Young Child Feeding practices (IYCF). Stunting in children sets in primarily during the weaning period and the focus on appropriate complementary feeding practices would reduce the prevalence of stunting. Bangladesh and India should focus on improving the IYCF practices through the use of locally available nutrient-rich complementary foods that fulfils adequate dietary diversity and

nutrients in young children. The geographical and natural calamities such as floods in Bangladesh should be considered while planning programmes and policies for interventions.

Anemia: Anemia remains as major public health challenge in the LMICs. The potential evidence supports the existing policy of IFA supplementation in LMICs as per the WHO guidelines for pregnant women. However, in many LMICs the weekly iron supplementation of non-pregnant women and young adolescent girls are yet to be established. Furthermore, food-based approaches of iron supplementation through staple foods might improve anemia and this should be emphasised so as to ensure the intake of supportive nutrients that play an important role in preventing anemia such as Vitamin A. Ideally, nutritional status of women prior to conception should be ensured. Dietary diversification strategies and supplementary feeding programmes together with appropriate nutrition counselling for reproductive age women in low resource settings of Bangladesh, India and other countries of South Asian regions could be implemented with a focus to incorporate locally available nutrient-rich foods. Geographical, climatic and socio-economic factors need to be considered while planning and implementing the dietary diversification strategies.

Exclusive Breastfeeding: The Exclusive Breastfeeding (EBF) rates in Bangladesh and other South Asian countries have improved over the last decade, however, further efforts to effectively enhance the practice of EBF would have far reaching beneficial impact on the growth and development of young children. Peer led and community based interventions to promote EBF together with the Kangaroo Mother care practice should be focussed as such interventions could be scaled-up with less financial and other resource constraints initially through the health system and later through peer led community groups.

Low Birth Weight: The Low Birth Weight (LBW) rates remains alarmingly high in LMICs, especially in low resource settings. Although there has been a slight reduction in the rates over a decade, the challenge of addressing LBW has been daunting. The results from evidence summary indicate that multiple micronutrient supplementation and fortification programmes, Vitamin D supplementation and nutrition counselling for improving dietary diversity during pregnancy could effectively reduce the prevalence of LBW.

The above evidence has to be contextualised to suit Bangladesh and South Asia. Bangladeshi women practice wearing Pardha and remain covered. Thus, are less exposed to sunlight that support the synthesis of Vitamin D in the body. Nepal, Pakistan and Afghanistan have seasons of winter during the year when the exposure to sunlight is limited. Hence, the formulation of programmes and policies should consider the contextual factors that might determine the dosage, frequency and form of supplements; design, implementation and effective uptake of these interventions in the geographically, climatically and culturally challenging countries. Additionally, fortification of foods and dietary diversity should be focused to harness

sustainable solutions to improve the micronutrient and energy intakes among the pregnant women in LMICs.

Wasting: Chronic and severe malnutrition among children under five years of age impedes the growth and development of children in LMICs. Wasting remains as a nutrition challenge and efficacy of multiple interventions to reduce wasting have been studied. Such interventions show a positive impact in the controlled settings, however, were found to be less sustainable to reduce/ prevent wasting. The results from evidence summary indicate the necessity for further community-based interventions from LMICs that could develop effective sustainable solutions for wasting.

STRENGTHS AND LIMITATIONS

Strengths: The evidence harnessed during the evidence summary process would support policy makers, nutrition practioners and development agencies to develop informed and evidence-based policies and programmes to achieve the WHA targets by 2025 that could be applicable to Bangladesh, India and South Asian countries.

Limitations: The results are drawn based on the primary studies that were conducted in different contexts of LMICs and pooling the evidence may or may not work in certain settings. Furthermore, there was a paucity of information on the contextual factors in the primary studies and the SRs developed from these primary studies. Hence, contextualising the findings to South Asian countries has been challenging considering the wide disparities and diversity in this region.

1 BACKGROUND

SOUTH ASIA

The global population is escalating to reach nine billion people by 2050. This raises a grave concern for nutritional quality and safety along with other concerns (Buttriss and Riley, 2013). South Asia has been progressing significantly in economic transformations, yet there has been a hidden burden of undernutrition dominating in various ways (Shekar et al., 2016). The undernutrition rates are determined by the set of factors such as immediate, underlying and basic determinants (Black et al., 2013). The strategy to improve includes nutrition specific interventions focusing on determinants of poor diet and illness delivering it through community-based programs or health systems (Bhutta et al., 2013). Similarly for nutrition sensitive interventions the underlying determinants are food insecurity, poverty, women's status and sanitation (Ruel and Alderman, 2013).

Wasting, particularly in South Asian region is often observed in children below six months of age, focusing more to chronic malnutrition and societal aetiologies i.e. poor maternal health, poor infant and young child feeding practices, lower caste/class category (Menon, 2012). Thus, scaling up the treatment for 91 million children residing in low and middle-income countries (LMICs) will entail about $9.1 billion over 10 years. This averages up to $90 per child living in South Asia, which will scale up economy productivity by $25 billion annually (Shekar et al., 2016). The Copenhagen Census identified nutrition interventions as one of the most cost effective methods for investments during the first 1000 days of period. It has the highest returns and offers a window of opportunity to permanently lock-in human capital. Also, they estimated that a 40% reduction in stunting in children by 2030 would return $45 for every dollar spent (Copenhagen Consensus Centre 2015; Hoddinott et al., 2013). Additionally, this leads to an increase in the costs to society i.e. increase in mortality, morbidity and decreased cognitive and physical abilities (Shekar, Dayton Eberwein and Kakietek, 2016).

The WHO recommends early initiation of breastfeeding within the first hour of birth as the best public health practice, which directly impacts the progress towards improving nutritional status of children less than 5 years of age. Various factors influence exclusive breastfeeding rates such as socio-economic factors, geographical factors, individual factors and health related factors. Policies and programmes to improve EBF are in place in South Asian region (Sharma and Byrne, 2016), yet there has not been any significant improvement in comparison to the rest of the world (Bocquenet et al., 2016).

Achieving the world health assembly target for anemia in women of reproductive age over 10 years would require an investment of $12.9 billion. The net return for this investment in LMICs would be $110.1 billion over 10 years for women. The pooled benefit-cost ratio for the

children would be 12.1. Thus, it will not only improve the lives of women and their children but would also contribute positively to the economy of countries. Reproductive age women of LMICs with concurrent multiple micronutrient deficiencies would benefit from the micronutrient supplementation programmes. There has been a growing consensus on expanding the multiple micronutrient supplementation or food fortification programs from the current focused target population to all women of LMICs to address anemia in reproductive age women. Also, it will reduce gender wage gaps and poverty. Hence, government with donors and communities can together seize opportunity for anemia prevention and control (Shekar et al., 2016).

Modulating malnutrition issues especially in South Asian region remains as a great public health challenge considering the socioeconomic and cultural disparities, geographical distribution, environmental, and political challenges the region undergoes from time to time. Also, providing food to a population in limited resource settings continues to be a serious concern requiring rigorous and sagacious approach (Akhtar, 2015).

BANGLADESH

Recently, Bangladesh is significantly progressing in socioeconomic sector, as per BDHS (2014) report; the country has exhibited robust growth of GDP by 6.5% in the fiscal year 2014-2015 (Survey, 2014). Although South Asia is linked with high rates of malnutrition, Bangladesh has been lauded for the considerable progress in reduction in undernutrition rates for at least two decades. The health system of Bangladesh is pluralistic in nature. There are 4 sectors defining the structure and functions of the system: government, private, donor agency and non-government sector. An adoption of integrated approach by these sectors led to an overall progress in the Health Population and Nutrition Sector Development Programme. This approach significantly reduced under-five and maternal mortality rates, total fertility and improved immunisation coverage despite poverty, socio-economic disparities and income inequality.

The period from birth to age 2 is very crucial for optimal growth, health and development. Thus, growth monitoring and frequent nutritional assessments support to identify growth faltering along with the trend analyses. Bangladesh has been suffering from poor nutritional status, which is one of the leading factors of health and welfare issues in this country. Various socio-economic and cultural factors sway feeding and nutritional status. During the past three years, Bangladesh has found cohesion to the infant and young child feeding practices. A total of 23% children between 6-23 months are appropriately fed based on IYCF guidelines. However according to BDHS (2014), 51% of neonates are exclusively breastfed during the first hour after birth; 89% of newborn babies were breastfed within one day after delivery; 55% of children under 6 months have been exclusively breastfed and almost 96% of children continue breastfeeding until one year of age (National Institute of Population Research and Training

(NIPORT), Mitra and Associates, 2016). Also, there has been considerable progress in the linear growth of the children under-five years. The stunting rates have declined considerably from 51% in 2004 to 36%in 2014. Also, in the past three years it has significantly reduced by 5% points. However, there has only been a 3% reduction in wasting rates from 2007 to 2014.

Due to demographic transition, the health sector is playing a pivotal role in delivering holistic approach with package of nutrition specific and sensitive services for the population through one of the largest delivery platform known as National Nutrition Services along with strengthening the linkages between nutrition relevant departments. Following the same, policies and policy strategy aims to focus on food security enforcing nutrition within comprehensive framework. Thus it led to development of robust food security policy framework (the National Food Policy 2006) and strategy document (the National Food Policy Plan of Action 2008-2015) along with investment plan developed for food nutrition and security (the Bangladesh Country Investment Plan 2011-2016). Also, Bangladesh introduced Common Results Framework (CRF) uniting food security and health stakeholders: National Strategy for Anemia Prevention and Control (2007), National Strategy for Infant and Young Child Feeding (2007), National Food Policy Plan of Action (2008-2015), National Neonatal Health Strategy and Guidelines for Bangladesh (2009), Country Investment Plan for Agriculture, Food security and Nutrition (2010-2015), National Health Policy (2011), National Food Safety Policy (2012), National Hygiene Promotion Strategy for Water Supply and Sanitation in Bangladesh (2012), Health, Population, Nutrition Sector Development Programme – HPNSDP (2011-2016), National Sixth Five Year Plan (2011-2015), 7th five year plan (2016-2020), and Vision 2021.

National Strategy on Prevention and Control of Micronutrient Deficiencies in Bangladesh (2015-2024).

No	Programme Name	WHA target	Interventions	Government health system
1	National Food Policy Plan of Action (2008-2015)	Stunting	1. Adequate and stable supply of safe and nutritious food 2. Increased purchasing power and access to food of the people 3. Adequate nutrition for all individuals, especially women and children	Food Planning and Monitoring Unit of Ministry of Food and Disaster Management
2	National Strategy for Anemia Prevention and Control (2007)	Anemia	1. Micronutrient supplementation 2. Dietary improvement 3. Parasitic disease control 4. Family planning and safe motherhood 5. Food fortification 6. Production of micronutrient rich foods through household food production, crop diversification, biotechnology, biofortification	The Ministry of Health and Family Welfare has overall responsibilities through the Directorate General of Health Services (DGHS), Directorate General of Family Planning (DGHS) and National Nutrition Programme (NNP)
3	National Strategy for Infant and Young Child Feeding (2007)	EBF	WHO recommended steps	Legislation, policy and standards, health system support, community based support

4	National Neonatal Health Strategy and Guidelines for Bangladesh (2009)	LBW, EBF, Anemia	1. Strengthen service delivery at all levels to improve newborn health, using evidence-based interventions 2.Build capacity of health service providers at all levels to deliver quality services to address the major contributors to neonatal death, including birth asphyxia, neonatal sepsis and low birth weight	DGHS, DGFP and NNP
5	Country investment plan for Agriculture, Food security and Nutrition (2010-2015)	Stunting, Anemia	Community based nutrition programme and services	The Ministry of Health and Family Welfare, the Ministry of Agriculture (in particular the DAE), the Ministry of Fisheries and Livestock and the Ministry of Food and Disaster Management
6	National Hygiene Promotion Strategy for Water Supply and Sanitation in Bangladesh (2012)	Not focusing directly on any WHA targets	Prevention of water and sanitation related diseases	MoLGRD & C (Local Government Division)

7	Health, Promotion, Nutrition Sector Development Program (2011-2016)	EBF, LBW, Stunting, Wasting, Anemia	1. Expanding the access and quality of MNCH services. 2. Strengthening of various family planning interventions to attain replacement level fertility. 3. Mainstreaming nutrition within the regular services of DGHS and DGFP.	The Ministry of Health and Family Welfare (MOHFW), Government of Bangladesh (GOB)
8	National Nutrition Policy (2015)	EBF, LBW, Stunting, Wasting, Anemia	1. Improve nutritional status of children, adolescent girls, pregnant women and lactating mothers 2. Strengthen nutrition specific and nutrition sensitive interventions 3. Strengthen multi-sectoral programmes and increase coordination among sectors to ensure improved nutrition	Ministry of Health and Family Welfare and Ministry of Local Government, Rural Development and Cooperatives

9	National Sixth Five Year Plan (2011-2015)	Stunting, Anemia, EBF	1. To ensure access and utilization of HPN services for every citizen of the country, particularly elderly, women, children, poor, disadvantaged and those living in difficult areas 2. Ensure adolescent and reproductive health care	Directorate General of Health Services (DGHS), the Directorate General of Family Planning (DGFP) and the Directorate of Nursing Services (DNS). Other Directorates like the Directorate General of Drug Administration (DGDA), Health Engineering Department (HED), National Institute of Preventive and Social Medicine (NIPSOM), Institute of Epidemiology, Disease Control and Research (IEDCR), Institute of Public Health and Nutrition (IPHN), Institute of Public Health (IPH), National Institute of Population Research and Training (NIPORT)
10	7th five year plan (2016-2020)	Stunting, Anemia, Undernutrition	1. To ensure adolescent and reproductive health care 2. To strengthen community support and involvement to obtain better results in implementation of programmes 3. To improve nutritional status of children and women.	MoHFW

11	National Strategy on Prevention and Control of Micronutrient Deficiencies (2015-2024)	EBF, Anemia	1. 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 2. 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 3.To improve knowledge, awareness and utilisation of micronutrient deficiency control interventions through advocacy, social mobilisation and behaviour change communication 4. To strengthen research and monitoring and evaluation of National Micronutrient Deficiency Prevention and Control programmes in the country	Directorate General of Health Services (DGHS) and Directorate General of Family Planning (DGFP).

INDIA

India has been lauded for the better economic growth during past years; yet, the country's nutrition scenario continues with high burden of undernutrition (Vir et al., 2014). According to a recent NFHS 2015-2016 survey, exclusive breastfeeding rates have increased considerably from 46.4% in 2005-06 to 54.9% in 2015-2016; approximately 10% decrease was observed in stunting rates and 6.8% in underweight. However, there was a rise in the wasting rates from 19.8% in 2005-06 to 35.7% in 2015-16 and there was a very slight decrease in anemia rates (IIPS, 2015). Despite the improvements, the stunting rates and other factors relating to malnutrition indicators remain high and they mask wide variation among the Indian states (Menon et al., 2017). Thus, India needs to focus on major public health problem i.e. wasting and anemia (IFPRI, 2017).

These developments occurred during the initiation of substantial change in the policy and programmatic revisions particularly the two national programmes- the Integrated Child Development Scheme (ICDS) and National Health Mission (NHM), which are operated under the Ministry of Women and Child Development and the Ministry of Health and Family Welfare (MoHFW). These are developed on evidence based interventions. The ICDS address 12 out of 14 interventions while NHM address 13 out of 14 interventions (Avula et al., 2013). The ICDS during one decade (2006 to 2016) has been through many developments in the health system as well as the mode of delivery of interventions. The NRHM currently recognised as NHM focused on facilitating healthcare to all the rural populations. In 2011, the MoHFW developed framework for tackling SAM children known as Facility-based Management of Children with Severe Acute Malnutrition and also released guidelines for promoting optimal infant and young child feeding (IYCF) practices. During 2014, the government felt need for continuum-of-care lifecycle based approach due to inadequate progress towards SDGs. Hence Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) was proposed aiming health care interventions for all. Between 2013-15, iron, deworming, oral rehydration solution (ORS) and calcium guidelines were launched. However, recently MoHFW launched "Mother's Absolute Affection" campaign in 2016 for the advocacy and promotion of exclusive breastfeeding (Menon et al., 2017). India has a broad national policy and programmatic environment, however, there is interstate variability in the outcome affecting the outcome. The salient features of India's last ten five year plans to tackle undernutrition and hunger have been mentioned in "Landscape of Policies and Programmes: Key finding from the review of evidence- IFPRI" (Vir et al., 2014). Thus, India has robust policy frameworks for addressing malnutrition issues. It acts as a key public health challenge in order to reduce the harmful impact of undernutrition (Vir et al., 2014).

No	Policy/Program Name	WHA target	Interventions
1	National Nutrition Policy (1993)	LBW, HFA, WHZ, WAZ, Anemia	It provides direct and indirect interventions to pregnant, lactating, adolescents and children
2	Policy on Infant and Young Child Feeding (2004, 2006)	EBF	Advocacy, planning for awareness generation
3	Guidelines for administration of zinc supplements (2007)	Directly not applicable to WHA	Zinc supplementation, at a dosage of 20 milligrams per day for children older than six months or 10 mg per day in those younger than six months, for 10–14 days
4	Operational Guidelines on Facility-based Management of Children with Severe Acute Malnutrition (2011)	WHZ	Planning and management of a health facility, particularly nutrition rehabilitation centers (NRCs), ten steps of management
5	Provision of Supplementary Nutrition to Women and Children under the ICDS Scheme	LBW, HFA, WHZ, WAZ	1. Children up to 6 years—300 kilocalories (kcal) and 8–10 g of protein (for the severely malnourished child, double the daily supplement provided to other children), and 2. Pregnant and nursing mothers and adolescent girls—500 kcal and 20–25 g of protein.
7	National Nutritional Anemia Prophylaxis Programme (1971, 1991, 2005-2006)	Anemia	The iron amount per tablet was increased from 60 mg of elemental iron to 100 mg. The content of folic acid was retained at 500 µg. Dosage for children 1 to 5 years is also defined: 20 mg of elemental iron and 100 µg of folic acid
8	National Plan of Action for children (2005)	LBW, HAZ, WAZ, WHZ, EBF	Promoting correct infant and child feeding practices, as well as universalizing access to ICDS centres

Interventions with evidence of positive effect: The results of included SRs are presented in the following table for the five WHA targets

No	Outcomes	Interventions
1	Stunting	1. Dietary diversity and complementary feeding
2	Anemia	1. Iron supplementation during pregnancy 2. Fortification of staple foods with iron 3. Vitamin A and Carotenoids supplementation
3	EBF	1. Peer group led breastfeeding programs 2. Community interventions for the promotion of EBF 3. Kangaroo mother care
4	LBW	1. Multiple micronutrients/ food fortifications 2. Vitamin D supplementation to pregnant women 3. Dietary diversity and supplementary feeding
5	Wasting	N/A

2 CONTEXTUALISATION RESULTS

Asia encompasses a diverse range of topography, culture, religion and associated food habits with different levels of economy, urbanisation and political commitment. This diversity imposes many challenges to tackle the problem of undernutrition in this region. Understanding the current nutrition situation together with potential causes of undernutrition in different country context is vital for country specific programmes to effectively address this problem.

STUNTING

The growth of the child from birth to five years of age remains similar across the world (Multicenter Growth Reference Study Group, 2006). However, South Asia has been undergoing chronic nutrition deprivation (UNICEF, WHO, WBG, 2016). Thus, the study conducted by Smith and Haddad (2016) observed three main factors majorly contributing for stunting outcome: less dietary diversity and poor diets in children less than one year of age, poor nutritional status of women in reproductive age group and poor sanitation and hygiene practices in households and communities. With this evidence and the present findings from evidence summary on “Effectiveness of nutrition interventions in LMICs”, it-indicates an urge to prioritise dietary diversity and complementary feeding interventions for reduction in the prevalence of stunting in South Asia. Food and agriculture based renders socioeconomic, cultural and environmental benefits but also support income generation and improved food accessibility (Nair et al., 2016). Therefore, a crucial part to promote dietary diversification could be enabling environment and sustainable agriculture together with behaviour change

communications (Nair et al., 2016). The largest proportion of stunting occurs during the complementary feeding period (6–23 months), the 500-day transition period from exclusive breastfeeding in the first 6 months of life, to consuming a wide range of family foods while breastfeeding continues. Therefore, adequate and appropriate infant and young child feeding practices including complementary feeding is critical to support optimal physical and neurobehavioural growth and development in children. Nutrient dense complementary foods coupled with appropriate feeding practices are inevitable to prevent stunting. Efforts to improve dietary diversity and appropriate complementary feeding programs are implemented in South Asian region to address various nutritional issues (Manikam et al, 2017).

South Asia: Out of 155 million stunted children worldwide, 87 million children reside in Asia (UNICEF/WHO/WORLD Bank Group-Joint Children Malnutrition Estimates, 2017); about two-third of the stunted children live in lower-middle income countries. Chronic malnutrition leads to billions of dollars in future revenue losses, as there will be detrimental effects on cognitive and physical developments. Study conducted by Grantham McGregor et al. (2007) observed stunted adults to earn 20% less than normal adults who were not stunted. It has been observed that fewer than 25% of the children between 6-23 months from South Asian countries including Afghanistan, Bangladesh, Nepal and Pakistan meet the minimum requirements of dietary diversity (United Nation's Children's Fund, UNICEF 2015). Evidence from SRs that evaluated the interventions using nutrient rich diverse home based foods and multiple micronutrient fortified complementary foods from LMICs showed increased energy density and/or nutrient bioavailability of foods used among these children (Kristjansson et al., 2015; Dewey et al., 2008). Thus, potentially scaling-up of such interventions may prove beneficial to reduce the stunting rates in LMICs where stunting remains as a public health challenge.

Bangladesh: The stunting rates have declined considerably in the last decade though there was no significant improvement of dietary diversity for more than a decade considering the fact of increase in per capital consumption expenditure (HKI and JPGSPH, 2014). Also, poor consumption of dairy, eggs, fruits and vegetables was noted in many Bangladeshi children. The study conducted by Helen Keller International (HKI, 2014) performed a 4 year long implementation of Enhanced Homestead Food Production (EHFP) with an aim to increase availability and intake of diverse nutrient rich foods in the community. The study showed significant improvements in the range of practices, which positively led to child growth with reduction the stunting rates (Haselow et al., 2016).

Recommendations: Promotion of affordable and effective complementary foods especially among food insecure population along with raising awareness and education of mothers on appropriate complementary feeding practices could be implemented in Bangladesh. Delivery modes of implementing the interventions require strengthening at organisational and community/family level. Addressing traditional food approach and local believes through behaviour change interventions that target the whole community than just parents can

improve dietary diversity and complementary feeding practices, thus, could potentially reduce the stunting rates.

India: The stunting rates in India have declined from 48% to 38% in more than a decade though not met the global target rates. More than half of the population are still not availing the benefits of nutrition interventions specifically implemented to address nutrition issues in India. This includes inability to attain minimum diet diversity, lack of operational guidelines and monitoring indicators for dietary diversity and complementary feeding practices.

Recommendations: Evidence from the LMICs to reduce the stunting rates can be implemented in India considering factors such as promotion of dietary diversity at policy level, training the front-line workers on how to deliver these interventions in order to achieve positive impact to raise awareness regarding appropriate complementary feeding practices. A holistic approach is required to tackle the issue of underlying determinants of stunting by revisiting programme designs and implementation gaps.

Despite there has been overwhelming evidence of the debilitating costs of stunting, minimal resources have been allocated to the reduction of stunting rates, and where there are resources provided they are not often focused on scaling up the most cost effective interventions (Shekar et al., 2016). The drivers for reducing stunting rates may vary in nature and intensity from country to country. Hence, it is essential to have an accurate understandings of the situation of the country to develop tailor made interventions and programmes that brings significant reduction in the stunting rates. Thus, it is essential for the government and non-government organisations to prioritise interventions along with strengthening of political commitments to nutrition across the region (Aguayo et al., 2016).

ANEMIA IN REPRODUCTIVE AGE WOMEN

Anemia is defined as a low red blood cell (number and size) and low concentration of haemoglobin in the blood, consequently inhibits the delivery of oxygen to the body's tissues. Anemia is caused due to various reasons, it is estimated that half of the cases is due to iron deficiency. The condition could affect anyone, but children and women of reproductive age are at highest risk for anemia in LMICs. Interventions to prevent and control anemia in pregnant women and women of reproductive age from the present evidence summary includes, distribution of iron-containing supplements/foods, wheat flour (alone or in combination with maize flour) fortified with iron and iron supplementation with or without folic acid and Vitamin A and carotenoids supplementation.

South Asia: South Asia has the highest prevalence of anemia globally along with central and West Africa (Stevens et al., 2013). However, while planning the action required to achieve 50% reduction of anemia in women of reproductive age, especially in South Asian countries it is crucial to adopt an integrated approach. The risk associated with maternal anemia not only includes- maternal and child mortality and morbidity but also risk of miscarriages, stillbirths, prematurity, and LBW (WHA, anemia policy brief).

Bangladesh: In the major part of Bangladesh, several national and international NGOs along with private and public sectors are providing Iron-Folate Supplementation (IFA) to pregnant and lactating women both in rural and urban areas. However, there is no specific national programme/intervention to reduce anemia prevalence in adolescent girls.

Recommendations: The result from the present evidence summary includes wheat and maize flour fortified with iron, which can be implemented in Bangladesh. Levels of iron and dosage should consider the fact that the majority of population are meat eaters and emphasis should be given to promote dietary diversity. Fortification of flour with iron can be beneficial for large-scale reduction in anemia especially in non-pregnant women. Vitamin A or beta carotene supplementation, which showed significant impact in the review conducted by Lyman et al (2012) in reducing the risk of maternal anemia, could be included to support Bangladeshi women as it has potential to improve maternal immunity and reduce anemia (Ronsmans et al., 2008). Additionally, ground water iron levels should be considered and probably smaller doses of iron might support in combating anaemia among reproductive age women. The interventions from the findings of LMICs can be contextualised in Bangladesh along with specific focus on factors like supply chain management, training of health care providers, advocacy, behaviour change communications and monitoring the compliance level.

India: The national programmes to address the issue of anemia in pregnant and non-pregnant women in India remain poor despite of organisational and community based delivery platforms.

Recommendations: IFA supplementation intervention is presently implemented in India but it is crucial to see whether women are compliant to the routine supplementation and dietary modifications. Vitamin A or beta-carotene can also be supplemented to pregnant women during antenatal check-ups. A few factors are required to be considered to implement interventions found effective from current findings these includes, addressing operational issues in implementing interventions, follow-up dietary counselling during IFA supplementation to pregnant and non-pregnant women, behaviour change programmes and training of community health workers could strengthen existing programmes. It is also important to concentrate on comprehensive approaches in dealing with anemia in terms of other underlying causes such as infections and infestations. Further, smaller doses of iron together with multiple micronutrients could be more effective in reducing the prevalence of anaemia, especially in women from low resource settings. Focused and targeted approaches are needed to reduce anemia prevalence in India.

EXCLUSIVE BREASTFEEDING (EBF)

South Asia: Child survival in one of the public health priority in the South Asian region. It has been proved by science and humans agree that breastfeeding has unparalleled immunological and nutritional benefits on the infants and young children. It has important implications for the health of mother and children. Peer led support, community based interventions and

Kangaroo mother care were found to show positive impact in improving breastfeeding rates in LMICs. There are various reasons behind low rates of exclusive breastfeeding in South Asian countries that includes, socio-cultural believes, inadequate support at the community and family level, lack of interpersonal counselling to mothers and inadequate provision of maternity leave.

Bangladesh: The country has made considerable progress in early initiation and exclusive breastfeeding practices. The multi-disciplinary sectors are working in designing and implementing large-scale multi-channel social and behaviour change and systems strengthening programmes that can improve breastfeeding practices. Along with existing interventions, findings from the evidence summary can be contextualised in Bangladesh, which could potentially improve rates of exclusive breastfeeding.

Recommendations: The factors that can be considered while implementing the evidence results includes, peer support in-terms of methods adopted (one-to-one/group, proactive/indirect, professional/lay supporters), visits scheduled and training; community based support in terms of home based peer counselling, education support and follow up; raising awareness above kangaroo mother care. The cultural context and uniformity of exclusive breastfeeding messages along with face to face support and those reflecting local needs of population could be looked upon while implementing peer support programme.

India: India has not achieved much rise in breastfeeding rates since the past 2-3 decades. The exclusively breastfed child translates to improved academic performance, increased long term earnings and productivity as well. The Lancet Report (2016) states India can add 4300 crores annually through improved IQ (Breastfeeding Lancet Series, 2016).

Recommendations: The programmes along with other existing efforts made by public and private sector in India in enhancing optimal breastfeeding practices have incorporated factors like training of community health workers in providing relevant information and counselling support to mothers for breastfeeding, monitoring and impact assessment. The promotion of improvement in exclusive breastfeeding rates could be strengthened by implementing findings from the evidence summary, which includes community based intervention via peer led face to face support with clear messages and Kangaroo mother care.

LOW BIRTH WEIGHT (LBW)

Birth weight is an important indicator of fetal and neonatal health. Low birth weight still remains a public health problem in low and middle-income countries. A continuous investment in strategies or interventions, which could improve women's nutrition status throughout life cycle, is the need of the hour. The present findings from evidence summary revealed that multiple micronutrient supplementation; Vitamin D supplementation and dietary interventions have reduced low birth weight rates in LMICs.

South Asia: According to UNICEF (2013) report, South Asia contributes to 52% global burden of LBW. The situation of the LBW outcome is possibly much worse due to inappropriate time and inaccurate weighing of newborn. Moreover, LBW do not estimate issues related to fetal growth restriction or intra growth restriction or poor maternal status (Vir et al., 2016). Thus, analysis conducted on the data from LMICs was associated 2.5 fold to 3.5 fold higher odds of stunting, wasting and underweight in children (Christian et al., 2013).

Bangladesh: Bangladesh has 20-22% low birth weight rate, one of the highest in the world (UNICEF, 2015). More than two out of five Bangladeshi women have experienced increased risk of delivering low birth weight babies. The country lacks national level data on incidence of low birth weight babies and has few programmes addressing low birth weight issue in the country.

Recommendations: Based on the current findings from the evidence summary- multiple micronutrient supplementation containing iron and folic acid and Vitamin D supplementation during the pregnancy can be implemented at policy and practice level. Few contextual factors which could be considered while supplementing multiple micronutrient and Vitamin D to the pregnant women could be uninterrupted supply of supplements, positive counselling of pregnant women along with counselling of adverse effects of supplements. Although being a tropical country, Bangladeshi women are Vitamin D deficient due to conservative dresses. Dietary intervention in terms of nutrition education with fortified food products could also be implemented in Bangladesh.

India: The country lacks specific programme or intervention at national level to tackle the issue of low birth weight babies. Considering the complexity of risk factors associated with low birth weight, it is quite essential to develop multi-sectoral nutrition programme to address the issue. A few interventions are already implemented at national and regional level in the country to improve maternal health and nutrition status, of which relevant to low birth weight includes- supplemental nutritional support during pregnancy and lactation, health and nutrition counselling and institutional childbirth.

Recommendations: The existing interventions could be strengthened to reduce the number of low birth weight babies by incorporating existing findings from the evidence summary which includes- multiple micronutrient and Vitamin D supplementation during pregnancy and dietary diversity in pregnant women.

3 DISCUSSION AND CONCLUSIONS

The present report focuses on contextualising the evidence generated from the evidence summary synthesis to LMICs with specific reference to South Asia, Bangladesh, and India. The evidence generated aims to support development and implementation of informed policies in these countries to achieve the WHA targets- reduction in stunting, wasting, LBW, anemia and improve EBF rates.

The process of contextualisation lacks clarity and there is a dearth for the literature pertaining to the process of contextualisation. There are multiple models discussed in various contexts to understand and interpret the barriers and facilitators of varied intervention programmes in the community. However, such models were less applicable to the contextualization process for the present evidence summary synthesis. These could be attributed to the following reasons. Firstly, the evidence summary was conducted from a collection of SRs that covered a wide range of interventions using different vehicles (food vs supplements), dosage, frequency of use, type of nutrients (single vs multiple) and at different contexts; secondly, the SRs provided less information on the contexts of these interventions and the potential context-specific barriers and facilitators that could be attributed to either the success or failure of these programmes/ interventions; thirdly, drawing inferences from SRs and included studies that are socio-economically and culturally different with wider disparities in geographical distribution, the access to nutrient rich foods, and food security, and to contextualise the evidence to one particular region may yield less benefits to the policy makers; fourthly, the interventions may work in some contexts while the same may not be effective in other contexts indicate that the evidence should be cautiously interpreted and used with interventions/ programmes tailored to specific communities or groups; and finally, there was a paucity of evidence for interventions that reduced wasting in children- an important WHA target.

The indicators that are used to assess the chronic malnutrition such as stunting - the WHA target-respond to interventions over a period of time and predominantly requires a combination of strategies, especially in low resource settings. Such SRs and primary studies that evaluated multipronged approaches in the same population were unavailable and hence, there is a need for further studies to understand the effectiveness of multiple interventions to reduce the prevalence of stunting in South Asian populations. Similarly, globally anemia among reproductive age women remains as public health challenge for more than four decades. Despite supplementing pregnant and lactating women with IFA, anemia remains unabated, which indicate a need for more effective strategies to address anemia other than due to iron deficiency. Although available evidence suggests the efficacy of iron supplementation in reducing anemia in LMICs, the reduction has been modest. Furthermore, more effective strategies are required for combating anemia (due to reasons other than iron deficiency) and the evidence to such strategies are unavailable at this point and thus, need to be generated.

Although the present report indicated a few recommendations, the context specific application needs emphasis. For example, iron supplementation dose for Bangladesh needs to be cautiously considered because the majority are meat eating population, the access to such nutrient-rich foods, the higher groundwater iron levels and deficiencies of other micronutrients such as vitamin A may be less prevalent than other South Asian countries. Further studies are needed to estimate the iron supplementation dosages in such contexts to develop evidence-based informed implementation of policies and programmes. Alternately, dietary diversification strategies and food-based dietary strategies may be a safer and sustainable practice to reduce the prevalence of anemia.

Conclusion:

The present evidence summary suggests the potential evidence to reduce the prevalence of stunting, anemia, LBW and improving EBF rates. Results showed that dietary diversification and appropriate infant and young child feeding practices could reduce stunting in LMICs. Secondly, anemia in reproductive age women could be reduced through iron with or without folic acid supplementation, iron fortified foods, and supplementation of vitamin A in deficient populations. Thirdly, LBW rate reduced with Vitamin D supplementation, multiple micronutrient supplementation and through improving dietary diversity and nutrition counselling. Fourthly, EBF rates could be improved through peer led, community-based interventions, and Kangaroo mother care practices. Finally, the evidence to reduce the prevalence of wasting was mixed and needs further studies develop recommendations.

4 REFERENCES

Akhtar, S. (2015) 'Malnutrition in South Asia - A Critical Reappraisal', *Critical reviews in food science and nutrition*, 8398(October), p. 0. doi: 10.1080/10408398.2013.832143 [doi].

Avula, R., S. Kadiyala, K. Singh, and P. Menon. 2013. A Review of Evidence-Based Interventions in Indian Nutrition Programs. Poshan. No:2, New Delhi: International Food Policy Research Institute.

Bhutta, Z. A. *et al.* (2013) 'Maternal and Child Nutrition 2 Evidence-based interventions for improvement of maternal and child nutrition : what can be done and at what cost ?', 382. doi: 10.1016/S0140-6736(13)60996-4.

Bhutta, Z.A., et al. (2013). . Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *The Lancet Maternal and Child Health Series* 382 (9890), 452-477.

Black, R. E. *et al.* (2013) 'Maternal and child undernutrition and overweight in low-income and middle-income countries', *The Lancet*, 382(9890), pp. 427–451. doi: 10.1016/S0140-6736(13)60937-X.

Bocquenet, G. *et al.* (2016) *The State of the World's Children 2016: A fair chance for every child*, *United Nations Children's Fund*. doi: 10.18356/4fb40cfa-en.

Buttriss, J. and Riley, H. (2013) 'Sustainable diets: Harnessing the nutrition agenda', *Food Chemistry*. Elsevier Ltd, 140(3), pp. 402–407. doi: 10.1016/j.foodchem.2013.01.083.

Global Nutrition Targets 2025, Anaemia policy brief, 2014 pg-2. Available at http://www.who.int/nutrition/publications/globaltargets2025_policybrief_anaemia/en/

Helen Keller International (HKI), James P Grant School of Public Health (JPGSPH), 2014. State of food security and nutrition in Bangladesh: 2013. Dhaka, BD:HKI and JPGSPH

IFPRI (2017) *Global Food policy report 2017*. doi: 10.2499/9780896292529.

IIPS (2015) *National Family Health Survey - 4 - 2015-16: India Fact Sheet*.

Manikam, L., Robinson, A., Kuah, J.Y. et al. (2017). A systematic review of complementary feeding practices in South Asian infants and young children: the Bangladesh perspective. BMC Nutr 3: 56. https://doi.org/10.1186/s40795-017-0176-9

Menon, P. (2012) 'Childhood undernutrition in South Asia: Perspectives from the field of nutrition', *CESifo Economic Studies*, 58(2), pp. 274–295. doi: 10.1093/cesifo/ifs015.

Menon, P. *et al.* (2017) 'Trends in Nutrition Outcomes, Determinants , and Report', (10).

Nair, M. K., Augustine, L. F. and Konapur, A. (2016) 'Food-Based Interventions to Modify Diet Quality and Diversity to Address Multiple Micronutrient Deficiency', Frontiers in Public Health. Frontiers, 3, p. 277. doi: 10.3389/fpubh.2015.00277.

Ruel, M. T. and Alderman, H. (2013) 'Nutrition-sensitive interventions and programmes: How can they help to accelerate progress in improving maternal and child nutrition?', *The Lancet*.

Elsevier Ltd, 382(9891), pp. 536–551. doi: 10.1016/S0140-6736(13)60843-0.

Sharma, I. K. and Byrne, A. (2016) 'Early initiation of breastfeeding: a systematic literature review of factors and barriers in South Asia', *International Breastfeeding Journal*. International Breastfeeding Journal, 11(1), p. 17. doi: 10.1186/s13006-016-0076-7.

Shekar, M. *et al.* (2016) *An Investment Framework for Nutrition*. doi: 10.1596/25292.

Shekar, M., Dayton Eberwein, J. and Kakietek, J. (2016) 'The costs of stunting in South Asia and the benefits of public investments in nutrition', *Maternal and Child Nutrition*, 12, pp. 186–195. doi: 10.1111/mcn.12281.

Ronsmans, C., Collins, S., & Filippi, V. (2008). Maternal mortality. In: Semba, R., Bloem, M., eds. *Nutrition and Health in Developing Countries*. The Humana Press. Totowa, NJ.

Stevens G, Finucane M, De-Regil L, Paciorek C, Flaxman S, Branca F et al.; Nutrition Impact Model Study Group (Anaemia). Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. Lancet Glob Health. 2013;1:e16-e25. doi:10.1016/S2214-109X(13)70001-9.

Vir, S. *et al.* (2014) 'National policies and strategic plans to tackle undernutrition in India: A review', (2), p. 84. Available at: http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/128808/filename/129019.pdf.

ABBREVIATIONS

BDHS- Bangladesh Demographic and Health Survey
CRF- Common Results Framework
DAE- Department of Agricultural Extension
DDA- Directorate General of Drug Administration
DGFP- Directorate General of Family Planning
DGHS- Directorate General of Health Services
DNS- Directorate of Nursing Services
EBF- Exclusive Breastfeeding
EHFP- Enhanced Homestead Food Production
GDP- Gross Domestic Product
GOB- Government of Bangladesh
HED- Health Engineering Department
HFA- Height for Age Z score
HPNSDP- Health, Population, Nutrition Sector Development Program
ICDS- Integrated Child Development Scheme
IEDCR- Institute of Epidemiology, Disease Control and Research
IFA- Iron-Folic acid
IPH- Institute of Public Health
IPHN- Institute of Public Health and Nutrition
IYCF- Infant and Young Child Feeding
LBW- Low Birth Weight
LMIC- Low and Middle Income Countries
MNCH- Maternal, Newborn and Child Health
MOHFW- Ministry of Health and Family welfare
NFHS- National Family Health Survey
NGO- Non-Governmental Organisations
NHM- National Health Mission
NIPORT - National Institute of Population Research and Training
NIPSOM- National Institute of Preventive and Social Medicine
NNP- National Nutrition Programme
ORS- Oral Rehydration Solution
RMNCH+A- Reproductive, Maternal, Newborn, Child and Adolescent Health

SR- Systematic Review

UNICEF- United Nations Children's Emergency Fund

WAZ- Weight for Age Z score

WHA- World Health Assembly

WHO- World Health Organization

WHZ- Weight for Height Z score