Strategy to Conduct Operational and Implementation Research for Second National Plan of Action for Nutrition (NPAN2)

Bangladesh National Nutrition Council (BNNC)
SUN Academia and Research Network (SARN)

Preface

Bangladesh with its current steady improvement in nutrition is likely to achieve many of its NPAN2 targets by 2025. However, it may fall short towards achieving Sustainable Development Goals (SDG) targets set for nutrition by 2030. There are a few unknown areas in nutrition programming in country, which, if had been known, could show a definite accelerated path towards better nutrition to achieve SDG targets on time. Thus to systematically explore unknown problem areas of nutrition and to undertake recommended research, and consequentially use those results in nutrition programing would be a best-suggested way for Bangladesh to meet its SDG targets for nutrition.

The development of this strategy on operation and implementation research was approved by the Standing Technical Committee (STC) of Bangladesh National Nutrition Council (BNNC) on 30 September 2019. In the current practice of nutrition research, BNNC found opportunities for better coordination and management. Although, there are several institutions, organizations, NGOs responsible for managing and undertaking nutrition research in Bangladesh, these are done on an ad hoc basis, primarily to meet a specific need for a particular theme to fulfill the requirement of respective organization. Hence, they are not well coordinated, and in most cases the results are not shared and remain widely unutilized.

In this context, to address the current uncoordinated approach of managing research and to avoid duplications of research, the BNNC and SUN Academia and Research Network (SARN) jointly found it appropriate to develop a strategy for operational and implementation research under NPAN2. The strategy has outlined the role of BNNC in overall management and how to make the best use of those research results, suggested monitoring of progress, proposed preparing national repository of research, and most importantly, put forward suggestions of coordination of different bodies engaged in research and finally budget management and resource mobilization plan.

In the process of developing this strategy, existing research policies and strategies of different organizations were reviewed by a research team hired by BNNC. A systematic literature review, key informant interviews, peer review of key findings, and expert consultations were all undertaken in the process. In addition to hiring of the research team, BNNC formed a Technical Core Committee of Research Strategy. The technical group oversaw the study, organized the consensus building and validation of workshop findings, and thereafter developed and finalized the strategy.

Research topics identified by the research team were prioritized and validated in a consensus building workshop with participants from research organizations, academic institutions, universities, NGOs, donors and experts in program implementation. Categorization of the research was done based on the specific thematic areas and timeline. Furthermore, learning from the devastating experiences of COVID-19, the Technical Group for Research Strategy included research on humanitarian emergency that may similarly affect the country in future, as a priority research area.

I extend my sincere thanks to the members of the Technical Core Committee of Research Strategy and partners for their generous technical and financial supports for undertaking this endeavour

I believe, this strategy on operational and implementation research will help us move forward towards an evidence-based pathway to follow for better nutrition programming. This will help us to accelerate our progress to achieve the NPAN2 and SDG nutrition targets on time.

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Contents

List of acronyms

BARD	Bangladesh Academy of Rural Development
BARC	Bangladesh Agricultural Research Council
BAU	Bangladesh Agricultural University
BARC	Bangladesh Agricultural Research Council
BIRDEM	Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders
BIRTAN	Bangladesh Institute of Research and Training on Applied Nutrition
BMRC	Bangladesh Medical Research Council
BNNC	Bangladesh National Nutrition Council
BRRI	Bangladesh Rice Research Institute
CSA for SUN	Civil Society Alliance for Scaling Up Nutrition
HSTU	Hajee Mohammad Danesh Science & Technology University
IFST	Institute of Food Science and Technology
INFS	Institute of Nutrition and Food Science
IYCF	Infant and Young Child Feeding
JUST	Jashore University of Science and Technology
KII	Key Informant Interviews
MAM	Moderate Acute Malnutrition
MBSTU	Mawlana Bhashani Science and Technology University
MNP	Multiple-micronutrient Powder
MoHFW	Ministry of Health and Family Welfare
NCD	Non-communicable Disease
NIPSOM	National Institute of Preventive & Social Medicine
NPAN	National Plan of Action for Nutrition
NSTU	Noakhali Science and Technology University
NSU	North South University
PHC	Primary Health Care
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SAM	Sever Acute Malnutrition
SUN	Scaling Up Nutrition
SARN	Scaling Up Nutrition Academia and Research Network
STC	Standing Technical Committee

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Introduction

World Health Organization (WHO) defines Operational Research (OR) as "the use of systematic research techniques for program decision-making to achieve a specific outcome. OR provide policymakers and managers with evidence that they can use to improve program operations.[1]"

Characteristics of operational research that distinguish it from other kinds of research:

- It addresses specific problems within specific programs, not general health and nutrition issues;
- It addresses those problems that are under control of managers, such as program systems, training, pricing and provision of information;
- It utilizes systematic data collection procedures, both qualitative and quantitative, to accumulate evidence supporting decision-making;
- It requires collaboration between managers and researchers in identification of the research problem, development of the study design, implementation of the study and analysis and interpretation of results; and
- It succeeds only if the study results are used to make program decisions; publication alone is not a valid indicator of successful OR."

In Bangladesh, Operational Research (OR) and Implementation Research (IR) are designed to test alternative intervention modalities for those indicators and areas of nutrition that are not progressing well and answer key operational questions of utmost needs as they might arise in course of NPAN2 implementation. BNNC, the lead nutrition apex body in the country in collaboration with SUN Accademia and Research Network (SARN), research agencies, civil society organizations and academic institutions under various ministries and universities will lead nutrition related operational research as part of its mandate for smooth implementation of NPAN2. Accordingly, BNNC in collaboration with key stakeholders in research will set out guidelines, procedures and tools to identify, manage and operate related operational research of importance in Bangladesh.

Developing a research strategy had been one of the three priority commitments for Bangladesh in SUN Joint Assessment for 2019-2020. Accordingly, developing this strategy is the joint outcome of efforts put in by SARN and BNNC. In the process, Standing Technical Committee (STC) of BNNC provided the approval to complete this essential task on 30 September 2019. Therefore, the research team in the whole process went on to prioritize the recommended research for implementation on a priority basis, and also identified implementing partners, managing entity and potential donors to pursue the implementation of the recommended research.

[1]https://www.who.int/alliance-hpsr/alliancehpsr_irpguide.pdf

1.1 Review of existing research policies and strategies of different organizations

Research team through systematic review of literature, interviews, review of key findings, and expert consultations, identified gaps on key nutrition sensitive and nutrition specific topics and proposed a few ORs/IRs for considerations (Annex 1).

Key research gap identified by two background studies

Effective implementation of different nutrition specific and sensitive nutrition interventions envisaged in the National Nutrition Policy 2015 and the second National Plan of Action for Nutrition (NPAN2) is the job of BNNC. BNNC does this through strengthening of nutrition governance, policy coordination, and leadership and thereby helps facilitate the task. Therefore, to answer key operational questions that might arise in course of NPAN2 (2016-2025) implementation, BNNC needs to conduct operational and implementation research, which is deemed to test alternative intervention modalities of nutrition programs whose progress had been either stalled and very sluggish. In NPAN2, it has also been recognized that there is a need to establish a common nutrition research agenda to identify several areas for operational and implementation research. Consequently, BNNC, jointly with SUN Academia and Research Network (SARN) in Bangladesh with assistance from research agencies, civil society organizations, and academic institutions under various ministries and universities in keeping with NPAN2 objectives and priorities developed this research strategy.

During the process of developing the strategy, a comprehensive review was conducted in two phases to identify nutrition research gaps and needs. During the first phase, eight recommended topics of NPAN2 were selected to identify the potential research gaps. This review was conducted using a systematic review process and interviewing relevant experts with the support from the Civil Society Alliance for Scaling Up Nutrition, Bangladesh (CSA for SUN, BD). However, when experts revealed that in the first phased analysis, a few critical topics which could be relevant to NPAN2 implementation were not included, the second phase review included eight additional topics on behalf of SUN academia and BNNC. The process used similar methods as was used in the first phased review. All of these research gaps analysis were conducted by a team of consultants, albeit, as mentioned in two subsequent phases.

Below are list of eight topics in the first phased program and research gap analysis:

1. Fortification of salt with iodine
2. Home fortification of multiple-micronutrient powder (MNP) among under-5 years of age children in Bangladesh
3. Nutrition-sensitive interventions water, sanitation and hygiene in Bangladesh
4. Zinc bio-fortified rice in Bangladesh
5. Vitamin A fortification in edible oil in Bangladesh
6. Nutrition-sensitive agriculture programs
7. Climate-smart agriculture in Bangladesh
8. Integrating nutrition in social protection/safety-net programs in Bangladesh

Below are the list of additional eight topics in second phased program and research gap analysis:

1. Infant and Young Child Feeding (IYCF)
2. Management of severe and/or acute malnutrition among children
3. Anaemia among pregnant women and lactating mothers
4. Low birth weight and weight gain during pregnancy
5. Non-communicable diseases and obesity
6. High salt, sugar, saturated fats and trans-fats in processed foods
7. Adolescent nutrition
8. Food quality and safety

N:B: The detailed methods and result of the reviews are described in Annex-1

The topics were shared at an expert consultation held on 04 March, 2020 workshop where the participants identified research based on priority of implementation of those areas that need to be implemented immediately, and those which could be implemented later (See table 1).

1.2 Objectives of the research strategy

i. To identify the priority nutrition specific and sensitive research from different sectors related to nutrition according to categorization of urgency and importance of their results and recommendations to help achieve the World Health Assembly (WHA) and Sustainable Development Goal (SDG) nutrition targets by 2025 and 2030 respectively.

ii. To conduct policy advocacy with organizations financing/implementing research so that they support/ conduct research in the prioritized areas.

iii. To carry out a mapping exercise of all nutrition related operational research and implementation research to avoid duplication and to identify the challenges in preparing mapping report using national database.

iv. To develop a research warehouse for database for nutrition research that will be set up and housed within BNNC as the country's apex body for nutrition.

v. To ensure that nutritional impact is measured in all social protection and inter-sectoral programs.

vi. To develop a guideline to support University and Research Institute based researchers with grants to undertake nutrition research of national priority through the engagement of graduate students, support of Masters' Thesis, etc.

1.3 Methodology

The methodology depicted in the figure 1 was followed to develop the strategy;

- Review of existing research policies and strategies on specific and sensitive nutrition programs of different organizations. Lists and categories of the available nutrition research were collected from different organizations, institutions, universities, NGOs and individual researchers in Bangladesh over the past 10 years. (Annex 1-Research Gap report).
- Several brainstorming sessions with small group of technical and program people from various sectors were organized. Research team also consulted individual researchers from various sectors to get their deeper insights, perspectives and technical intuition.

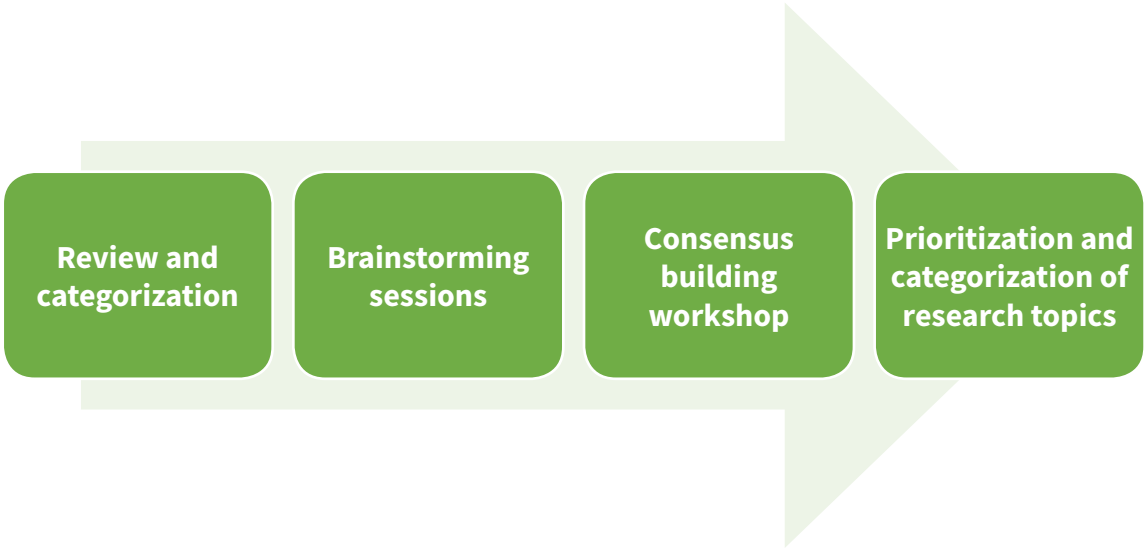

Figure 1: Methodology of the review of existing research policies and strategies

- A consensus building workshop and periotization of research topics was organized with participants from research organizations, academic institutions, universities, NGOs, donors and experts in program implementation.
- Finally, prioritization of research needs, and topics were done during the workshop. The study team developed a list of research gaps through extensive literature reviews, Key Informant Interviews and brain storming. The list accompanied by labels, definitions, and functions are described. Using an iterative expert consensus procedure, participating experts (N=55) put their valuable judgement on each gap on the preliminary list for redundancy, essentiality and uniqueness. They then assigned a score for each of those list items based on consensus group judgments. Finally, the prioritized list were organized under three categories, based on the urgency and importance of need of the research results that would help

Categories of topics according to their priority:

- Immediate: spanned between period 2020 to 2022
- Intermediate: spanned between 2022 to 2025
- Long-term: beyond 2025.

smooth implementation of programs for intended outcome. The three categories were: intermediate (2020-2022), medium (2020-2025) and long-term needs (beyond 2025 until 2030). Later on, medium and long-term needs were merged into one category. The categorization is included in the Table1.

1.4 Broad research topic question

Question name of the research in both main categories including immediate one (1) and intermediate and long term (2) one was kept quite wide open. The idea behind keeping the wide naming of research topic was to accommodate multiple elements like population group, intervention or exposure, comparison and outcome together which when required will be customized in a very specific scientific manner in the research question. Name was kept wide and open, also to allow specific time point for the research, for comparison modality, and for allowing method and settings when exact research will be processed and approved.

1.5 Categorization of the research thematic areas

Categorization of the workshop findings were done based on few thematic areas. These include Infant and Young Child Feeding (IYCF), Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM), Water and Sanitation, Urban, Agriculture, Climate Change and Agriculture, Social Safety Net, Micronutrients, Efficacy of Social and Social Behavior Change Communication (SBCC) intervention, Program Coverage, Adolescent, Food Safety, Non Communicable Disease (NCD), and Humanitarian Emergencies including COVID 19.

1.6 Inclusion of research agenda in humanitarian emergency

Looking at the all-around devastating consequences of the COVID-19 pandemic in the recent time, the technical small group put in deep thought on future epidemics and pandemics of serious magnitude which can affect health and nutrition of population to a large extent. Thereafter, an agenda of inclusion of research on humanitarian emergency, particularly which can directly or indirectly affect nutrition such as COVID-19 was put in. Purpose of this kind of research will be to offer timely support to health system, protect food security in order to prevent malnutrition, and thereby protect the hard-earned gains country achieved overtime in the last few decades. For instance, assessment of determining the impact of COVID-19 on nutrition, projection of the possible malnutrition burden during and post COVID-19 in Bangladesh was urgently done to support briefing of the policy makers on increase of rapid malnutrition in the country due to COVID-19. In addition, developing an integrating surveillance system which will generate valuable and reliable data to show a trend over time to take possible actions and required policies. Other possible question of interest for research will be to explore niche of relevant nutrition research pertaining to readiness of managing malnutrition in the country, or policy issue/s that can unfold improv nutrition.

1.7 Management of operational and implementation research

All organizations who excel in carrying out operational and implementation nutrition research will liaise with BNNC during the entire processes of conducting research, including sharing of research topics,

methods, research results and recommendations along with the final report of research. If required, data sets generated out of the research will also be shared under discretion of BNNC with organizations for separate analysis to gain different perspectives of results of research. This will avoid duplication of research efforts and consequently, facilitate the identification of key outstanding operational and implementation research areas in Bangladesh.

BNNC will undertake the following two approaches for operational and implementation research.

i. BNNC will advocate and pursue with relevant organizations, to undertake and manage some of the recommended priority research so that the organizations by themselves with their own resources undertake research, share conducted research results for wide and appropriate use.

ii. BNNC will commission research by themselves including development of Terms of Reference (ToR), prepare the Request for Proposal (RFP), peer review, award contract, review results, etc., share findings with partners and advocate for wider use as deemed necessary to achieve NPAN2 objectives.

Management of research projects will entail activities and processes starting from the reviews of organizations who are competent enough for conducting research. This could be done either by mediation through coordination with agencies conducting and supporting research projects such as Bangladesh Agricultural Research Council, Bangladesh Medical Research Council or by BNCC. Following up with proposals from the participating organizations will be done by the managing organization- BNNC. Part of the RFP- a set of assessment and evaluation tools for research proposals will be developed, based on which organizations or individuals will be shortlisted to take part in the research and finally awarded the contract.

BNNC being the managing organization will set up a national technical committee to assess and evaluate the research proposals submitted by different organizations and individuals. This committee will recommend best performing and successful agency and/or individuals to conduct the specified research project. Activities during the project period will be monitored and managed by BNNC. To carry out the research, there will be several steps and processes including initiation of selection of topics for the research and to identification of either the most eligible institution/s or capable individual.

Results of findings of the research will be used to inform and persuade policy makers to either update or undertake appropriate research to answer question/s that can help improve the current policies or programs. Recommendations out of the results of the research will be used for policy discussions to revise or change.

1.8 Monitoring of progress

Monitoring of the research will be one of the core activities of BNNC. This will aim to maintain a quality research project throughout its project cycle by offering support through standard operating procedures, holding central level bilateral meetings, making field visits and obtaining regular progress report from the research organizations. During the course of monitoring (either through holding central level meeting or through field visits) a checklist on detailed necessary elements of data quality, skilled human resources, financial resources will be cross checked for their intended quality. Field visit will ensure if standard

operating procedures are being followed. To enable quality monitoring, checklist on data quality, financial disbursement, ethical considerations including informed consent, conflict of interest in relation to procurement and supplies will be developed. Checklist will also incorporate gender equality in participation and workload for the project. A timeline and implementation schedule of the research will be prepared to monitor the progress.

1.9 Preparing national repository of research

Nutrition research that is being conducted in several health, nutrition and agricultural organizations in Bangladesh are not indexed, but need to be included in a database like "Banglajol". It will be indexed to ensure utilization of their findings and to avoid potential duplication of similar research. A database of research conducted in the country and global research will be created to compare where the current research is contributing to. This will also allow to inform how the current area of research has evolved to contribute to the domain of nutrition.

With the help of partners, BNNC will create a web-based repository for all nutrition research in Bangladesh. This would be an online database containing information related to nutrition research and programmatic evidence gathered in Bangladesh. The repository will be multi-sectoral in nature. Projects/ research related to nutrition-specific as well as nutrition-sensitive activities will be included in the repository.

1.10 Coordination between BNNC, SUN Academia and Research Network (SARN), research organization of other ministries, universities and academic institutions.

BNNC and SARN have been working jointly to take the nutrition agenda in Bangladesh forward in a more systematic and coordinated manner. BNNC has been providing the secretarial support to the SARN when required and they jointly have developed the research strategy. Both BNNC and SARN have more common mandates of Scaling Up Nutrition by engaging the partners and platforms. BNNC is an important part of SARN, likewise some of the SARN members are also member of various BNNC operational platforms. Their joint work has provided opportunity for both SARN and BNNC to create a strong synergy. For example, a review of nutrition research in Bangladesh has been performed under their joint leadership. SARN meetings have now become regular event under their joint efforts. Their collaboration in getting research organizations of other relevant ministries, universities and academic institutions is yielding positive benefits which is acknowledged by all partners. Current collaboration between the two will sustain and continue in the future. Both shall involve themselves in the entire process of and between managing, engaging in newer activities and monitoring nutrition research in Bangladesh. Universities and research organizations are members of the technical committee for monitoring evaluation and research, offering their expert inputs to make it more significant and scientific.

When research projects will be with specific ministries, BNNC will link them with its technical expertise along with their ministries and departments to improve better coordination and implementation of research. BNNC will also reach out to all possible research departments of relevant ministries, research organizations, universities and academic institutions and form a 'nutrition research consortium'. The aim will be to improve coordination and collaboration, improve advocacy & mobilization of resources, and

track utilization/application of the research results. This may also be done without creating another forum, instead, by extending the membership of the SARN and BNNC's M&E and Research platform by making them more inclusive.

1.11 Budget and resource mobilization

Two kinds of funds as follows, can be available for the research projects:

a. Funds from the government source or pooled fund, research grants to conduct research.
b. Research organizations, universities who will have their own funding sources from home and abroad.

It will be appropriate to develop a common monitoring system for both the funding sources. For the external funding source, the field visits will be conducted jointly. Regular central level meeting during project cycle and other procedures of monitoring will be determined through mutual discussions.

Additional funding will be required to conduct operational research as recommended under this strategy. A costing exercise will be undertaken to come up with the total budget requirements for undertaking these research for the period between 2020-2025. Accordingly, a resource mobilization strategy for research under NPAN2 will be developed.

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
1	IYCF	Conduct study to identify most effective and innovative ways to implement large-scale IYCF programs including private sector (e.g. RMG) to recommend for policy decision	Specific	Management/ scaling up Operation Research	NI, INV, BRAC, UNICEF, NNS, NI, BNNC, MOWCA, MOLU, MOHPW, BIRTAN, NFS, NIPORT, BBF, IPHN, BBS, CARE BD, NIPSOM, ICDDR,B
2	IYCF	Research to identify if incentives like paid maternity leave for working women, availability of day care at workplace (particularly at private sectors) have better outcome for IYCF	Sensitive	Operation Research	NNS, NI, BNNC, MOWCA, MOLU, MOHPW, BIRTAN, NFS, NIPORT, BBF, IPHN, BBS, CARE BD, NIPSOM
2	SAM and MAM	Conduct research to recommend most effective outpatient-based management of SAM and MAM, finding barriers of coordination gaps in managing SAM/MAM and find and recommend low cost, locally available ready to use food to treat SAM cases	Specific	Management of SAM/MAM	NNS, ICDDRB, INFS, MOHFW, IPHN, CONCERN, UNICEF, WFP, NIPSOM
2	Water Sanitation and Hygiene	Conduct research to find out most effective alternative ways among different approaches that motivates people to practice the best hygiene practices at scale	Sensitive	Operation Research	Water Aid, WFP, UNICEF (LGED)
1	Urban	Carry out research to find ways to improve sanitation facilities and supply of safe water in slum areas.	Sensitive	Operation Research	LGRD, City corporation

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
1	Water Sanitation and Hygiene	Conduct research to understand environmental enteropathy or environmental enteric dysfunction[2] what problems those are causing	Sensitive	Operation Research	LGRD, City corporation
2	Micronutrient	Conduct research to identify the extent to which groundwater iron is contributing to fulfil the iron requirement among Bangladeshi population (and its implication for IFA supplementation and fortification programs)	Specific	Operation Research	DNCC, DSCC, BUET, NI, Alive & Thrive, ICDDRB
2	Agriculture	Research on women empowerment & food security on agriculture sector	Sensitive	Nutrition sensitive agriculture intervention	MoA, MoFood, MoWCA
1	Agriculture	Review and list out zinc bio-fortified rice varieties that are also high yielding and climate adopted	Sensitive	Zinc bio-fortified rice production research	ICDDRB, BIRTAN, BINA, BARI, BAU, BARRI,
1	Agriculture	Review and prepare a list of crops including rice with high zinc content and low phytate content	Sensitive	Operation Research	MOA, BARC, IRRI, BRRI, ICDDRB, BIRTAN, BINA, BARI, BAU, BARRI, BAV

[2]It is a disorder of chronic intestinal inflammation.EE is most common amongst children living in low-resource settings. EE can lead to malnutrition, anemia, growth stunting, impaired brain development (Ref: Tickell, K. D., Atlas, H. E., & Walson, J. L. (2019). Environmental enteric dysfunction: a review of potential mechanisms, consequences and management strategies. BMC medicine, 17(1), 1-9.).

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
1	Agriculture	Review and develop list of breed rice varieties which contains different essential micronutrients such as zinc, iron and vitamin A in increased amount	Sensitive	Operation Research	ICDDRB, BIRTAN, BINA, BARI, BAU, BARRI, BAV, MoA, BARC, INFS, BRRI
1	Agriculture	Conduct research to recommend better rice varieties with higher micronutrient content and with high fiber content, low glycemic index/ load	Sensitive	Operation Research	ICDDRB, BIRTAN, BINA, BARI, BAU, BARRI, BAV, BRRI, FAO, Harvest Plus
1	Agriculture	Review and research how to expand programs to hard-to-reach areas through innovative technologies like promotion of floating garden in waterlogged areas and rooftop garden in urban areas.	Sensitive	Operation Research for Program expansion in hard-to-reach area	BIRTAN, MOF, BCSIR, World Fish, BARC, MOFL, BAV, BFRI
1	Climate Change and Agriculture	Undertake review to recommend most suitable technologies for Bangladesh in different agro-ecological zones and studying its effect on nutrition and livelihood	Sensitive	Climate adapted agriculture research	MOEF, BARC, BARI, BAU, BRAC, MOA, BARRI, DOF, Water Aid
2	Climate Change and Agriculture	Conduct research to develop varieties resistant to adverse climatic conditions (more heat, salt, submergences, drought tolerant)	Sensitive	Climate adapted agriculture research	BARC, BARI, BAU, BRAC, MOA, University (BAD, DU), BARRI. FAO
1	Social Safety Net	Review of social safety net programs and policies in Bangladesh with aim to enhance nutrition and gender sensitivity	Sensitive	Review	BNNC, Cabinet Division, MoDMR, MOWCA, MoFood, MOA, MOPME, WFP, NI, FCDO, IFPRI, UNICEF, FAO

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
1	Social Safety Net	Integration of nutrition and quality BCC activities in priority SSNPs	Sensitive	Implementation Research	BNNC, Cabinet Division, MoDMR, MOWCA, MoFood, MOA, MOPME, WFP, NI, FCDO, IFPRI, UNICEF, FAO
1	Social Safety Net	Carry out research to find better approaches about how to integrate nutrition messaging of current pilot projects into safety net programs on large scale and recommend better approached SSN programs that return better nutrition outcome.	Sensitive	Operation Research	WFP, MOCWA, MOFood, WB, EU, MOHFW, BNNC, MOSW, FPMU, IFPRI, BARD, MOH&FW
1	Social Safety Net	Find ways and recommend the most feasible approach that when foods are distributed through SSN provide better nutrition outcome	Sensitive	Operation Research Integration of nutrition in social safety net programs	WFP, MoE, School Health Program, WFP, NI, MOWCA, FAO, MODMR, MOSW, FPMU, IFPRI, BARD
2	Micronutrients	Conduct research to develop (and supplying to monitoring agencies) low -cost quantitative salt test kits to estimate the level (concentration) of iodine in salt	Specific	Operation Research	MoI with GAIN, NI, UNICEF, BSCIC, IFST (BCSIR), INFS, BLRI
2	Micronutrients	Conduct national survey to identify level of iodine in population in salt to recommend the optimum level of intake	Specific	Survey to infer level of iodine in population	NNS, NI, ICDDR, B Ministry of Industry (BSIC)
1	Micronutrients	Research to identify if additional micronutrients provide additional benefits (like lower prevalence of low birth weight) than fewer micronutrients	Specific	Clinical Research	MOHFW, NIPSOM, NI, ICDDRB, INFS, BAU, NNS, MICS

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
1	Micronutrients	Review, list and prioritize bioavailability of Zinc- research study (to help conclude evidence synthesis)	Sensitive	Operation Research	INFS, ICDDRB
1	Micronutrient	Operations research to see the effectiveness of any awareness raising interventions in micronutrient (effectiveness of different SBCC intervention), other globally adopted best practices to address the issue.	Sensitive	Operation Research	MOHFW, BRAC, NI, GAIN, ICDDRB, INFS, IPHN, WV, Harvest Plus, BRAC versity, Jivita, ICDRRB
2	IYCF	Research to ascertain degree of effectiveness of regular promotion Vs standardized audio-visual materials	Sensitive	Operation Research to study Efficacy of SBCC Program	MOHFW-HE & LHP, BCCP, NNS, MOWCA, MOLU, MOHPW, BIRTAN, NFS, NIPORT, BBF, IPHN, BBS, CARE BD, NIPSOM, Alive & THRIVE, GAIN, UNICEF, MOI, Mo Communication
2	Micronutrient	Research to develop promotional tools that have the best advantages to reduce anaemia in pregnant and lactating mothers.	Sensitive	Operation Research Efficacy of SBCC Program	ICDDR,B
1	NCD and SBCC	Conduct research to identify what behavior change communication is effective particularly among the aging population who are at risk of NCD burden (promotion of healthy diet and exercise).	Sensitive	Operation Research to see link between non communicable disease and obesity	MoHFW, MOFood, BIRDEM, NHF, BUHS, NICVD, Psychology Dept. DU, MOHFW, BMRC, ICDDRB, NNS, BRAC U, NCDC

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
1	NCD	Research on Dietary effect on NCD	Sensitive	Operation Research to see link between non communicable disease and obesity	MoH&FW
1	Program Coverage	Review of the coverage of nutrition programs (specific and sensitive), identify implementation barriers and develop community-based model for scale up	Sensitive and specific	Operation Research	BNNC, NNS, UNICEF, NI
1	Program Coverage	A Model to Address Programmatic Bottlenecks for Improving Selected Nutrition Outcomes at community levels	Sensitive	Operation Research	BNNC, SARN, WHO, UNICEF, WFP, NI, IFPRI, CARE, INFS, ICDDRB
2	Social Safety Net	Carry out large-scale implementation research on school meal program modalities and methods to recommend better approaches.	Sensitive and specific	Implementation Research	WFP, MoE, School Health Program, MOPME, BIRTAN, MOSW, MOWCA, FPMU, IFPRI, BARD, MOHFW
2	Micronutrient	Research to decide if lower dose is equally effective as higher dose of micronutrient and if it results in to lower incidence of side effects	Specific	Implementation Research	GAIN, BRAC, NI, ICDDRB, BRAC, INFS, IPHN
2	IYCF	Conduct research to pinpoint the social taboos and inadequate health care in early childhood, during pregnancy and its birth outcome, and recommend corrective actions.	Sensitive	Operation Research	MOSW, BNNC, BBF, MOWCA, MOLU, MOHPW, BIRTAN, INFS, NIPORT, BBF, IPHN, BBS, CARE BD, NIPSOM

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
2	Micronutrient	Develop a monitoring system to monitor Vitamin A level in edible oil	Specific	Operation Research to develop monitoring system	MoI with GAIN, NI, UNICEF, BSTI, IFST, INFS, ICDDRB, BIRTAN, IPHN, MNS, MOInd
2	Food Safety	Conduct operations research that best creates awareness in consumers to encourage restrictions of salt and sugar in their practice.	Sensitive	Operation Research	MOFood, BFSA, BFSA, IFST, NHF, INFS, BRAC, BIRTAN, BSMMU
2	Adolescent	Conduct research to identify most beneficial intervention at family and societal level on proper nutrition during puberty	Sensitive	Operation Research	NIPORT, MOWCA, NNS, IPHN, IFNS, ICDDRB, NI, HKI, BRAC-JPG
2	LBW and Pregnancy Weight Gain	Studies to compare and find optimum amount of time in different interventions for feeding of pregnant women, leisure period, that contribute to healthy behaviors during pregnancy	Sensitive	Operation Research	BBF, NNS, IPHN, ICDDR,B
2	Micronutrient	Conduct surveys to identify population level Vitamin A status (as part of national nutrition or micronutrient survey) and recommend adjusting vitamin A level in edible oil.	Specific	Survey to infer population level Vitamin A	IPHN, NNS, UNICEF, GAIN (MOHFW) Mo Industry (BSIC)
2	Micronutrient	Conduct survey to estimate iodine adequacy of pregnant women and lactating mothers (considering 15 ppm of iodine in salt, a level considered as adequate may not be sufficient for them)	Specific	Survey to infer adequacy of iodine among pregnant women	MoI with GAIN, NI, UNICEF, BSCIC, BSTI, DWA, MOWCA, MOInd, BCSIR, NNS, ICDDRB

Table 1: List of Recommended Operation Research from Workshop

Priority Of Research	Thematic area	Recommended research	Comments	Type of Research	Responsible agency/ Ministry
2	Micronutrient	Conduct Salt Consumption Survey, including salt quality to find different level of consumptions and recommend the optimum level of salt consumption	Specific	Survey to confer on population level of salt consumption	BSCIC, IPHN, BBS
1	Humanitarian Emergency	Review and develop food package/basket at the time of disaster for children and adult population	Sensitive	Operation Research	WFP, IFPRI
1	Humanitarian Emergency	Assess the impact of emerging large scale humanitarian disaster on food security and nutrition on vulnerable population	Specific and Sensitive	Operation Research	MoH&FW, MoDRR
1	Humanitarian Emergency	Determining the impact of covid-19 on nutrition: Projection of the possible malnutrition burden during and post covid-19 in Bangladesh	Specific	Assessment	INFS, BNNC, NNS/IPHN SARN, UNICEF, WHO, WFP, NI, IFPRI, ICDDRB, CARE, GAIN
1	Humanitarian Emergency	Potential Consequences of the COVID-19 Pandemic on the Status of the Selected Micronutrients in the	Specific	Assessment	INFS, BNNC, NNS/IPHN, SARN, UNICEF, WHO, WFP, NI, ICDDRB, GAIN, Alieve and Thrive, Griffith University
1	Humanitarian/ development	Guideline for Developing National Nutrition Surveillance System in Bangladesh: A Multi-Sectoral Collaborative Approach	Specific and Sensitive	Guideline/ protocol	INFS, BNNC, NNS/IPHN SARN, UNICEF, WHO, WFP, NI, IFPRI, ICDDRB, CARE, GAIN

Note: Intermediate and long term research need-2, Recommended research topics (Immediate Research need-1

Annexes:

1. Annex-1 (Research Gap Report)
2. Annex 2 (Technical Core Committee of Research Strategy)
3. Annex 3 (List of Workshop Participants)

Annex 1: Research gap report

Title: A study to identify nutrition research gaps and needs to develop a nutrition research strategy and support effective implementation of the Second National Plan of Action for Nutrition-NPAN2

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1. Background:

Despite being one of the most densely populated countries of the world, Bangladesh has achieved significant progress in many of the social indicators such as economic growth, health, and education. In particular, Bangladesh has shown exceptional achievements in health outcomes, mainly in reducing maternal and child mortalities (Chowdhury et al., 2013, Mahmud et al., 2013). Malnutrition remains pervasive in the country and is more prevalent among children aged less than five years, adolescents, and pregnant and lactating women. In spite of considerable progress over the last decades, rate of status of maternal and childhood malnutrition remains a key concern and remain a significant barrier to achieving Sustainable Development Goals by 2030. The most recent demographic and health survey reported that 31% of Bangladeshi under-5 children are stunted, while 22% are underweight, and 8% are wasted (National Institute of Population Research and Training et al., 2016). Although some improvement in child nutritional status has been noticed over the past decade (National Institute of Population Research and Training et al., 2016), the rate of reduction is still sluggish (Hossain and Khan, 2018). It is also crucial that nearly one-third of the Bangladeshi women are undernourished with a body mass index of less than 18.5 kg/m2 (Ahmed et al., 2012b).

Bangladesh National Nutrition Council (BNNC) is mandated with the strengthening of nutrition governance, policy coordination, and leadership and facilitate the implementation of different specific and sensitive interventions as envisaged in the National Nutrition Policy 2015 and the second National Plan of Action for Nutrition (NPAN2). In doing so, BNNC needs to conduct operational and implementation research, which is deemed to test alternative intervention modalities of the interventions and indicators that are not showing any progress or the progress is sluggish and to answer key operational questions as they arise during NPAN2 (2016-2025) implementation. In NPAN2, it has also been recognized that there is a need to establish a common nutrition research agenda for all who have been working in nutrition. NPAN2 has also identified several areas for operational and implementation research. To turn broader policy into specific outcome, BNNC, in collaboration with SUN Academia and Research Network (SARN), research agencies, civil society organizations, and academic institutions under various ministries and universities, has developed a strategy for undertaking operational and implementation research in line with NPAN2 objectives and priorities. Identifying nutrition research gaps and needs was considered as one of the most vital steps for developing this research strategy.

A comprehensive review on eight recommended topics from NPAN2 was conducted. The research was supported by the Civil Society Alliance for Scaling Up Nutrition, Bangladesh (CSA for SUN, BD), a member-based alliance or network comprising different national and international organizations has been launched in Bangladesh in 2012, whose secretariat has been housed within Concern Worldwide since 2016. In a joint approach, the CSA for SUN and the Civic Engagement Alliance (CEA) project funded by ICCO Cooperation supported the review and the research gap analysis. However, when nutrition experts suggested, a few critical topics of nutrition research which should have been covered were not covered under that analysis then the current processes of review of the nutrition research documents added additional eight thematic areas on behalf of SUN academia and BNNC. Review of additional areas were done using similar methodology and this report was the outcome of those priority areas as described in the objectives.

2. Objective

2.1 Overall objective

The purpose of the assignment was to identify the nutrition research gaps and needs for developing the nutrition research strategy for the country for period 2020-2025 and beyond for the effective implementation of NPAN2.

2.2 Specific objectives

The study fulfilled the following specific objectives:

1. To identify the gaps and needs for effective implementation of NPAN2 that are mentioned in the NPAN2 strategy 6.2.1, strategy 6.2.8, and strategy 6.5.6[3].

2. To recommend available research findings from the evaluation of successful programs/projects (based on relevant and accessible documented findings/recommendations) for effective implementation of NPAN2.

3. To share the findings of the exercise and gap analysis for evidence, research, and coordination according to the strategy 6.5.6 (activity 1) of NPAN2.

4. To identify and share priority research topics relevant to identified national nutritional needs (strategy 6.5.6. activity 4 of NPAN2) according to areas and sectors (both nutrition-specific and sensitive) based on consultation with key stakeholders and review work.

5. To identify nutrition research gaps and recommend priority research needs for effective implementation of NPAN2

3. Methods

3.1 Selection of topics for nutrition research gap identification

3.1.1. The first phase of the research: A research gap analysis based on the discussions of the Executive Committee (EC) members of CSA for SUN of Bangladesh had a consultative meeting with Bangladesh National Nutrition Council (BNNC), Institute of Public Health Nutrition (IPHN), and ICCO Cooperation was conducted. The analysis kept in view of nutrition research gap referring to NPAN2. During the review process, a few key nutrition research areas were identified to speed up the effective implementation of NPAN2. These areas are mentioned under the NPAN2 strategy 6.2.1 (activities 10, 11, 12, 13, 14), strategy 6.2.8 (activity 4) and strategy 6.5.6 (activity 6). The research team reviewed the selected strategies under NPAN2 and identified eight topics based on inputs from Key Informant and reviewing of literature. During this phase, the following issues were analysed:

[3]Earlier a research gap analysis was undertaken in 8 priority areas. The current analysis covered an additional 8 topics, particularly on adolescent nutrition, infant and young child feeding practices (IYCF), and management of severe and moderate acute malnutrition.

i. Program and research gaps in fortification of salt with iodine

ii. Program and research gaps on home fortification of multiple-micronutrient powder (MNP) among under-5 children in Bangladesh

iii. Research priorities related to the nutrition-sensitive water, sanitation and hygiene in Bangladesh—program gaps and research priorities

iv. Zinc bio-fortified rice in Bangladesh - program gaps and research priorities

v. Program and research gaps relevant to the vitamin A fortification in edible oil in Bangladesh

vi. Program and research gaps related to the nutrition-sensitive agriculture programs

vii. Climate-smart agriculture in Bangladesh - program gaps and research priorities

viii. Integrating nutrition in social protection/safety-net programs in Bangladesh - program gaps and research priorities.

3.1.2. The second phase of the study: However, when the experts opined to add additional topics, thereby, adding to value on NPAN2 implementation. The following research topics were included in the second phases.

i. Program and research gaps related to the Infant and Young Child Feeding (IYCF)

ii. Program and research gaps relevant to the management of severe and/or acute malnutrition among children

iii. Anemia among pregnant women and lactating mothers–program gaps and research priorities

iv. Low birth weight and weight gain during pregnancy — program gaps and research priorities

v. Program and research gaps related to non-communicable diseases and obesity

vi. High salt, sugar, saturated fats and trans-fats in processed foods — program gaps and research priorities

vii. Program and research gaps relevant to adolescent nutrition

viii. Programs and research gaps relevant to food quality and safety.

3.2 Research design

A mixed-method design was followed, which included a review of the relevant health and nutrition literature on selected topics as well as obtaining information through discussions with the relevant stakeholders. Inputs in identifying relevant research and gaps were obtained from key informants. During the research, the findings were shared with the officers of the Bangladesh National Nutrition Council and invited experts from different institution, then their inputs were incorporated. Finally, four experts with background on nutritional epidemiology, program, and policy formulation and agriculture-nutrition linkages reviewed the documents and provided their feedbacks.

Letters were sent by the Director General, BNNC, to 20 relevant organizations/institutes, seeking their assistance in collecting research completer in their institutes/organizations. All the institutes were contacted over phones, and institutes situated in Dhaka were visited.

Table 1. List of institutes contacted for information

Sl. No.	Name of institutes
1	Bangladesh Academy of Rural Development (BARD)
2	Bangladesh Agricultural Research Council (BARC)
3	Bangladesh Agricultural University (BAU)
4	Bangladesh Fisheries Research Institute (BFRI)
5	Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM)
6	Bangladesh Institute of Research and Training On Applied Nutrition (BIRTAN)
7	Bangladesh Medical Research Council (BMRC)
8	Bangladesh Rice Research Institute (BRRI)
9	Bangladesh University of Health Sciences (BUHS)
10	College of Home Economics, Dhaka University
11	Department of Food Technology and Nutrition, Jashore University of Science and Technology (JUST)
12	Department of Food Technology and Nutrition, Noakhali Science and Technology University (NSTU)
13	Department of Food Technology and Nutrition, Mawlana Bhashani Science and Technology University (MBSTU)
14	Department of Food Technology and Nutrition, Hajee Mohammad Danesh Science & Technology University (HSTU)
15	Department of Public Health, American International University-Bangladesh (AIUB)
16	Department of Public Health, Bangabandhu Sheikh Mujib Medical University (BSMMU)
17	Department of Public Health, North-South University (NSU)
18	Institute of Food Science & Technology (IFST)
19	Institution of Nutrition and Food Science (INFS), Dhaka University
20	National Institute of Preventive & Social Medicine (NIPSOM)

3.3 Literature search

Both the electronic and grey literature published between 2000 and February 2019 were reviewed. The literature and documents comprised of published articles, grey literature, and website information of a few relevant organizations.

A systematic approach was undertaken to extract relevant literature from online databases, including PubMed, Google Scholar, and Banglajol. While searching for related documents, consideration was provided to all the available nutrition-specific and nutrition-sensitive research documents on the selected topics within the context of Bangladesh. Those were extracted and meticulously reviewed for content on the topics selected for this review. During the literature search, we followed the steps of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram, and the steps are 'identification,' 'screening,' 'eligibility' and finally 'included' the selected articles (Liberati et al., 2009).

Policy, plans/strategies, and projects or program documents of Bangladesh relevant to the selected review topics were manually searched and reviewed. A snowballing technique in searching for the potential bibliography cited in the selected documents was also used.

3.4 Literature analysis process

Documents were initially searched by one researcher, however to ensure data quality and data consistency, a second researcher cross-checked the entire process. Any disagreement between two was settled by group discussions and consensus was built. The duplications and screen titles of all the documents were removed before conducting the abstract screening. Finally, the relevant articles were selected based on the predetermined inclusion and exclusion criteria. The full articles were then reviewed and finally synthesized as narratives. A thorough analysis of the relevant nutrition policies, the national plan of actions, current and emerging nutritional issues, priorities, and 7th National Five-Year Plan and SDGs have been carried out to select important topics for review.

Following the desk review, during the first phase of the reviews, key informant interviews (KIs) were undertaken with the renowned Government representatives, CSA for SUN members, prominent nutrition experts (recommended by CSA) using a pretested checklist. The collected information was thematically analysed. Finally, the research gaps were identified and presented at review meetings held at the BNNC premise, and later with the Standing Technical Committee (STC) of the BNNC. The report is based on the findings of the desk review, the key informant interviews (KIs), and suggestions of the expert consultations and reviewers was further reviewed by four experts before being finalized.

4. Results

4.1. Nutrition-related research conducted by major institutes in Bangladesh:

Not all institutes responded to the request of the BNNC. However, from the website and visiting the research and academic institutes, titles of 420 studies have been identified, but the digital copies of only a few titles could be retrieved and were included in this review.

Table 2. List of nutrition-related research institutes and research considered for reviewing the research team

Name of the institute[4]	Period	Number of nutrition-related research identified	Comments
INFS	2012-18	120	Mostly thesis
IFST	2012-18	83	Including 63 completed projects
JPGSPH	2012-19	65	
ICDDR,B	2012-19	54	
BMRC	2001-2019	51	
NIPSOM	2010-19	26	
BUHS	2010-19	21	Including 10 completed projects
Total		420	

4.2.1 Program and research gaps related to the Infant and Young Child Feeding (IYCF)

Seven (Aemro et al., 2013; Kabir et al., 2012; Rasheed et al., 2017; Hanif, 2013; Zongrone et al., 2012; Na et al., 2018; and Abdullah et al., 2018) indexed papers identified through a rapid search of online libraries and the documents revealed through visiting 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 3. Program and research gaps related to infant and young child feeding

Program gaps	Research gaps	Recommended research
Lack of knowledge of mothers and/or caregivers on appropriate IYCF practices	Evidence is scarce on the factors from the demand and supply side, which contributed to inadequate knowledge and practices among the mothers and/or caregivers on appropriate IYCF practices.	1. Effectiveness of large-scale programs 2. Paid maternity leave for working women, availability of day-care at workplace 3. Implementation research to pinpoint the social taboos and recommended corrective actions 4. Effectiveness of regular promotion via standardized audio-visual materials.

Table 3. Program and research gaps related to infant and young child feeding

Program gaps	Research gaps	Recommended research
Integrating IYCF promotion with existing PHC	The primary care setting is the first point of contact with the community. It is the most crucial part of the local health care system. However, there is a lack of research on the effectiveness of primary care led health promotion activities to improve proper IYCF practices in Bangladesh.	
Social norms and taboos responsible for inadequate IYCF practices	Social norms and taboos are often acted as major barriers against proper IYCF practices, particularly among the rural people where large-scale misbelief is common. Yet, not much research has been carried out to date pinpointing the social taboos and cultural norms related to pregnancy, childbirth, and childcare practices.	
Mass-media interventions	The use of mass media in health promotion activities has been a unique feature of this century, with a massive advent in digital technologies that can reach huge population in rapid time. Internationally there is evidence that incorporating mass-media in health promotion activities can result in better outputs compared to the conventional health promotion initiatives. Yet, to date, few implementation research studies have been carried out in Bangladesh, examining the effectiveness of mass media in effective IYCF promotion.	
Policy program issues (for working women and promotion of BMS)	There is a scarcity of innovative action research to solve issues that are linked with working mothers, and research is required to see if incentives like paid maternity leave for working women, availability of day-care facilities at the workplace can result in better outcomes for IYCF practices.	

4.2.2 Program and research gaps relevant to the management of severe and moderate acute malnutrition (SAM and MAM) among children

Eight (Ahmed et al., 2001; Ahmed et al., 2012a; Arafat et al., 2018; Ashraf et al., 2007; Chisti et al., 2018; Choudhury et al., 2018; Hossain et al., 2019; and Puett et al., 2013) indexed papers identified through a rapid search of online libraries and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 4. Program and research gaps related to the management of severe and moderate acute malnutrition among children

Program gaps	Research gaps	Recommended research
Identification of cases	Identification of the severe and/or acute malnourished cases has always been a challenge. But there is not much research carried out in Bangladesh which focused on effective identification of the malnourished cases and those malnourished children who require immediate support. Research needs to be focused on identifying malnourished children who are in acute need.	1. Most effective ways to identify the cases 2. Effective involvement of community health workers at the community level 3. Development of effective training module for facility-based health staffs, CHWs 4. Research on effective outpatient-based management 5. Implementation research to find out the barriers for coordination gaps 6. Making low cost, locally available ready-to-use food available.
Availability of facilities at the doorsteps	In line with the concept of universal health coverage, the Government of Bangladesh and several local and international NGOs are trying to deliver health services at the doorstep of people. Yet, there is minimal research on the evidence of the effectiveness of those interventions. Particularly the role of community health workers in delivering IYCF services, has not been appropriately documented through large-scale research.	
Inadequate efficiency in management of SAM and MAM at the health service delivery level	Quality of care at the health service delivery level has been an issue in Bangladesh that has been overly discussed. However, research needs to be carried out to find out the loopholes and shortcomings at the health service facilities. Research should also focus on developing an effective training module for facility-based health staffs and community-level health workers.	
Poor uptake of inpatient services	In Bangladesh, inpatient services are not well managed, mainly due to lack of resources such as scarcity of beds and other quality medical equipment, support services, human resources, and so forth. Therefore, the research is required to be carried out to develop effective community-based identification of cases and to provide management services those would be implemented by using the existing MoHFW infrastructures as a part of a standard primary health care package.	
Improper nutrition coordination	Fragmentation within the health system is a critical concern to ensure proper health service, including IYCF care in Bangladesh. Implementation research is required to find out the barriers for improper nutrition coordination at the health service delivery level.	
Home-based management	It is essential that people-centric home-based care for IYCF practices are being promoted in Bangladesh, where health facilities are scant and are accused of delivering low-quality health services. Therefore, more research is required to identify low cost, locally available, nutritious, ready-to-use therapeutic nutritious foods.	

4.2.3 Program and research gaps related to anaemia of pregnant women and lactating mothers priorities

Seven (Ahmed et al., 2018; Ahmed et al., 2016a; Chowdhury et al., 2015; Hyder et al., 2004; Merrill et al., 2011; Rahman et al., 2016; and Rahman and Ireen, 2019; and Shamim et al., 2013) indexed papers were identified through a rapid search of online libraries and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 5. Program and research gaps related to the anaemia of pregnant women and lactating mothers

Program gaps	Research gaps	Recommended research
Lower than expected prevalence of iron deficiency	It is essential to note that the prevalence of anaemia is not as high as it is expected among pregnant and lactating women considering the poor quality and diversity of foods they consume. This put forwarded the importance of other sources of iron in the human diet, especially research should focus on the iron content in drinking water and how they are contributing to the overwhelming iron requirement among pregnant and lactating women.	1. Role of iron in water need to be studied 2. Addition of other micronutrients may provide additional benefits (like the lower prevalence of low birth weight) 3. Effective promotional tools.
Association of haemoglobin concentration with other micronutrients	It is also crucial that the mutual benefit of haemoglobin and other micronutrients are also adequately studied in the context of proper growth and development of the children.	
Effectiveness of a lower dose of iron and switching to multiple micronutrients	While there is a strong argument that iron content of water heavily compensates for the overall iron requirement among pregnant and lactating women, research needs to be carried out to see the effectiveness of low dose iron supplementation. There is also a scarcity of evidence on the effectiveness of multiple micronutrients with relatively lower iron content in it.	
Low coverage of iron-folate supplementation during pregnancy	Research suggests that the iron-folate supplementation during pregnancy is a relatively lower and identified reason, such as inadequate promotional activities for this. Research needs to be carried out to develop effective promotional activities involving audio-visual materials and engaging mass media.	

4.2.4 Low birth weight and weight gain during pregnancy— program gaps and research priorities

Six (Nisha et al., 2019; Ferdous et al., 2018; Arifeen et al., 2000; Shahid et al., 2012; Adams et al., 2020; and Monawar Hosain et al., 2005; and Shamim et al., 2016) indexed papers were identified through a rapid search of online libraries and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 6. Program and research gaps related to low birth weight

Program gaps	Research gaps	Recommended research
Intrauterine growth retardation	Despite progress, childhood malnutrition remains a key concern in Bangladesh. Intrauterine growth retardation is considered as a potential cause of low birth with concomitant malnutrition in childhood. Improper nutrition during pregnancy period has been identified as a causative factor for intrauterine growth retardation. However, there is a lack of research on this issue in Bangladesh	1. Inadequate dietary intake in pregnancy 2. Clinical pathobiology of pregnancy complications and restricted growth during pregnancy 3. Food taboos and insufficient health care during pregnancy 4. Time allocated for feeding of pregnant women, leisure period, healthy behaviors during pregnancy 5. Delaying marriage and pregnancy of adolescent girls.
Pregnancy complications (i.e., gestational diabetes mellitus, pregnancy-induced hypertension)	While several studies pointed out the higher incidence of pregnancy complications in Bangladesh, there is a lack of evidence on specific pathobiology of pregnancy complications and compromised growth during pregnancy.	
Social determinants affecting pregnancy care	Currently no implementation research exists that identifies the effectiveness of correcting different social factors such as maternal leisure period, healthy behaviours, and social support on pregnancy-related care and outcomes.	
Adolescent marriage and pregnancy	Adolescent girls are more likely to give birth to low-birth weight babies. However, determinants and programmatic measures needed to delay adolescent marriage and pregnancy are not fully studied.	
Poor diet quality and care during pregnancy	Pregnancy-related care is a crucial factor for ensuring positive pregnancy outcomes, yet there is a lack of studies focusing on the components of improved pregnancy care and counselling to improve diet quality in Bangladesh	

4.2.5. Program and research gaps related to non-communicable diseases and obesity

Six (Biswas et al., 2017; Bleich et al., 2011; Zaman et al., 2016; Biswas et al., 2016; Rahman et al., 2019; and Nujhat et al., 2020) indexed papers were identified through a rapid search of online libraries and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 7. Program and research gaps related to non-communicable diseases and obesity

Program gaps	Research gaps	Recommended research
Psychosocial effect of non-communicable diseases (NCD)	Like many other underprivileged nations of the world, Bangladesh is also passing through an epidemiologic transition in recent years. Over the last two decades, there has been a tremendous shift from communicable diseases to non-communicable diseases in Bangladesh. However, there is a lack of research on the psychosocial outcomes of NCDs in Bangladesh.	1. Research on how non-communicable disease has a profound effect on psychosocial wellbeing 2. Pathology of obesity and concomitant progression of NCDs 3. What behavior change communication is effective particularly among the aging population who are at risk of NCD burden (promotion of healthy diet and exercise) 4. Development of easy-to-understand guideline pictorial materials, for example, "MyPlate," "Eat Well Plate." 5. Effectiveness of "easy-to-understand" food labeling and SBCC.
Association between excessive weight gain and NCD progression	Several studies have identified excessive weight gain as a potent risk factor of NCDs. Yet, there is a clear gap in literature from Bangladesh on the pathobiology of NCDs in relation to obesity.	
Behaviour and practices leading to excessive weight gain	Certain behaviour change and lifestyle modification would be crucial in preventing excessive weight gain, thereby restricting the progression of NCDs. However, implementation research needs to be carried out to examine which behaviour change communication is useful, particularly among the aging population who are at risk of NCDs.	
Inadequate intake of foods and nutrients associated with a lower prevalence of NCDs (fruits and vegetables, dietary fibres)	Healthy eating, notably higher intake of vegetables and fruits and fibre-rich diets, is critical for preventing NCDs. But there is a widespread knowledge gap on these issues throughout the community. Research needs to be focused on developing innovative ideas to disseminate that information at the community level.	
Increased consumption of sweet, savoury foods and sugar-sweetened beverages	One of the major reasons for increasing obesity and concomitant NCD prevalence is a higher intake of processed food items, including sweets, savoury foods, and sugar-sweetened beverages. Therefore, research should focus on making the people aware of the detrimental effect these food items through enabling things such as easy to understand food labelling.	

4.2.6. High salt, sugar, saturated fats and trans-fats in processed foods— program gaps and research priorities

Five (Waid et al., 2019; Nasreen and Ahmed, 2014; Ali, 2013; Khan, 1984; and Khan and Talukder, 2013) indexed papers were identified through a rapid search of online libraries and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 8. Program and research gaps related to high salt, sugar, saturated fat and trans-fat intake

Program gaps	Research gaps	Recommended research
Composition of commonly consumed ready to use processed and packaged foods in unknown	Following a recent nutrition transition in Bangladesh, the consumption of processed foods has increased tremendously in Bangladesh in recent years. Yet, the nutritive components of these food items are mostly unknown, and research should focus on reporting the composition of these new food items.	1. Analysis of processed foods (representative samples) 2. Introduction of easy-to-understand food labeling systems for example' front of the package' labeling 3. Analysis of samples and introduction of alternative bakery shortening (fats and oils those are solid at room temperature such as partially hydrogenated oils) 4. Operations research to educate consumers and development of educational tools 5. Effective enforcement methods.
Limited research indicated the presence of high levels of salt, sugar, saturated and trans fats in processed foods	While there is documented increasing intake of salt, sugar, saturated and trans fats among the Bangladesh population, there is a lack of evidence on the exact amount of these constituents present in different food items that are frequently eaten.	
High levels of trans fats in partially hydrogenated vegetable oils	Research indicates a higher presence of trans fats in partially hydrogenated vegetable oils in Bangladesh. However, there is a lack of evidence on innovative food technologies to address these issues as high levels of trans fatty acids are injurious to health.	
Poor consumer awareness and literacy about food salt, sugar, saturated and trans fats in foods	There is a wide gap in knowledge on the detrimental effect of salt, sugar, saturated and trans fats in foods. Operation research needs to be carried out to identify practical approaches for consumer education on these issues.	
Use of unauthorized food colour, preservatives, and food adulteration	Due to a lack of proper monitoring, many food industries are using unauthorized food colours and preservatives to an unacceptable level. Future research should also focus on identifying useful methods for proper monitoring of the food industries and market.	

4.2.7. Program and research gaps relevant to adolescent nutrition

Seven (Hossen et al., 2016; Shahabuddin et al., 2000; Islam et al., 2019; Nguyen et al., 2017; Ame, 2013; Ahmed et al., 2012b; and Mistry et al., 2017) indexed papers were identified through a rapid search of online libraries

and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 9. Program and research gaps related to adolescent nutrition

Program gaps	Research gaps	Recommended research
High prevalence of anaemia among adolescent girls	Adolescent girls are particularly prone to iron deficiency due to their increased iron requirement for menstrual blood loss. However, there is limited research on this issue in Bangladesh and particularly on innovative approaches through promoting behaviour change communication among this vulnerable group.	1. Behavior change communication targeting this vulnerable group 2. Promotion of a healthy lifestyle 3. Restraining unhealthy food choices and nutritious alternatives to them 4. Nutritional consequences of social issues such as early marriage and adolescence pregnancy.
The double burden of malnutrition	Research suggests that the adolescent population is suffering from both undernutrition and overnutrition. While some of the adolescent girls from the underprivileged segment of the population are suffering from undernutrition, others from affluent groups are practicing unhealthy lifestyles and consuming unhealthy diets leading themselves to overnutrition. Research should focus on addressing this dual burden of malnutrition among adolescents through promoting a healthy lifestyle and behaviour.	
Unhealthy food choice	Adolescents tend to consume unhealthy and processed food items outside of their homes frequently. These food items are rich in saturated fats and excessive salt, and both contribute to overnutrition. Research is required to document these unhealthy food choices among the adolescent girls and to look for suitable nutritious substitutes for them.	
Social factors related to adolescent nutrition	Social issue such as early marriage and early pregnancy has a significant impact on malnutrition during adolescence. Child marriage is widespread in Bangladesh, which make them vulnerable to malnutrition. It is because girls married in their adolescence often become pregnant in their adolescence. While their growth was still on the process, they are to bear a child who is detrimental to their health and nutrition. However, limited research is being carried out on the nutritional consequence of these social issues in Bangladesh.	

4.2.8. Program and research gaps relevant to food quality and safety

Seven (Noor and Feroz, 2015; Majed et al., 2016; Real et al., 2017; Paul et al., 2017; Ahmed et al., 2016b; Alam et al., 2015; and Nasreen and Ahmed, 2014) indexed papers were identified through a rapid search of online libraries and the documents revealed through visiting the 20 key nutrition research institutions of Bangladesh were reviewed, and the following research gaps were identified.

Table 10. Program and research gaps related to food quality and safety

Program gaps	Research gaps	Recommended research
Contamination within the supply chain	Food items are subjected to microbial contamination in different stages of the supply chain, including food production, food processing, food transportation, and food distribution. Research is scarce for proper identification of the contamination pathways and possible remedies for avoiding widespread food contamination within the supply chain.	1. Preventing food contamination in different stages of the supply chain 2. Proper food handling measures during food handling procedures within the supply chain 3. Development of organic pesticides for food items 4. Water and soil treatment strategy to reduce heavy metal contents in them before using in food production 5. Measures for strong monitoring of food adulteration 6. Operation research to increase awareness on food quality and safety.
Improper food handling	Lack of knowledge of basic hygiene practices, attitudes and behaviour resulting in widespread non-compliance with hygienic practice in food handling among all the actors in the food chain, e.g., food producers, food processors, food handlers, food traders, street food vendors and also consumers, is the major contributory factor to the high prevalence of enteric diseases. There is limited action research to improve food handling practices in different stages of food handling in the supply chain.	
Presence of pesticides and antibiotics in foods	Pesticides are increasingly being used for the protection of crops from pest or insect attacks and diseases in Bangladesh. Antibiotic resistance is also a food safety problem. Antibiotics which are used in food animals for treatment, disease prevention, or growth promotion and transmits to the human body. Research is required to produce safe alternatives to these chemicals. Extensive research is required to generate organic pesticides and pest control.	
Heavy metals in food	Soil and water are the primary source of heavy metals through which they enter the food chain and often results due to the unregulated discharge of industrial wastewater, application of heavy metals contaminated/containing pesticide, fertilizers or irrigation water, and many other anthropogenic activities. One of the primary sources of arsenic and cadmium contamination of rice is groundwater irrigation. Research is required to develop water and soil treatment strategy to reduce heavy metal contents in them before they are used in food production.	
Food adulteration	Food adulteration is a serious issue in Bangladesh and has reached a dangerous level posing serious health hazards in the country. Some added adulterants like non-food grade colorants are added to make the food attractive but may be toxic and may cause health risks. There needs to have strong monitoring to tackle this issue, and future research needs to focus on safe supply chain management and production on chemicals having the capacity to lessen the adverse effect of adulterants on health.	
Awareness on food quality and safety	There is a wide gap in knowledge and awareness regarding quality and safety of food items both at the consumer as well as producer and vendor level. However, this issue is not adequately researched and properly analysed from the Bangladesh context.	

5. Recommended research identified during an earlier phase of research gap analysis

1. Research needs in fortification of salt with iodine in Bangladesh

   Seven articles were reviewed, and KII information was summarized to come up with specific research needs for the effective salt iodization initiative in Bangladesh. Research is necessary to -

   a. Identify ways to ensure an adequate level of iodine in fortified salt

   b. Develop a 'point of use' salt iodization test kit to help effective monitoring of salt iodization efforts, especially in hilly, coastal, and hard to reach areas

   c. Understand ways to motivate people to buy packaged salt (market research)

   d. Identify the consequences of iodine insufficiency among pregnant and lactating women

   e. Find the means to meet the additional requirements of pregnant and lactating women

2. Research needs in-home fortification of multiple-micronutrient powder (MNP) among under-5 children in Bangladesh

   Six articles were reviewed, and KII information was summarized to come up with specific research needs for effective MNP home fortification in Bangladesh.

   a. The effectiveness needs to be tested for any awareness-raising interventions or other globally adapted best practices to address the issue of coverage.

   b. The effectiveness of 5 versus more (up to 22) micronutrients needs to be tested through studies.

3. Research needs in nutrition-sensitive water, sanitation and hygiene in Bangladesh

   Eight articles were reviewed, and KII information was summarized to come up with specific research needs for effective nutrition-sensitive water, sanitation, and hygiene initiative in Bangladesh. Research is required to -

   a. Know the extent to which the groundwater iron is contributing to fulfilling the iron requirement among the Bangladeshi population

   b. Understand the factors and possible remedies of improper feces disposal of 0-2 years children

   c. Identify ways to improve safe water and sanitation facilities in slum areas

   d. Find out the effective ways to motivate people to practice proper hygiene, including safe disposal of child and animal feces

4. Research needs in zinc bio-fortified rice in Bangladesh

   Five articles were reviewed, and KII information was summarized to come up with specific research needs in zinc bio-fortified rice production in Bangladesh.

   a. Research is required to generate new zinc fortified rice varieties with high zinc content and less phytate content.

   b. Research needs to be carried out to develop zinc bio-fortified rice varieties, which are also high yielding.

   c. There is a lack of research on whether iron and other micronutrients can be simultaneously bio-fortified in rice varieties.

5. Research needs in vitamin A fortification in edible oil in Bangladesh

   Five articles were reviewed, and KII information was summarized to come up with specific research needs for effective vitamin A fortification in edible oil in Bangladesh.

   a. Research is required to know the current Vitamin A status among the Bangladeshi population following Vitamin A fortification.

   b. Research is required to identify why nearly two-third of the oils (mainly unbranded) are not fortified with Vitamin A in Bangladesh.

6. Research needs in nutrition-sensitive agriculture in Bangladesh

   Thirteen articles were reviewed, and KII information was summarized to come up with specific research needs for an effective nutrition-sensitive agriculture initiative in Bangladesh.

   a. Research is required to know how raising income influences decisions about what people eat.

   b. Research needs to be conducted to reformulate processed foods to increase the intake of healthy foods at an affordable price.

   c. Research needs to be done to expand the homestead production of fruits, vegetables, livestock, and small indigenous fish programs in hard-to-reach areas.

   d. Research should be carried out to develop more nutrient-dense rice, fish, and other crop varieties.

7. Research needs in climate-smart agriculture (CSA) in Bangladesh

   Eight articles were reviewed, and KII information was summarized to come up with specific research needs for effective climate-smart agriculture in Bangladesh.

   a. Research needs to be conducted to identify the most promising technologies suitable for all agro-ecological zones and develop ways to expand such technologies at scale.

b. Research is required to develop further the CGIAR initiative to protect food security and livelihood against the adverse effect of climate change in Bangladesh.

8. Research needs in integrating nutrition in social protection/safety-net programs in Bangladesh

   Five articles were reviewed, and KII information was summarized to come up with specific research needs for integrating nutrition in social protection/Safety-net Programs in Bangladesh.

   a. Research needs to be carried out to integrate nutritional vulnerability as the selection criteria of the vulnerable population.

   b. Studies are required to check the efficacy of the existing pilot projects and how to integrate the nutrition messaging of these pilot projects into safety net programs on a large scale.

   c. Implementation research should be done on the school meal program modalities and methods.

6. Conclusions

This exercise attempted to highlight the critical research gaps for the effective implementation of NPAN2 in terms of the research arena. A mixed approach was followed, which incorporated the results from the analysis of both systematic literature reviews and key informant interviews. Research gaps under eight key themes addressing both nutrition-sensitive and nutrition-specific interventions in the Bangladesh context were identified. It is now essential for BNNC to identify research priorities from the potential list using recommended techniques like CHNRI method or Delphi method (Ruden, 2016; and Yoshida, 2016); develop a nutrition research strategy and action plan and take appropriate measures to persuade research institutes such as BARC, BMRC, Universities to conduct or fund research so that they allocate more resources for nutrition research in the areas recommended in this review. BNNC also needs to take initiatives for seeking proposals from qualified researchers, select proposals for funding through peer review by national and international experts, and monitor the progress of the implementation process, after developing a plan for follow-up actions.

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Annex - 2

Annex 2: Technical core committee of research strategy

Chairperson

Dr. Tahmeed Ahmed, Senior Director, Nutrition and Clinical Services Division, icddr'b.

Co-chairperson

Dr. AFM Iqbal Kabir, Team Leader, NTEAM, Nutrition International, TAN/UKAid

Member Secretary

Dr. Farzana Rahman, Deputy Director (Research), BNNC.

Members

Professor Dr. Iqbal Kabir, Director (PMR), DGHS & Chair, SUN Academia and Research Network

Professor, Dr. Nazma Shaheen, Institute of Nutrition and Food Science (INFS)

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Professor, Dr. Kaosar Afsana, James P Grant School of Public Health (JPGSPH), BRAC University

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Dr. Delwar Hussain, Consultant, BNNC.

Coordinators

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Dr. Nazmus Salehin, Ex-Deputy Director, (Admin, Audit & Finance), BNNC.

Ms. Mehruba Sharmin, Research Officer, CCHPU, MOHFW.

Annex-3

Annex 3: List of workshop participants

Venue: CICC (1st Floor), CIRDAP, Dhaka

Date: 4 March, 2020

A. List of Government Participants from the Government Organizations

1. Md. Habibur Rahman khan, Addl. Secretary, HSD, MoHFW
2. Dr. Md. Shah Nawaz, Ex-Director General, Bangladesh National Nutrition Council.
3. Dr. Md. Khalilur Rahman, Ex-Director, IPHN
4. Prof. Dr. Iqbal Kabir, Director (Plan & Dev), LD (DGHS) & SUN Academia Network
5. Prof. Dr. Habibur Rahman, Director, MIS , DGHS
6. Dr. S.M Mustafizur Rahman, LD- NNS, IPHN
7. Mr. Ramesh Chandra Saha, DD, PHC DGHS
8. Md. Monirul Islam, Director (Nutrition), BARC
9. Dr. Fatima Akter, DPM, NNS, IPHN
10. Dr. M. Islam Bulbul, Ex-DPM, NNS
11. Dr. Sahadev Chandra Saha, Director, BFSA
12. Dr. Md. Ruhul Amin, Associate Professor, INFS
13. Dr. Rowshan Jahan, MO, MoHFW
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15. A.K.M Abdullah, Research Associate, NIPORT
16. Dr. Anamul Haque, CSO, DIPI
17. Ms. Jinnat Rehana, DS, MoCom
18. Md. Iqbal Hussain, JS, MOWCA
19. Abu Tareq Mohammud Abdullah, Principal Scientific Officer, IFST
20. Dr. Shakila Faruque, SSO, BLRI
21. Mabuba Sharmin, Research Officer, MoHFW
22. Md. Ahsanul Haque CHowdhury Add. Deputy Director, MoF
23. Dr. Akter Imam, Deputy Director, BNNC
24. Dr. Nazmus Salehin, Ex-Deputy Director, BNNC
25. Dr. Khainoor Zahan, Deputy Director, BNNC
26. Dr. Md Fazla Rabbi, Assistant Director, BNNC
27. Dr. Sumaya Yakub, Assistant Director, BNNC
28. Dr. Farzana Rahman, Deputy Director, BNNC
29. Dr. Tanzina Sultana, Assistant Director, BNNC

B. List of Participants from the Non-Government Organizations

1. A.F.M Iqbal Kabir, Team Leader, BNNC/NI
2. Delwar Hussain, Consultant, BNNC/NI
3. Abu Ahmed Shamim, Assoc. Scientist, JPGSPH
4. Dr. Sabiha Sultana, Technical Specialist, GAIN
5. Rowshan Afroza, professor , BRAC University
6. Dr. Kaosar Afsana, Professor, JPGSPH, BRAC University
7. Tonima Sharmin, Nutrition Officer, WFP
8. Nazmul Alam, PM ,IFPRI
9. Nazneen Rahaman, Team leader, CARE
10. Mohammed Hafijul Islam, Sr. Technical Coordinator, CARE
11. Farhana Sharmin, National Consultant, WHO
12. Dr. Shakhwat Islam Bh., Chairman, NCIB
13. Dr. Bishnupada Dhar, Advisor, NCIB
14. Shirin Afroz, Director (Nutrition), HKI
15. Md. Nezam Uddin Biswas, Consultant, M&E, BNNC/NI
16. Md. Habibur Rahaman, Consultant, BNNC/UNICEF
17. Yamina Tasnim, Intern, BNNC
18. Dr. Ayan Shankar Seal, Advisor, FHI 360.
19. Dr. Tahmeed Ahmed, Senior Director, ICDDR'B
20. Taufiqur Rahaman , ACF
21. Amir Hossain, Nutrition Advisor, Concern worldwide
22. Dr. Mohsin Ali, Consultant, BNNC/ NI 360
23. Ashek Mahfuz- NPO, Nutrition International
24. Fahmida Taim, Vice- Chairman, NCIB
25. Esha Farooqe- PM, IFPRI

May 2020

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