Effectiveness of nutrition interventions and approaches used for Management of Moderate Acute Malnutrition in Children of age 6-59 months – A Systematic Review Protocol

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Protocol

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Abstract

Background:

In year 2019 approximately 47.0 million children under five were wasted of which 32.3 million were moderately & remaining 14.3 million were severely wasted. Acute malnutrition has been estimated to be responsible for almost 12.6% of under five deaths globally. If remained untreated moderate Acute malnutrition (MAM) is likely to progress to Severe Acute Malnutrition (SAM). Both prevention and treatment of MAM are, therefore, likely to improve under-five survival globally. Therefore, this review aimed in determining the effectiveness of different approaches used for the management of MAM in Children 6-59 months of age in comparison with WHO Protocol for the management of MAM.

Methods:

Systematic review of Quantitative literature on Management of MAM in children 6-59 months using two electronic data bases (PubMed and Cochrane Library) and search engine (google scholars). Use of Grey literature, manual search and cross referencing were also performed. PRISMA checklist was used as a guide to this review. Total 14 studies out of XXXX were available for full text review based on eligibility criteria. Data extraction sheet was designed to extract relevant information. Overall Quality appraisal of included studies will be undertaken using Joanna Briggs Institute (JBI) checklist for RCTs and New castle checklist for other studies. Data Synthesis will be done using Review Manager software version 5.3.

Discussion: Acute malnutrition is a continuum condition, but severe and moderate forms are treated separately This review findings would expect to explore the effective interventions and approaches undertaken for the management of MAM; in order to support and advocate for uniform, effective, simpler and sustainable approach for its management and to ensure that all MAM children should have access to treatment and hence not been neglected or awaited till the situation deteriorated to SAM.

Systematic Review registration: PROSPERO, CRD42020161404

Background

Malnutrition remains a significant problem of developing countries. Maternal and child undernutrition comprised of Stunting (short height for age), Wasting (low weight for height), Under-weight (low weight for age) and Micronutrient deficiencies or hidden hunger (deficiency of essential vitamins and minerals) [1]. Despite of multiple efforts over decades, globally the current burden of malnutrition is still high. Estimated over 150 million of under five children are stunted and 50.5 million are wasted (severe and moderate acute malnutrition), these account for 22.2% and 7.5% of total under five children worldwide [2].

According to UNICEF, WHO and World Bank joint estimates report 2020, in year 2019 approximately 47.0 million children under five were wasted (6.9% of total under five children globally) of which 14.3 million were severely wasted (a weight-for-height at -3 Z-scores of median WHO growth standards with visible

severe wasting and/or presence of nutritional edema) [3]. More than two thirds (69%) of all wasted children under 5 lived in Asia and more than one quarter (27%) [3]

Acute malnutrition has been estimated to be responsible for almost 12.6% of deaths in children under 5 years of age [4], of this Severe Acute Malnutrition (SAM) contributes to 7.4% of the under-5 mortality [4]. South Asia is the home of 32 million acutely malnourished under 5 children higher than any other region, with greatest prevalence in India (26 million), Pakistan (3 million) and Bangladesh (2.2 million) [5]. Among acute malnutrition, the major proportion of children are moderately Acute Malnourished (MAM) (22 million). If they remained untreated due to any reason; MAM is likely to progress to SAM [5]. Both prevention and treatment of MAM are, therefore, likely to improve under-five survival globally [6]

According to key findings report of National Nutrition Survey, 2018; In Pakistan since 1997, the prevalence of low weight for height among young children is on the rise, from 8.6% in 1997 to 15.1% in 2011 and 17.7% in 2018 [7]. Despite improvements in other socioeconomic indicators, acute malnutrition remains in a state of nutrition emergency. This is the highest rate of wasting in Pakistan's history. [7]; Sindh province have even quite high prevalence of wasting than National figure (23.5% approx.) [7].

According to World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) MAM is defined as a low weight-for-height between -2 and -3 z-scores of the median WHO growth standards, without oedema [8], or an arm circumference between 115 and 125 mm, without oedema in children aged 6 to 59 months [9].

Over decades; Prevention and treatment of MAM demanded the development of specialized food products, including Fortified Blended Foods (FBFs) [10] and Lipid based Nutrient Supplements (LNS). Various formulations of Corn Soy Blend (CSB) and Wheat Soy Blend (WSB) have been used for the past five decades, evolving with the advances in scientific evidence of their nutritional value and impact [10] (refer table 1).

A review document by Food and Nutrition Technical Assistance; indicated high reliance on specialized food and no standardized approach for the management of MAM [11]. Similar document has delineated interventions used for treatment of MAM in developing countries of South Asia [11] (refer table 2).

The purpose for prescribing nutritional supplements/ therapy in acute malnutrition is to provide macro- and micronutrients in relatively large quantities to enable fast recovery. Since infants and children have small body sizes that limit the quantity of food that can be consumed at one time, the supplement must be energy dense and given at frequent intervals to satisfy the dietary need of these children.

In the absence of standard guidelines for the management of uncomplicated MAM and variety of products available and protocol followed for its management, it is important to systematically evaluate the effectiveness of the various approaches used or currently in practice for the management of MAM in children 6-59 months.

One recent Cochrane Review has evaluated the effectiveness and safety of LNS for the treatment of MAM in children 6 to 59 months of age but that is only confined with Lipid based supplements and doesn't captured any details for alternate approaches other than products like effective behaviour change communication counselling, reliance on indigenous food for its management, or optimizing on integrated preventive package rather than supplementary foods etc.

In addition; specialized supplements for MAM – CSB, Lipid based Nutrient Supplements (LNS), High Energy Biscuits (HBE) are program dependent commodities and have patchy coverage and supply inconsistencies, moreover such commodities also undermined the use and potential of indigenous food obtained through plant sources at highly reasonable cost. Therefore, it is expected that this review will provide insights on wider avenues for Policy makers and program implementers for effective, efficient, simpler and sustainable management of MAM in context of developing countries. Therefore, this review aimed in determine the effectiveness of different nutrition interventions use for the management of MAM in comparison WHO defined protocol for the management of MAM in children 6-59 months of age.

Methodology

This study is a systematic review of peer-reviewed Quantitative studies from literature on management approaches undertaken for the management of uncomplicated MAM in children 6-59 months of age using. The protocol of this systematic review is registered with 'International Prospective Register for Systematic Review' (PROSPERO) CRD CRD42020161404. This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines [13]. It comprised of 27 items checklist (refer annexure 1) to assist author to improve systematic review reporting [13].

Types of Studies

The review will include evidence from randomized controlled trials, both individual and cluster randomized, non-randomized controlled trials, both individual and cluster, which have a comparison group; Controlled before-and-after studies (CBA) and interrupted time series analyses, where allocation to the comparison groups was not carried out by the researchers.

Studies that containing only qualitative data and other forms of secondary studies, Commentaries, editorials, symposiums and conference proceedings will be excluded. The publication date will be restricted last five years starting from Jan 2014 to the present date (Nov 30th , 2019).

Types of Participants

Children 6-59 months of age identified with MAM using Middle Upper Arm Circumference (MUAC) tape between 115-125mm OR a Weight-for-Height Z-scores (WHZ) between -3 and -2 standards deviations of WHO 2006 child growth standards. Children must be from developing countries. Study participants identified with MAM based on the National Centre for Health Statistics (NCHS) references will not be included.

Intervention details

Any nutrition intervention that include therapeutic food, supplementary food, fortified food or infant young child feeding (IYCF) counselling opted for the Management of MAM in children 6-59 months of age. In addition to intervention, any implementation approaches OR alternate protocols and guidelines adopted for MAM management would be included in this review.

Outcomes

The primary study outcomes include cured or recovery from MAM (based on MUAC $\geq$ 12.5 cm and change in number of deaths in children 6-59 months due to non-provision of any intervention to children identified with MAM. Secondary outcome includes average weight gain, average MUAC gain, average length of stay & non-recovered (refer table 3).

Search Methods

The online electronic databases like Pub Med and Cochrane library and search engine – Google scholars were explored to identify studies exploring different modalities of nutrition interventions for the management of MAM in children of age 6-59 months. The information sources were searched using detailed search strategy. Grey literature like Global data base for Implementation of Nutrition Actions (GINA) and WHO regional data base, manual search and cross referencing were also given equal importance. The search terms were grouped into major concepts of Nutrition interventions, Acute malnutrition and children 6-59 months. Boolean operators “AND” and “OR” were used to combine or exclude keywords in a search, resulting in more focused and productive results (Refer table 4)

Study selection (Inclusion & Exclusion Criteria)

The PICO criteria (Population, Intervention, Comparison and Outcome) were used for study selection. The studies discussing on nutrition interventions or/and different protocols used for the management of MAM in children of age 6-59 months without medical complications were considered for this review. Studies conferring other forms of malnutrition (stunting, micronutrient deficiency, obesity), also severe form of acute malnutrition or malnutrition with any sign of medical complications was not be included in this SR. Moreover, studies targeting children less than 6 months of age or children older than 59 months were excluded from this review. The detailed inclusion and exclusion criterion for this review is shown in Table 5.

Database searches initially identified a total of 71,717 studies. After deduplication an applying filter for years of publication, English language and human as species; 10,490 studies were available for title screening and were screened by titles. From those screened studies, 128 studies were chosen for abstract review and remaining were dropped as not meeting the eligibility criteria or study objectives. Nineteen studies (N=19) were selected for full text review; however, five studies were excluded as not capturing the

intended outcome hence not considered further; therefore, only fourteen (n=14) studies were selected for this systematic review. (Fig 1 is explaining PRISMA flow diagram for database search of studies).

Data Extraction

Data extraction sheet has been developed considering the review context (Please refer annexure 2). Two authors will independently extract the required relevant information from all the articles (n=14) article available for full text review. Relevant data such as the details of the participants, methods, context, intervention, outcomes, results, Barriers in implementations and ethical concerns with its implementations will be extracted from the included articles. Any discrepancies will be resolved by mutual discussion and consensus

Quality Assessment

The quality appraisal of selected randomized Control Trail (RCTs) studies will be performed using Joanna Briggs Institute (JBI) checklist for Randomized Control trials (refer annexure 3) [14]. The purpose of using this checklist is to critically appraise the studies in a manner that is reviewer friendly and less time consuming. Whereas quality appraisal for non-randomized and other studies will be conducted using New Castle Ottawa Quality assessment scale checklist (refer annexure 5) [15].

Risk of Bias assessment for RCTs; we will use the Cochrane risk of bias tool [16] which assesses selection bias, performance bias, detection bias, attrition bias and reporting bias. We will rate each component as 'high', 'low', or 'unclear' for each risk of bias component. For non-randomised studies, we will use the Cochrane Effective Practice and Organisation of Care (EPOC) risk of bias criteria (based on additional criteria including similar baseline outcome measurements).

Data Synthesis

If included studies are found to be similar in terms of research question, study design and outcome measures reported, a meta-analysis will be carried out for the assessment of heterogeneity and to obtain a pooled estimate of effect. Where meta-analysis is not possible synthesis will be performed using narrative approach.

Subgroup and Sensitivity Analysis

Depending on time and data availability subgroup analysis will be carried out to assess the effectiveness in children of age category 6-23 months and children from 2-5 years. A sub-group analysis may be carried out to ascertain whether there is a significant difference between studies with "No intervention" comparison group and those with an alternative intervention (not CMAM) as a comparison group

Results

In progress

Discussion

In progress

Conclusion

In progress

List Of Abbreviations

CMAM- Community Based Management of Acute Malnutrition

CSB- Corn Soya Blend

FBF- Fortified Blended Food

HBE- High Energy Biscuits

JB- Joanna Briggs Institute

LNS- Lipid based Nutrient Supplements

MAM- Moderate Acute Malnutrition

PRISMA- Preferred Reporting Items for Systematic review and Meta-Analysis

PROSPERO- Prospective Register for Systematic Reviews

RUSF- Ready to Use Supplementary Food

RUTF- Ready to use Therapeutic Food

SAM – Severe Acute Malnutrition

UNICEF- United Nations Children Emergency Fund

WHO- World Health Organization

WSB- Wheat Soya Blend

Declarations

Ethical Approval and Consent to participate: Since this study doesn't involve human subjects and completely dealing with secondary studies therefore ethical approval was not attempted for this review

Consent for publication: Dr Amir Ali Samnani, author of this study provide consent to BMC to publish my review protocol without disclosing the author details

Availability of supporting data: Data can be requested from corresponding author once gathered and analysed

Competing interests: Not applicable

Funding: Not applicable

Authors' contributions: Amir Ali Samnani (AS) involved in conceptualizing the whole review idea and writing of protocol, both Authors AS & Mehak Azim (MA) involved in searching of studies, screening of articles and review of finally chosen articles with consensus to be included in this review.

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Tables

Table 1: Milestones in development of Specialized Food Products for MAM Treatment [10]

Timeframe	Specialized Food Product
1964	Cereal–plant–protein (Ceplapro) prototype FBF developed for Food for Peace (FFP)
1966–1970s	Corn–Soy Milk (CSM), Corn–Soy Blend (CSB), UNIMIX
1980s	High-Energy Biscuits (HEBs)
1990s	Ready-to-Use Therapeutic Foods (RUTFs)-sometimes used in MAM programming
2000s	Ready-to-Use-Supplementary Foods (RUSFs) Lipid-Based Nutrient Supplements Other fortified-soy flours
2010s	Enhanced variants of Corn-Soy Blend and Wheat-Soy Blend (Super cereals with new micronutrient formulations), new FBFs made of alternative grains and pulses, emergency survival bars/pastes, reformulated high-energy biscuits

Table 2: Commodities used for MAM treatment in Asian countries [11]

Countries	Interventions for MAM
Afghanistan	Ready to use Supplementary food (RUSF)
Bangladesh	Wheat Soy Blend (WSB+) planned for Chickpea-based RUSF
Pakistan	Acha Mum
Sri-Lanka	Super cereal plus (CSB++)
Myanmar	Fortified mixture of 125gm rice, 125g yellow means, 50gm sugar and 43gm Oil
Combodia	CSB++
Vietnam	Hebi Mam (RUSF)

Table 3: Outcomes:

Outcomes	Measurement variable	Method of aggregation
Cured	MUAC $\geq$ 125mm and no edema	proportion
Died	Number of malnourished children died	proportion
Secondary Outcome		
Average weight gain (MAM) cases	Difference in weight (weight at time of admission and weight after discharge from program)	Mean (in gm)
Average MUAC gain (MAM)	Difference in MUAC (MUAC at time of admission and MUAC after discharge from program)	Mean (in mm)
Average length of Stay (MAM)	Days in treatment	Mean (in days)
Non recovered	Children not attain the MUAC of 125mm over a period of four months (maximum)	proportion

Table 4: Search strategy

Concepts	Search Terms
Population	children age 6-59 months OR children under 5 years OR children less than 5 years OR young children.
Intervention	Nutrition Interventions OR supplementary food OR therapeutic food OR dietary supplements OR Sprinkles OR counselling
Outcomes	Acute Malnutrition OR Moderate Acute malnutrition OR moderate wasting OR wasting
Filters	Year of Publication; Jan 1 st , 2014 till Nov 30 th ; 2019 Species: Human species Language: English

Table 5: Eligibility Criteria

Attribute	Inclusion Criteria	Exclusion Criteria
Population	Children of age 6-59 months with Moderate Acute Malnutrition without any medical complications	Studies involving children less than 6 months of age or children of age over 5 years. Children with medical complications or with Severe acute malnutrition
Intervention	Nutrition improvement interventions (including supplements, therapeutic food or sprinkles, dietary counselling, integrated preventive package)	Non-nutrition interventions
Comparison	Comparing with WHO protocols for the management of MAM	
Outcome	a. Cured rate b. Change in Mortality rate of children 6-59 months Secondary Outcome: Average Length of Stay	Any Health outcome other than related to nutrition (improved IQ, brain development etc.)
Study design	The review will include evidence from randomized controlled trials, both individual and cluster randomized, non-randomized controlled trials, both individual and cluster, which have a comparison group; Controlled before-and-after studies (CBA) and interrupted time series analyses, where allocation to the comparison groups was not carried out by the researchers.	Secondary literature (reviews), Qualitative study only, Commentaries, editorials, symposiums and conference case-control studies, cohort studies, cross-sectional studies, qualitative formative assessment, discussion paper, thesis dissertation papers reviews Proceedings

Figures

Figure 1

PRISMA flow diagram for database search of studies

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