EFFECTS OF INTEGRATED NUTRITION-SPECIFIC AND NUTRITION-SENSITIVE INTERVENTIONS ON CHILD GROWTH OUTCOMES IN LOW- AND MIDDLE-INCOME COUNTRIES: A SYSTEMATIC REVIEW

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eISSN: 2828-4070
https://doi.org/10.69951/proceedingsbookoficeonimeri.v9i-.307
Proceedings ICE on IMERI. 2025.
Received: October 25th, 2025
Accepted: January 22nd, 2026
Published online: February 6th, 2026

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Abstract

Undernutrition and impaired linear growth among children under five years old remain as major public health challenges in low- and middle-income countries (LMICs). This systematic review evaluated the effects of integrated nutrition-specific interventions (infant and young child feeding [IYCF] counseling, micronutrient supplementation, and home-based health promotion) and nutrition-sensitive interventions (agriculture, cash transfers, water, sanitation, and hygiene [WASH] and behavior-change communication) on child growth outcomes. Following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2020 guidelines, we included cluster randomized trials, randomized controlled trials, and quasi-experimental studies reporting anthropometric outcomes in children aged 0–59 months including height-for-age z-score or length-for-age z-score (HAZ/LAZ), weight-for-age z-score (WAZ), and weight-for-height z-score (WHZ). Searches on PubMed, Cochrane CENTRAL, Google Scholar, and OpenAlex identified 4,041 records; 12 studies met the inclusion criteria and meta-analysis was not conducted due to heterogeneity. Nutrition-specific interventions consistently improved breastfeeding and complementary feeding practices and were associated with small improvements in linear growth and child development in some settings (e.g., Tanzania: standardized mean difference (SMD) for cognitive development = 0.15 [95% CI 0.05–0.24] and for motor development = 0.16 [95% CI 0.03–0.28], indicating small but statistically significant effect sizes). Facility-based conseling increased exclusive breastfeeding (+12.8 percentage points [2.1–23.6]) without significant anthropometric effects. Agriculture interventions combined with behavior-change communication improved diet quality and modestly increased linear growth (Ethiopia: HAZ +0.28 [0.02–0.54]; Ghana: $\beta \approx 0.40$–0.44). In contrast, WASH-only interventions in Bangladesh, Zimbabwe, and Cambodia showed no meaningful effects on growth. Integrated nutrition-specific and nutrition-sensitive programs produce modest but meaningful gains in linear growth when delivered with high program intensity and caregiver engagement, whereas WASH alone is insufficient.

Keywords: agriculture, child growth, HAZ, IYCF, WASH

Introduction

Undernutrition in children remains a major public health concern in low- and middle-income countries (LMICs). In 2022, it was estimated that 148 million children under five years old were stunted and 37 million were overweight, reflecting a persistent and evolving burden of malnutrition worldwide.[1,2] Stunting is strongly associated with increased morbidity and mortality, reduced cognitive development, lower educational attainment and economic productivity, and higher risk of non-communicable diseases in adulthood.[3,4]

Over the past decade, global initiatives have emphasized a life-course approach to maternal, infant, and young child nutrition. The 2013 Lancet Maternal and Child Nutrition Series distinguished nutrition-specific interventions, which addressed immediate determinants of fetal and child nutrition (adequate food and nutrient intake, caregiving, and disease) from nutrition-sensitive interventions, which acted on underlying determinants such as food security, agriculture, social protection, women's empowerment, and WASH.[1,5–7] Scaling up a package of evidence-based nutrition-specific actions at high coverage could avert a substantial proportion of under-five deaths,[8] yet these interventions alone are insufficient to eliminate stunting, particularly where structural deprivations persist.

Consequently, multisectoral strategies that integrate nutrition-specific actions with agriculture, social protection, early child development, and WASH have been promoted as a pathway to sustainable improvements in child growth and development.[5,7,9] A growing number of large cluster randomized trials have evaluated such integrated programs in LMICs, particularly in sub-Saharan Africa and South Asia. However, findings have been mixed: some interventions have improved diet quality, breastfeeding practices, or developmental scores with modest gains in height-for-age, while others—especially WASH-only packages—have shown little or no benefit for linear growth.[10–12]

Previous reviews have typically combined diverse study designs or focused on specific sectors (e.g., agriculture or WASH), making it difficult for policymakers to understand the added value of integration and the conditions under which it is most effective.[13,14] This systematic review therefore focuses on experimental and quasi-experimental studies with robust designs conducted in LMICs, synthesizing evidence on how nutrition-specific and nutrition-sensitive programs, alone and in combination, influence child anthropometric outcomes.

The objectives were to synthesize evidence from cluster randomized controlled trials (C-RCTs), randomized controlled trials (RCTs), and strong quasi-experimental studies assessing the effects of nutrition-specific and nutrition-sensitive programs on child growth in LMICs, and to identify consistent pathways leading to improved height-for-age and weight-for-age outcomes.

Materials and Methods

Study Design and Reporting Guideline

This systematic review was conducted in accordance with the PRISMA 2020 reporting guideline. The protocol was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO)

Eligibility Criteria (PICOS)

Eligibility criteria were defined a priori using the PICOS framework. The population included pregnant women, caregivers, and children under five years of age residing in low- and middle-income countries (LMICs), as classified by the World Bank at the time each study was conducted. Eligible interventions comprised at least one nutrition-specific component, including infant and young child feeding (IYCF) counseling, micronutrient supplementation, or home-based health promotion, and/or at least one nutrition-sensitive component, including agriculture or livestock interventions, cash transfers or other social protection mechanisms, water, sanitation and hygiene (WASH) activities, and integrated behavior-change communication strategies. Comparators included usual care, minimal intervention, or alternative program packages without the nutrition component under evaluation. Eligible outcomes were child anthropometric indicators, including height-for-age or length-for-age z-scores (HAZ/LAZ), weight-for-age (WAZ), weight-for-height (WHZ), mid-upper arm circumference z-scores (MUAC-Z), and binary indicators of stunting, wasting, or underweight. Secondary outcomes included child development and dietary quality when reported. Eligible study designs included cluster randomized controlled trials (C-RCTs), individually randomized controlled trials (RCTs), and quasi-experimental studies with clearly defined comparison groups. Observational cross-sectional studies, uncontrolled before–after evaluations, protocols, reviews, and studies conducted exclusively in high-income or upper-middle-income countries were excluded.

Search Strategy

A comprehensive search was conducted in PubMed, Cochrane CENTRAL, Google Scholar, and OpenAlex. To identify unpublished or ongoing studies, additional searches were performed in ClinicalTrials.gov and the WHO International Clinical Trials Registry Platform (ICTRP), and reference lists of relevant reviews and eligible trials were screened. Search terms combined controlled vocabulary and free-text keywords related to child growth, stunting, nutrition-specific and nutrition-sensitive interventions, agriculture, cash transfer, WASH, integrated programs, and LMIC country names. Searches were limited to studies published from January 2013 onward, reflecting the formalization of nutrition-sensitive frameworks following the 2013 Lancet and WHO initiatives. Only articles published in English were included to ensure accurate screening, data extraction, and methodological appraisal.

Study Selection

All records were imported into reference management software and duplicates were removed. Two reviewers independently screened titles and abstracts, followed by full-text assessment of potentially eligible studies. Disagreements were resolved through discussion or consultation with a third reviewer. Reasons for full-text exclusion were documented.

Data Extraction

A standardized data extraction form was developed and pilot-tested. Extracted information included study design, setting, sample size, participant characteristics, intervention components, duration of follow-up, and reported outcomes. Effect estimates and corresponding 95% confidence intervals were extracted directly from published reports without additional statistical recalculation.

Risk of Bias Assessment

Risk of bias was assessed independently by two reviewers using the Cochrane RoB 2.0 tool for randomized trials and ROBINS-I for quasi-experimental studies. Domains included randomization, allocation concealment, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. An overall judgment was assigned to each study.

Data Synthesis and Certainty of Evidence

Due to substantial heterogeneity in intervention components, outcome definitions, and follow-up duration, meta-analysis was not conducted. A narrative synthesis was performed by grouping studies into nutrition-specific interventions, nutrition-sensitive agriculture or social protection interventions, and WASH-only versus combined packages. Certainty of evidence for major outcomes was evaluated using the GRADE approach.

Results

After removal of 1,714 duplicates, 2,327 unique records from bibliographic databases remained for title and abstract screening. In addition, 26 records were identified through clinical trial registries (ClinicalTrials.gov and WHO ICTRP) and were screened separately. Two reviewers independently screened titles and abstracts against the eligibility criteria; disagreements were resolved by discussion or consultation with a third reviewer.

Full texts of potentially relevant articles from database searches (n = 98) were retrieved and assessed for eligibility. Of these, 48 full-text articles were excluded (27 wrong

outcomes, 12 protocols or review papers, and 9 reporting maternal-only outcomes). All 26 registry records were excluded because they were either ongoing without available outcome data, already published, conducted in non-LMIC settings, or did not evaluate child anthropometric outcomes relevant to integrated nutrition interventions. Finally, 12 studies met the inclusion criteria and were retained for qualitative synthesis (Figure 1).

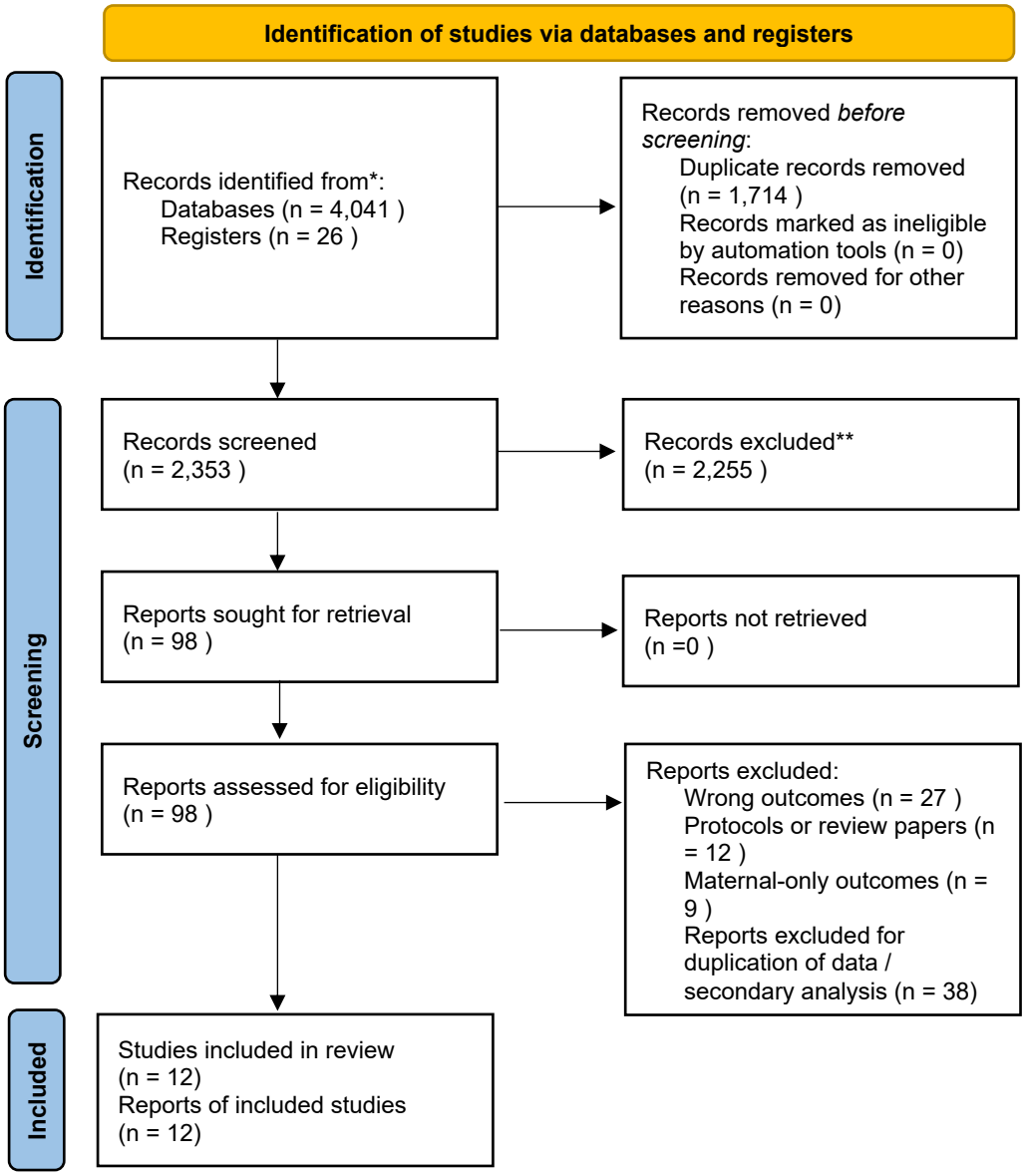

Figure 1. PRISMA 2020 Flow Diagram of Study Selection from Databases and Trial Registries

The main characteristics of the included studies are summarized in Table 1, including country, study design, target population, intervention and comparator, intervention duration, and primary outcomes. The twelve included studies were conducted across ten LMICs, mainly in sub-Saharan Africa (Burkina Faso, Ethiopia, Ghana, Kenya, Somalia,

Tanzania, and Zimbabwe) and South Asia (Bangladesh, Nepal, and Cambodia). Of these, eight were cluster randomized controlled trials and four were quasi-experimental evaluations examining program implementation or participation. Intervention durations ranged from 12 to 36 months, with follow-up assessments focused primarily on early childhood (6–24 months of age).

Risk of bias for randomized controlled trials assessed using the Cochrane RoB 2.0 tool is presented in Table 2, while risk of bias for quasi-experimental studies assessed using ROBINS-I is summarized in Table 3.

Table 1. Characteristics of Included Studies by Intervention Category

Category 1 – Nutrition-specific interventions

Study	Country	Design	Population	Intervention	Comparator	Duration	Main Outcomes
Sudfeld, et al.	Tanzania	Cluster RCT	Caregivers with young children (early childhood follow-up)	CHW home visits ± CCT	Usual care	24 months	Child development, HAZ
Nikièma, et al.	Burkina Faso	RCT	Infants	Facility-based maternal nutrition counseling	Standard care	18 months	Exclusive breastfeeding
Ali, et al.	Somalia	Quasi-experimental	Children <2 yrs	Nutrition counseling + cash transfer	Pre–post	12 months	WAZ, food security, child growth

Category 2 – Nutrition-sensitive Agriculture / Social Protection

Study	Country	Design	Intervention	Comparator	Duration	Main Outcomes
Wegmüller, et al.	Kenya	Cluster RCT	Integrated agriculture + nutrition package	Control	24 months	HAZ, anemia
Passarelli, et al.	Ethiopia	Cluster RCT	Poultry production + BCC	Control	18 months	HAZ, egg intake
Dallmann, et al.	Ghana	Quasi-experimental	Level of maternal participation in agriculture–nutrition program	Lower participation	24 months	Egg intake, LAZ/HAZ
Olney, et al.	Burkina Faso	Quasi-experimental	Agriculture + BCC (Enhanced Homestead Food Production)	Low participation	36 months	Hemoglobin, anemia
Miller, et al.	Nepal	Cluster RCT	Multisectoral agriculture–nutrition–WASH package	Control communities	24 months	LAZ, stunting, dietary diversity

Category 3 – WASH-only and Combined WASH–nutrition

Study	Country	Design	Arms	Duration	Main Outcomes
Luby, et al.	Bangladesh	Cluster RCT	WASH / Nutrition / Combined	24 months	LAZ, stunting
Humphrey, et al.	Zimbabwe	Cluster RCT	IYCF / WASH / Combined	18 months	LAZ, anemia
Lai, et al.	Cambodia	Cluster RCT	Nutrition-only; sanitation-only; combined nutrition + sanitation; control	18 months	LAZ, stunting
Waid, et al.	Bangladesh	Quasi-experimental	Essential Nutrition Actions (ENA) implementation vs pre-intervention comparison	12 months	WAZ, infant and young child feeding practices

Despite variation in delivery platforms and content, the interventions were clustered into three broad categories. First, nutrition-specific and early child development interventions included community health worker (CHW) home-visiting programs, delivered with or without conditional cash transfers in Tanzania; facility-based personalized maternal nutrition counseling in Burkina Faso; implementation of the Essential Nutrition Actions (ENA) framework in Bangladesh; and IYCF counseling that formed part of larger WASH or infant feeding trials in both Zimbabwe and Bangladesh.[15–19] Second, nutrition-sensitive agriculture and social protection interventions comprised integrated agriculture–nutrition packages delivered through smallholder support platforms in Kenya, poultry production interventions combined with intensive behavior-change communication (BCC) in Ethiopia, nutrition-sensitive agricultural programs with varying levels of maternal participation in Ghana, and the Enhanced Homestead Food Production (E-HFP) approach coupled with BCC in Burkina Faso.[20–24] Finally, evaluations of WASH-only and combined WASH–nutrition packages included the WASH Benefits trial in rural Bangladesh assessing water quality, sanitation, handwashing, nutrition, and combined intervention arms; the SHINE trial in Zimbabwe investigating the independent and combined effects of IYCF and WASH on child growth and anemia; and a factorial trial in Cambodia testing nutrition-only, sanitation-only, and combined nutrition–sanitation interventions.[18,19,25]

Table 2. Risk of Bias Assessment for Randomized Controlled Trials (Cochrane RoB 2.0)

Study	Randomization process	Deviations from intended interventions	Missing outcome data	Measurement of outcome	Selection of reported result	Overall Risk
Wegmüller (2022)	Low	Low	Low	Low	Low	Low
Miller (2020)	Some concerns	Low	Low	Low	Some concerns	Some concerns
Sudfeld (2021)	Low	Low	Low	Low	Low	Low
Nikièma (2017)	Some concerns	Low	Low	Low	Some concerns	Some concerns
Passarelli (2020)	Low	Low	Low	Low	Low	Low
Lai (2022)	Low	Low	Low	Low	Low	Low
Luby (2018)	Low	Low	Low	Low	Low	Low
Humphrey (2019)	Low	Low	Low	Low	Low	Low

Table 3. Risk of Bias Assessment for Quasi-Experimental Studies (ROBINS-I)

Study	Confounding	Selection of Participants	Classification of Interventions	Deviations from Intended Interventions	Missing Data	Measurement of Outcomes	Selective Reporting	Overall Risk
Dallmann (2022)	Moderate	Low	Low	Low	Low	Low	Low	Moderate
Waid (2019)	Serious	Low	Low	Low	Some concerns	Low	Some concerns	Serious
Ali (2022)	Moderate	Low	Low	Low	Low	Low	Low	Moderate
Olney (2015)	Some concerns	Some concerns	Low	Low	Low	Some concerns	Some concerns	Some concerns

Most C-RCTs were judged to have low risk of bias across domains, with adequate randomization, allocation concealment, and minimal missing outcome data.[15,18–20,22,25] Some trials had "some concerns" due to limited reporting of allocation procedures or selective reporting of secondary outcomes.[16,21,24] Quasi-experimental evaluations ranged from moderate to serious overall risk, mainly due to potential confounding and non-random program participation.[17,23,26]

In Tanzania, a cluster-randomized trial evaluating a home-based community health worker (CHW) intervention with or without conditional cash transfers (CCT) demonstrated small but statistically significant improvements in child developmental outcomes. Compared with control, the CHW arm improved cognitive development (standardized mean difference [SMD] 0.15, 95% CI 0.05–0.24), while the CHW+CCT arm further increased cognitive scores (SMD 0.18, 95% CI 0.07–0.28) and improved motor development (SMD 0.16, 95% CI 0.03–0.28); additional gains were observed for language development in the CHW+CCT group (SMD 0.08, 95% CI 0.01–0.15). In the primary intention-to-treat analysis, neither intervention significantly affected height-for-age z-score (HAZ); however, multivariable adjusted analyses suggested modest positive effects on linear growth.[15]

In Burkina Faso, a facility-based personalized maternal nutrition counseling intervention significantly increased exclusive breastfeeding (+12.8 percentage points, 95% CI 2.1–23.6) and feeding frequency (+14.1 percentage points, 9.0–19.2) among infants, yet did not translate into measurable anthropometric gains by 18 months of age.[16] In Bangladesh, implementation of the ENA framework was associated with improvements in WAZ and feeding practices relative to pre-intervention observations, although the quasi-experimental design and lack of a concurrent control group resulted in serious risk of confounding.[17] Several trials integrating agriculture or livestock support with nutrition behavior-change communication demonstrated consistent improvements in diet quality and modest gains in linear growth.

In Ethiopia, a chicken production intervention combined with intensive BCC led to increased egg consumption and improved HAZ. Midline HAZ was higher in the intervention group by 0.28 z-scores (95% CI 0.02–0.54), with a smaller but still statistically significant difference at endline (+0.18, 0.01–0.36).[22] In rural Ghana, higher maternal participation in a nutrition-sensitive agriculture program was associated with greater child egg intake (adjusted odds ratio 3.03, 95% CI 1.15–7.94) and improved linear growth (regression coefficients for LAZ/HAZ approximately 0.40–0.44 in the highest participation group compared with lower participation).[23]

An integrated agriculture–nutrition package in Kenya and the E-HFP program in Burkina Faso reported positive effects on diet diversity and selected micronutrient outcomes, with suggestive improvements in HAZ but variable statistical significance.[20,24] In Burkina Faso, among children aged 3–5.9 months at baseline, the E-HFP plus BCC program increased mean hemoglobin by 0.74 g/dL (p=0.03) and reduced anemia prevalence by 14.6 percentage points (p=0.03) at follow-up.[24]

Across three large C-RCTs in Bangladesh, Zimbabwe, and Cambodia, WASH-only interventions consistently failed to improve linear growth.[18,19,25] In the WASH Benefits trial, water, sanitation, and handwashing packages did not affect LAZ or stunting, whereas nutrition and combined WASH+nutrition arms produced small positive effects on growth.[19] Likewise, in the SHINE trial, IYCF improved LAZ and hemoglobin, while WASH-only arms had no meaningful effect on stunting or anemia.[18] In Cambodia, sanitation-only interventions were ineffective, whereas nutrition or combined arms produced small increases in LAZ.[25]

Table 4. GRADE Summary of Findings for Integrated Nutrition Interventions and Child Growth Outcomes

Outcome	No. of participants (studies)	Study design	Effect (direction)	Certainty of evidence (GRADE)	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Overall judgment
Linear growth (HAZ/LAZ) – Nutrition-specific	Several thousand (3 studies)	1 RCT, 2 quasi-experimental	No consistent statistically significant improvement	Moderate	Some concerns	Serious	Not serious	Serious	Undetected	Downgraded for inconsistency and imprecision
Linear growth (HAZ/LAZ) – Agriculture + BCC	Large multi-site samples (4 studies)	3 cluster RCTs, 1 quasi-experimental	Small improvement in some trials	Moderate	Some concerns	Serious	Not serious	Serious	Undetected	Downgraded for heterogeneity and imprecision
Breastfeeding / feeding practices	Several thousand (3 studies)	2 cluster RCTs, 1 quasi-experimental	Consistent improvement	Moderate	Some concerns	Not serious	Not serious	Not serious	Undetected	No downgrading
WASH-only interventions on linear growth	Large multicenter samples (3 trials)	3 large cluster RCTs	No effect on linear growth	High	Not serious	Not serious	Not serious	Not serious	Undetected	No downgrading

Overall, evidence from the twelve experimental and quasi-experimental studies indicated that nutrition-specific interventions, when delivered with adequate coverage and program intensity, were capable of improving breastfeeding practices, complementary feeding behaviors, and child developmental outcomes, while their effects on anthropometric indicators tend to be modest and highly context-dependent. Agriculture and other nutrition-sensitive programs that explicitly integrate nutrition behavior-change communication and achieve high levels of caregiver participation were consistently associated with improvements in diet quality and small but meaningful gains in linear growth (HAZ). In contrast, WASH-only intervention packages, even when implemented under rigorously controlled trial conditions, appeared insufficient to produce measurable improvements in child growth in high-burden settings. Evidence suggested that modest benefits for linear growth were more likely to arise when WASH components were combined with nutrition interventions and behavior-change strategies rather than delivered in isolation.

Using the GRADE approach, the certainty of evidence was rated as moderate for the effects of nutrition-specific and agriculture-plus-BCC interventions on linear growth, moderate for outcomes related to breastfeeding and feeding practices due to some concerns regarding risk of bias and imprecision, and high for the consistent null effects observed for WASH-only interventions across multiple large trials (Table 4).

Discussion

This systematic review synthesizes evidence from 12 high-quality trials and quasi-experimental studies evaluating integrated nutrition interventions in LMICs. Our findings show that multi-component interventions integrating nutrition-specific and nutrition-sensitive approaches generally yield modest yet meaningful improvements in child diet and linear growth, whereas WASH-only packages produce no measurable anthropometric benefits, despite substantial investments.

The observed pattern aligns with conceptual frameworks from the Lancet Maternal and Child Nutrition Series, which posit that nutrition-specific interventions need to be complemented by actions addressing underlying determinants of diet and disease.[5,7,8] Integrated agriculture–nutrition programs that successfully increased household production of animal-source foods and leveraged strong BCC (as in Ethiopia, Ghana, and Burkina Faso) were able to translate gains in diet quality into small improvements in HAZ and hemoglobin.[22,23,27] These findings reinforce the notion that agriculture and social protection programs must be nutrition-sensitive by design, with explicit objectives for maternal and child nutrition and mechanisms for engaging caregivers.[5,15]

At the same time, the limited impact of facility-based counseling on growth, despite large improvements in breastfeeding and feeding practices, highlighted the multifactorial

nature of stunting.[16] Persistent poverty, high prevalence of infections, environmental enteric dysfunction, and inadequate food environments may attenuate the translation of improved practices into anthropometric gains.[3,10,28]

The consistent absence of effect of WASH-only interventions on linear growth in three independent large-scale trials echoed prior reviews and had shifted global thinking about the role of household-level WASH in stunting reduction.[10,28] Even substantial improvements in latrine coverage and handwashing behaviors may be insufficient to reduce pathogen exposure to the degree needed to affect growth, especially where animals co-habitate in household compounds or fecal contamination is widespread in the wider environment.[10,28] These findings underscored the need for broader food systems and environmental health approaches alongside nutrition interventions.[6,28]

For policymakers in LMICs, this review highlights the need to prioritize integrated program packages that link IYCF counseling, home-based support, and early child stimulation with nutrition-sensitive interventions such as agriculture, social safety nets, and women's empowerment initiatives.[5,6,8] Program design should place strong emphasis on implementation intensity and caregiver participation, as the most consistent improvements in child diet quality and linear growth have been observed where community health workers conducted regular home visits, conditional transfers reinforced behavior-change messaging, and mothers were actively engaged in agriculture and BCC activities.[15,20,23] At the same time, there is a need to re-evaluate large-scale WASH investments that are pursued primarily for stunting reduction. Although access to safe water and sanitation remains fundamental for child survival, health, and dignity, expectations of substantial direct effects on linear growth should be moderated, and WASH programs should be positioned as complementary components within broader nutrition and food-system strategies rather than implemented in isolation.[10,28] Finally, policymakers should strengthen monitoring and evaluation frameworks by adopting harmonized anthropometric indicators and tracking key intermediate outcomes—including dietary practices, morbidity patterns, and caregiver behaviors—to facilitate cross-country learning and enable more robust future evidence synthesis.[1,29]

Strengths and limitations

This review has several strengths. We applied a comprehensive search strategy across multiple databases, adhered to PRISMA 2020 guidance, and restricted inclusion to C-RCTs, RCTs, and robust quasi-experiments, thereby enhancing internal validity. Risk of bias was systematically assessed using RoB 2.0 and ROBINS-I, and certainty of evidence was graded using the GRADE framework.[11,29,30]

Although improvements in breastfeeding and complementary feeding practices were consistently observed across studies, the certainty of evidence was downgraded to

moderate because several contributing studies were quasi-experimental and some outcomes exhibited imprecision, consistent with the GRADE framework.

However, some limitations should be acknowledged. First, substantial heterogeneity in intervention content, delivery platforms, and follow-up periods precluded quantitative meta-analysis; our synthesis is therefore narrative. Second, quasi-experimental studies were susceptible to confounding by unmeasured differences between high- and low-participation groups.[15,26] Third, most trials did not report implementation fidelity or cost-effectiveness, limiting our ability to infer scalability. Finally, publication bias cannot be excluded; integrated programs with null results may remain unpublished.

Future research

Future work should prioritize comparative effectiveness studies that explicitly test different combinations and intensities of nutrition-specific and nutrition-sensitive components, alongside longitudinal evaluations that follow children beyond 24 months to capture sustained effects on growth, schooling, and cognitive outcomes. In parallel, implementation research is needed to clarify how political commitment, governance, and financing influence the design, scale-up, and long-term success of multisectoral nutrition strategies.[9,20]

Conclusions

Evidence from experimental and quasi-experimental studies suggested that integrated nutrition-specific and nutrition-sensitive interventions were associated with improvements in child diet quality and small, context-dependent gains in linear growth, particularly when implementation intensity and caregiver engagement are high. In contrast, WASH-only interventions consistently showed no measurable effect on anthropometric outcomes. For LMICs, these findings supported prioritizing integrated, multisectoral strategies that embed nutrition actions within agriculture, social protection, and early child development platforms, while recognizing that WASH is necessary for child health but insufficient on its own to improve growth. Continued efforts to harmonize outcome reporting, strengthen implementation quality, and sustain political commitment will be essential to enhance comparability across studies and inform scalable child nutrition policies.

Competing Interests
The authors declare that they have no competing interests.

Acknowledgments

The authors express their sincere appreciation to the Faculty of Medicine, Universitas Sriwijaya, for the support provided. No external funding was received for this work.

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