

Scoping Review: Factors Contributing to the Success of Community-Based Interventions in Improving Animal Protein Intake among Children Aged 6–23 Months (Studies in Low-Income and Middle-Income Countries)

Tinjauan Cakupan: Faktor-faktor yang Berkontribusi pada Keberhasilan Intervensi Berbasis Komunitas dalam Meningkatkan Asupan Protein Hewani pada Anak Usia 6–23 Bulan (Studi di Negara Berpendapatan Rendah dan Menengah)

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Abstract

Purpose: The intake of animal protein among children aged 6–23 months in low-income and middle-income countries remains far below WHO recommendations. This scoping review aims to map community health worker–based interventions in improving animal protein intake during complementary feeding. **Methods:** Through a systematic search of the Scopus, PubMed, and EBSCOhost databases, 12 studies from various low-income and middle-income countries were analyzed using the Joanna Briggs Institute appraisal tool. Twelve studies from Africa, Asia, and Latin America met the inclusion criteria. All studies reported improvements in maternal knowledge related to animal-source protein (ranging from 19% to 37%) and positive changes in complementary feeding practices, including increased consumption of animal-source foods and improved dietary diversity. Several studies also demonstrated favorable impacts on child nutritional status, with reductions in stunting of up to 8.1%. Five main intervention strategies were identified: face-to-face nutrition education, community-based behavior change communication, home visits, combined lipid-based supplementation, and practical learning approaches. Ten enabling factors were consistently reported, particularly adequate CHW training, strong health system support, high CHW motivation, family involvement, and availability of local animal-source foods. Conversely, nine major barriers were identified, most notably household economic constraints, which were reported across all studies. **Conclusion:** Community-based interventions led by community health workers are effective in improving animal-source protein intake and complementary feeding practices among children under two years of age in LMICs. Program success depends on the interaction between well-trained and supported CHWs, enabling household and community environments, and broader socioeconomic conditions. Addressing structural barriers, especially household economic limitations, is essential to sustain and scale up effective interventions.

Keywords: Animal-Source Foods, Community Health Workers, Complementary Feeding, Nutrition Education, Intervention Barriers.

Abstrak

Tujuan: Asupan protein hewani pada anak usia 6–23 bulan di negara berpenghasilan rendah dan menengah masih jauh di bawah rekomendasi WHO. Tinjauan cakupan ini bertujuan untuk memetakan intervensi berbasis petugas kesehatan masyarakat dalam meningkatkan asupan protein hewani selama pemberian makanan pendamping. **Metode:** Melalui pencarian sistematis di basis data Scopus, PubMed, dan EBSCOhost, 12 studi dari berbagai negara berpenghasilan rendah dan menengah dianalisis menggunakan alat penilaian Joanna Briggs Institute. Hasil: Seluruh studi melaporkan peningkatan pengetahuan ibu terkait protein hewani (berkisar antara 19%–37%) serta perubahan positif dalam praktik pemberian makanan pendamping, termasuk peningkatan konsumsi makanan sumber hewani dan keragaman pangan. Beberapa studi juga menunjukkan dampak yang menguntungkan terhadap status gizi anak, dengan penurunan prevalensi stunting hingga 8,1%. Lima strategi intervensi utama diidentifikasi, yaitu pendidikan gizi tatap muka, komunikasi perubahan perilaku berbasis masyarakat, kunjungan rumah, suplementasi berbasis lipid secara kombinasi, dan pendekatan pembelajaran praktis. Sepuluh faktor pendukung dilaporkan secara konsisten, terutama pelatihan petugas kesehatan masyarakat yang memadai, dukungan sistem kesehatan yang kuat, motivasi kader yang tinggi, keterlibatan keluarga, serta ketersediaan makanan sumber hewani lokal. Sebaliknya, sembilan hambatan utama juga diidentifikasi, dengan kendala ekonomi rumah tangga sebagai hambatan paling dominan dan ditemukan pada seluruh

studi. Kesimpulan: Intervensi berbasis komunitas yang dipimpin oleh petugas kesehatan masyarakat efektif dalam meningkatkan asupan protein hewani dan praktik pemberian makanan pendamping pada anak di bawah usia dua tahun di negara berpendapatan rendah dan menengah. Keberhasilan program bergantung pada interaksi antara petugas kesehatan masyarakat yang terlatih dan didukung dengan baik, lingkungan rumah tangga dan komunitas yang mendukung, serta kondisi sosial ekonomi yang lebih luas. Upaya untuk mengatasi hambatan struktural, khususnya keterbatasan ekonomi rumah tangga, sangat penting untuk mempertahankan dan memperluas implementasi intervensi yang efektif.

Kata Kunci: Makanan Sumber Hewani, Petugas Kesehatan Masyarakat, Pemberian Makanan Pendamping, Pendidikan Gizi, Hambatan Intervensi.



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Introduction

The critical period for physical, cognitive, language, and socio-emotional development occurs within the first 1,000 days of life, spanning from conception to a child's second birthday.[1,2] During this period, adequate intake of both macronutrients and micronutrients is essential to support optimal brain development and physical growth.[3] Breastfeeding and appropriate complementary feeding practices play a central role in meeting these nutritional needs. After six months of age, breast milk alone is no longer sufficient to provide adequate energy, iron, zinc, protein, and several essential vitamins required for optimal infant growth and development.[4,5] Complementary foods are therefore necessary to fill this nutritional gap. Appropriate Infant and Young Child Feeding (IYCF) requires careful attention to the quality, quantity, consistency, and frequency of foods provided. One of the most critical components of complementary feeding is animal-source protein, which supplies essential amino acids that cannot be synthesized by the human body. Animal-source proteins have high biological value and are easily digestible, making them particularly important during this rapid growth period.[6,7]

Despite its importance, the intake of animal-source protein among children under two years of age remains a major public health concern in low- and middle-income countries (LMICs).[8,9] Epidemiological studies indicate that average animal-source protein intake among children aged 6–24 months in LMICs remains far below the World Health Organization (WHO) recommendation of at least 15–20 grams per day. Food consumption surveys from several Southeast Asian countries show that approximately 40–60% of children under two years of age have inadequate daily protein intake. Low consumption of animal-source protein is commonly associated with household economic constraints, limited access to affordable animal-source foods, and insufficient knowledge among mothers or caregivers regarding the importance of animal-source protein for optimal child growth and development.[10–12]

Inadequate intake of animal-source protein during early childhood is strongly associated with adverse health outcomes, including stunting, wasting, and impaired immune function, which increases susceptibility to infectious diseases.[9,12] Over the long term, protein deficiency may negatively affect cognitive development, reduce intellectual capacity, and increase the risk of metabolic diseases later in life.[8,13] Globally, more than 140 million children under five years of age are affected by stunting, with the highest burden occurring in LMICs.[11] Growing evidence suggests that not only the quantity but also the quality of protein intake—particularly from animal sources—plays a critical role in preventing stunting and wasting.

Consequently, improving animal-source protein intake among children under two years of age is a strategic priority in efforts to reduce malnutrition and enhance human capital development.[14,15]

Community-based interventions delivered by Community Health Workers (CHWs) have demonstrated considerable potential in improving maternal knowledge and practices related to complementary feeding. In this review, the term “**community health workers (CHWs)**” refers to trained frontline community-based personnel, including cadres, volunteers, and extension workers, who deliver nutrition and health interventions at the household and community levels. As members of the communities they serve, CHWs possess a unique advantage in engaging mothers and caregivers through culturally appropriate and context-sensitive approaches.[1,16] Their familiarity with local social, cultural, and economic conditions enables health messages to be tailored to community realities, increasing acceptability and effectiveness. Numerous studies have shown that CHW-led interventions are more effective in changing health-related behaviors than conventional top-down approaches. However, the success of these interventions is influenced by a range of enabling and inhibiting factors that warrant systematic identification and in-depth analysis.[17–19]

This scoping review aims to address existing knowledge gaps regarding what works, for whom, and under what conditions in CHW-based interventions designed to improve animal-source protein intake in complementary feeding. By synthesizing evidence on intervention strategies, implementation contexts, and influencing factors, this review seeks to identify best practices and promising CHW engagement models that can inform the design of more effective child nutrition programs. In addition, the review highlights underexplored areas requiring further investigation, thereby guiding future research agendas. Ultimately, this study aims to contribute to efforts to improve nutritional outcomes among children under two years of age in LMICs and to support the development of healthier and more productive future generations.

The primary objective of this scoping review is to systematically map the existing literature on CHW-based interventions that aim to improve the knowledge and practices of mothers or caregivers in providing animal-source protein-rich complementary foods to children under two years of age in low- and middle-income countries.

Methods

Study Design and Reporting Standard

This study employed a scoping review methodology to systematically map evidence on factors influencing the success of community health worker (CHW)–based interventions in improving animal-source protein intake during complementary feeding. The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. A PRISMA-ScR flow diagram illustrating the study selection process is presented in Figure 1.

A review protocol was developed prior to data extraction to guide the search strategy, screening process, and data charting. However, the protocol was not prospectively registered in an international registry such as PROSPERO or the Open Science Framework (OSF). This is acknowledged as a limitation of the study. To ensure methodological rigor and transparency, all stages of the review were conducted systematically following PRISMA-ScR guidance, with predefined eligibility criteria, independent screening, and structured data synthesis. A completed PRISMA-ScR checklist is provided as supplementary material.

Eligibility Criteria

Eligibility criteria were defined a priori using a PICOS framework adapted for scoping reviews.

1. Population: Mothers or primary caregivers of children aged 6–23 months living in low- and middle-income countries (LMICs), as defined by the World Bank classification.
2. Intervention: Community-based health or nutrition interventions involving community health workers, health cadres, or equivalent community-based personnel as the primary or central providers of the intervention. Studies in which CHWs played a clearly defined and substantive role in intervention delivery were included, even if the intervention comprised multiple components. Studies were excluded if the role of CHWs was peripheral, unclear, or not explicitly described.
3. Comparator: Consistent with scoping review methodology, no specific comparator was required. Studies with or without control or comparison groups were eligible.
4. Outcomes: Studies were included if they reported at least one of the following outcomes: (a) maternal or caregiver knowledge related to complementary feeding or animal-source protein; (b) complementary

feeding practices, particularly those involving animal-source foods; (c) child intake or consumption of animal-source protein or animal-source foods; (d) child nutritional status indicators (e.g., stunting, underweight, wasting, anemia).

Study Design:

Original empirical studies employing quasi-experimental, randomized or non-randomized controlled trials, cross-sectional, or prospective cohort designs were included.

Exclusion Criteria:

Studies were excluded if they:

1. were conducted in high-income countries;
2. did not involve children aged 6–23 months;
3. did not explicitly describe the role of community health workers or cadres;
4. were policy documents, commentaries, protocols, or reviews without primary data; or
5. did not report outcomes relevant to complementary feeding or animal-source protein.

Search Strategy

A systematic literature search was conducted in Scopus, PubMed, and EBSCOhost. The search covered publications from January 2015 to December 2024, corresponding to the date of the final database search. Articles published online ahead of print within this period were also considered. The search strategy combined terms related to community-based health delivery and complementary feeding. Representative search terms included: (“community health workers” OR “health cadres” OR “community-based intervention” OR “community health program”) AND (“complementary feeding” OR “infant and young child feeding” OR “complementary feeding knowledge” OR “complementary feeding practices” OR “animal-source foods”). The full search strings for each database are provided in the supplementary materials.

Study Selection

All retrieved records were imported into Zotero for duplicate removal. A two-stage screening process was applied. First, titles and abstracts were screened for relevance. Second, full-text articles were assessed against the eligibility criteria. This process resulted in the inclusion of 12 original research studies indexed in Scopus Q1, published between 2015 and 2025, from an initial total of 4,021 records. Screening was conducted systematically, and discrepancies were resolved through discussion.

Quality Appraisal

Although critical appraisal is not mandatory in scoping reviews, the methodological quality of included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tool to enhance transparency and contextual interpretation of findings. Only studies with a quality score of 70% or higher were included in the final synthesis.

Data Extraction and Synthesis

Data were extracted using a standardized charting form capturing study characteristics, intervention components, outcomes, and reported enabling and inhibiting factors. Given the heterogeneity of study designs and outcome measures, quantitative meta-analysis was not appropriate. Instead, findings were synthesized using descriptive and narrative approaches. Thematic analysis was applied to identify recurring intervention strategies and enabling or inhibiting factors, while narrative synthesis was used to summarize intervention effects across different study designs. Differences in study design were considered during interpretation, and the implications of varying levels of evidence strength are discussed in the Discussion and Limitations sections..

Methodological Quality Assessment

All studies analyzed achieved a methodological quality score of 70% or higher using the Joanna Briggs Institute (JBI) appraisal tool, meeting the minimum criteria for inclusion in this scoping review. The quality assessment results show that eight studies (67%) achieved a high-quality score ($\geq 80\%$), while four studies (33%) achieved a moderate-quality score (70–79%). The methodological aspect most consistently praised across all studies was the clarity of the research objectives and the description of the study population, whereas

several studies demonstrated limitations in controlling for potential bias and in reporting participant attrition rates. Table maximum 3, gives important reasons if more than that. Above the table, there is a sentence: Table 1 shows blah blah blah, and so on according to the table numbering.

Result

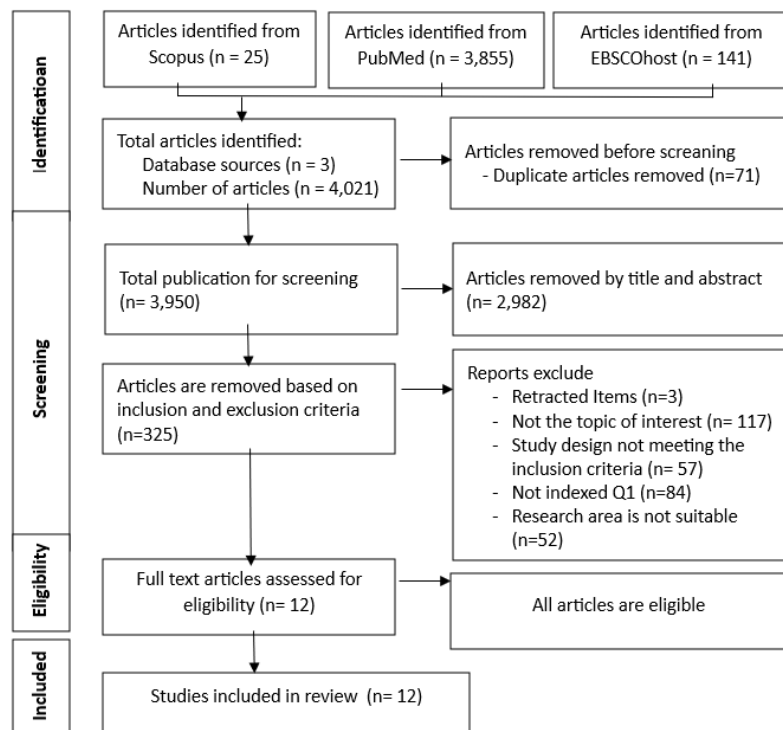


Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR): diagram of the source selection process.

Table 1. Study Quality Assessment Using the Joanna Briggs Institute (JBI) Appraisal Tool

No.	Author, Year	Study Design	Score (%)	Overall Rating
1	Kang et al., 2016	Cluster Randomized Trial	85	High
2	Cândido et al., 2020	Non-Randomized Controlled Intervention	78	Moderate
3	Blaney et al., 2019	Cross-Sectional	82	High
4	Muluye et al., 2020	Randomized Control Trial	87	High
5	Abiyu & Belachew, 2020	Cluster Randomized Controlled Trial	88	High
6	Desai et al., 2015	Pre-Pilot and Post-Pilot Study	80	High
7	Agbozo et al., 2016	Cross-Sectional Comparative Study	76	Moderate
8	Sanghvi et al., 2016	Mixed Methods Evaluation	79	Moderate
9	Yao et al., 2022	Pre-Comparison dan Post-Comparison Study	83	High
10	Mekonnen et al., 2022	Quasi-experimental	81	High
11	Rahman et al., 2022	Longitudinal Cohort Study	84	High
12	Nassar & Al-Haddad, 2023	Cross-Sectional Comparative Study	77	Moderate

Characteristics of Included Studies

In this scoping review, 12 studies that met the inclusion criteria were systematically analyzed. These studies were published between 2015 and 2025 and encompassed research from various low-income and middle-income countries in Africa, Asia, and Latin America. Most of the articles employed quasi-experimental designs (n=6) and cross-sectional studies (n=4), while the remaining studies used prospective cohort designs (n=2). The study locations were distributed across several countries, including Ethiopia (n=4), Bangladesh (n=2), Zimbabwe (n=1), Ghana (n=1), Brazil (n=1), Cambodia (n=1), China (n=1), and Yemen (n=1). The sample sizes ranged from 40 to 8.5 million mothers with children under two years old, although the majority of studies involved 100–1,000 respondents.

Table 2. Characteristics of Studies Included in Scoping Reviews (n=12)

Author, Year	Country	Sample (n)	Age Group	Duration of Intervention	Community Type	Intervention Focus
Kang et al., 2016	Ethiopia	1,790	6-12 months	12 months	Community Health Workers	Community-Based Participatory Nutrition Promotion (Positive Deviance/Hearth)
Cândido et al., 2020	Brazil	200	4-24 months	4 months	Education Professionals	Food & Nutrition Education in Nurseries
Blaney et al., 2019	Cambodia	360	6-23 months	Baseline	Women Development Army	Promotion of Optimal Feeding Practices
Muluye et al., 2020	Ethiopia	200	6-23 months	4 months	Health Extension Workers	Nutrition Education (IYCF Guidelines)
Abiyu & Belachew, 2020	Ethiopia	516	6-23 months	9 months	Women Development Army Leaders	Behavior Change Communication (MPASI)
Desai et al., 2015	Zimbabwe	19	7-12 months	4 months	Village Health Workers	IYCF Intervention with SQ-LNS
Agbozo et al., 2016	Ghana	232	0-24 months	Ongoing	Community Health Volunteers	Community-Based Growth Promotion (CBGP)
Sanghvi et al., 2016	Bangladesh	8.5 million	6-24 months	2010-2014	Frontline Health Workers & Community Volunteers	Alive & Thrive IYCF Programme
Yao et al., 2022	China	1,200+	6-23 months	2.5 years	Village Child Health Assistants	Child Health Counselling + YYB Supplement
Mekonnen. et al., 2022	Ethiopia	140	6-23 months	9 months	Health Extension Workers	Community-based nutrition education
Rahman et al., 2022	Bangladesh	758	6-23 months	12 months	Community Health Workers	Home Visits & MPASI Counselling
Nassar & Al-Haddad, 2023	Yemen	926	<24 months	Ongoing	Community Health & Nutrition Volunteers	IYCF Counselling & Education

Table 3 presents findings from 12 studies on improvements in knowledge and changes in complementary feeding practices, the provision of animal-source foods, and dietary diversity. Several studies reported the impacts of changes in nutritional status.

Table 3. Research Results on Knowledge and Practice of Complementary Foods

No.	Author, Year	Knowledge (Pretest → Posttest)	Practice of Giving Complementary Foods	Consumption of Animal Food	Food Diversity	Nutritional Status
1	Kang et al., 2016	Not reported	Increased (significant)	Increased (significant)	Increased (significant)	↓Stunting; ↓Underweight
2	Cândido et al., 2020	Increased (significant)	Increased (quantified: 32%)	Increased (significant)	Increased (significant)	Not reported
3	Blaney et al., 2019	Increased (not quantified)	Increased (not quantified)	Protein/Zinc: Increased (significant)	Increased (significant)	LAZ: Increased (significant)
4	Muluye et al., 2020	Increased (quantified: 55.3%)	Good Complementary Practices: Increased (quantified: 50%) MMF: Increased (quantified: 25%)	Increased (significant)	MDD: Increased (quantified: 43.1%)	LAZ: Increased (significant)
5	Abiyu & Belachew, 2020	Increased (significant)	MAD: Increased (quantified: 36.6%)	Not significant change	MDD: Increased (quantified: 42%)	Not reported
6	Desai et al., 2015	Increased (significant)	Increased (quantified: 16%)	Increased (significant)	Micronutrient intake (exp fe and zn): Increased (significant)	Not reported
7	Agbozo et al., 2016	Increased (quantified: 12%)	EBF: Increased (quantified: 73%)	Increased (significant)	MAD: Increased (quantified: 23%)	↓Underweight
8	Sanghvi et al., 2016	Increased (significant)	breastfeeding & CF: Increased (significant)	Increased (significant)	Increased (significant)	↓Positive malnutrition trend

9	Yao et al., 2022	Increased (significant)	IYCF indicators: Increased (significant)	Iron-rich foods: Increased (significant)	MDD: Increased (significant)	↓Stunting ↓Anemia
10	Mekonnen. et al., 2022	Increased (significant)	Increased (significant)	Increased (significant)	Increased (significant)	Not reported
11	Rahman et al., 2022	Increased (significant)	Dietary diversity: Increased (significant) MAD: Increased (significant)	Increased (significant)	DDS: Increased (significant)	MAD: Increased (significant)
12	Nassar & Al-Haddad, 2023	Increased (significant)	EBF practice Increased (significant) Bottle feeding: decreased (significant)	Increased (significant)	Increased (significant)	Not reported

Abbreviations: CF = Complementary Feeding; ASF = Animal-Source Foods; MMF = Minimum Meal Frequency; MAD = Minimum Acceptable Diet; MDD = Minimum Dietary Diversity; LAZ = Length-for-Age Z-score; DDS = Dietary Diversity Score.

Based on the synthesis of the 12 included studies, intervention success was shaped by the interaction between enabling and inhibiting factors, which are summarized in Table 4.

Table 4. Summary of Supporting and Inhibiting Factors for Intervention Success

Factor	Frequency (n)	%	Evidence from Studies
Supporting Factors			
Adequate CHW Training	12	100	All studies emphasize the importance of training
Strong Health System Support	11	92	Kang, Muluye, Sanghvi, Yao, Smith, Rahman, et al.
High CHW Motivation and Commitment	10	83	Reported in most implementation studies
Family & Community Involvement	9	75	Abiyu, Sanghvi, Yao, Rahman, Nassar
Availability of Local Animal-Source Foods	8	67	Kang, Blaney, Desai, Smith, Yao, et al.
Interactive Learning Media and Tools	8	67	Desai, Sanghvi, Smith, Muluye, Abiyu
Adequate Duration and Frequency of Contact	7	58	Kang, Muluye, Abiyu, Yao, Rahman
In-Depth Formative Research	6	50	Desai, Smith, Sanghvi, Muluye, Kang
Continuous Monitoring and Evaluation	6	50	Sanghvi, Yao, Kang, Rahman, Smith
Incentives for CHW/Mothers	5	42	Sanghvi, Abiyu, Rahman, Nassar
Inhibiting Factors			
Family Economic Constraints	12	100	All studies identified these barriers
Misleading Traditional Cultural Beliefs	10	83	Kang, Blaney, Desai, Yao, Nassar, et al.
Excessive CHW Workload	9	75	Cândido, Agbozo, Sanghvi, Yao, Rahman, dkk
Limited Health System Support	8	67	Muluye, Abiyu, Agbozo, Yao, Nassar, dkk
High Attrition and Loss to Follow-Up	6	50	Kang, Muluye, Rahman, Smith, Yao
Limitations of M&E Resources	5	42	Cândido, Sanghvi, Abiyu, Nassar
Language Barriers & Low Literacy	4	33	Desai, Yao, Nassar, Agbozo
Difficulty in Reaching Vulnerable Groups	4	33	Smith, Rahman, Nassar, Agbozo
Lack of Long-Term Sustainability	3	25	Cândido, Sanghvi, Yao

Cadre-Based Interventions (n=12 studies) Note: Frequency indicates the number of studies that identified the factor; M&E = Monitoring & Evaluation

Discussion

The Strategic Role of Community Health Workers and Mechanisms of Intervention Success

This scoping review provides a comprehensive overview of the landscape of community health worker-based interventions aimed at improving the intake of animal-source protein in complementary feeding among children under 2 years in low- and middle-income countries (LMIC). These findings strongly reinforce global empirical evidence that community health workers, as frontline community workers, play a strategic and effective role in modifying Infant and Young Child Feeding (IYCF) behaviors.[18] The effectiveness mechanisms of these CHW-based interventions are grounded in three main factors. First, CHW work and live within the same community, providing them with a deep understanding of the local social, cultural, and economic context that external personnel often lack. Second, the interactions that form are more personal, close, and trust-based because CHW are an integral part of the community itself. Third, communication and educational strategies can be adapted using language and examples that are relevant to the local reality, making health messages easier for mothers of children under two years old to understand.[16,17,20].

Types and Strategies of Community Health Worker-Based Interventions

The reviewed studies revealed substantial variation in the types and strategies of nutrition interventions implemented by CHWs across different countries. Most interventions emphasized community-based

nutrition promotion and education focused on IYCF. For instance, several studies in Ethiopia implemented Community-Based Participatory Nutrition Promotion approaches, while others relied on home visits and individualized IYCF counseling to promote optimal feeding practices.[3,17,19] Beyond education-only models, some interventions adopted more comprehensive strategies, including behavior change communication, community-based growth promotion, and the integration of fortified complementary foods or nutritional supplements. These combined approaches reflect deliberate efforts to address structural and contextual barriers to improved feeding practices by coupling knowledge enhancement with practical support.[8,20,21]

Improvements in Maternal Knowledge of Animal-Source Protein Intake

All twelve included studies reported improvements in maternal knowledge following CHW-led interventions. These improvements encompassed mothers' understanding of appropriate types of animal-source foods for children under two years of age, safe preparation and processing methods, the importance of dietary diversity, and age-appropriate portion sizes and feeding frequency. Enhanced knowledge represents a critical foundation for behavior change, particularly in contexts where misconceptions and cultural beliefs previously limited the provision of animal-source foods to young children.

Improvement in Complementary Feeding Practices for Animal-Source Protein

The study's findings consistently show that CHW-led interventions significantly improve mothers' practices in providing Complementary Foods (CF), particularly those related to the intake of animal-source proteins. This improvement in practice is supported by three main indicators that show significant gains. First, the interventions successfully increased the consumption of animal-source foods substantially, with average improvements ranging from 30% to 200% across the studies. Second, the interventions had a positive impact on the dietary diversity provided to children, as shown by a consistent increase in the average dietary diversity from 46–61% at baseline to 54–77% at endline. Finally, there was an improvement in feeding frequency, with the proportion of children who achieved the Minimum Meal Frequency (MMF) increasing from 29–82% to 31–91%, depending on the study context. Overall, these findings underscore the effectiveness of CHW interventions in measurably modifying maternal nutrition behaviors, resulting in comprehensive improvements in animal-source protein intake, dietary diversity, and feeding frequency.

Impact on the Nutritional Status of Children Under Two Years Old

The analysis of studies reporting outcomes on the nutritional status of children under 2 years demonstrates consistent and significant improvements. The increase in animal-source protein consumption through CHW-based interventions had a measurable positive impact on child growth. Improvements were reflected in reductions in the prevalence of stunting, underweight, and wasting, as well as increases in length-for-age and weight-for-age z-scores. For example, a study in Ethiopia found an 8.1% lower prevalence of stunting in the intervention group at the end of the 12-month follow-up. The study from China also reported a reduction in stunting prevalence from 26.3% to 10.8%. Nevertheless, it is important to note that these positive impacts on nutritional status cannot be separated from improvements in other feeding indicators, such as dietary diversity and feeding frequency. In other words, animal-source protein is an essential element within a broader package of nutrition interventions, and its optimal impact is achieved when combined with improvements in other aspects of complementary feeding.

Supporting Factors for Intervention Success

The analysis of the twelve studies identified key supporting factors that synergistically contributed to the success of community-based interventions in increasing animal-source protein intake in complementary feeding. The most crucial supporting factor was adequate training for community health workers, emphasized by all studies (100%), which included comprehensive training on child nutrition, animal-source protein, and effective communication techniques prior to implementation. Structural support was also shown to be significant, identified in 92% of the studies, which included a strong health system support structure (pro-nutrition policies, budget allocation, and regular supervision) and high motivation and commitment among community health workers (83% of the studies). In addition, family and environmental involvement (75%), by engaging fathers, grandmothers, and community leaders, was an essential element that created a supportive social environment. From the program implementation perspective, the availability of affordable local animal-source foods (67%) was a critical supporting factor, as it ensured that the practices could be

sustained by low-income households. The effectiveness of message delivery was strengthened by the use of interactive and engaging communication media and learning tools (67%). The success of the interventions was also influenced by the adequacy of the duration and frequency of contact between community health workers and mothers (58%) and by the importance of in-depth formative research (50%) conducted before the intervention to align the program design with the local context. Finally, continuous monitoring and evaluation (50%) for program adaptation, along with the provision of incentives to community health workers or mothers (42%), also contributed to enhancing motivation and adherence to program recommendations.

Inhibiting Factors to the Success of the Interventions

Conversely, the synthesis identified several inhibiting factors that consistently constrained the successful implementation of community health worker (CHW)-based interventions aimed at increasing animal-source protein intake in complementary feeding among children under two years of age. The most pervasive and universal barrier, reported in all included studies, was limited household economic capacity and restricted access to high-quality animal-source foods. Despite documented improvements in maternal knowledge, low purchasing power and the relatively high cost of animal-source foods—such as meat, fish, eggs, and dairy products compared with staple foods remained the primary obstacles to adopting recommended feeding practices.

Beyond economic constraints, sociocultural and operational factors further impeded intervention effectiveness. Sociocultural barriers, reported in 83% of studies, included persistent traditional beliefs and misconceptions that discouraged caregivers from providing animal-source foods to young children. Operational challenges were also prominent, particularly excessive workload and limited time among CHWs (75% of studies), which reduced the intensity and continuity of support provided to households. Inadequate support and coordination from higher levels of the health system (67% of studies) frequently resulted in fragmented program implementation, further undermining effectiveness. Additional technical and outreach-related challenges included high participant attrition and loss to follow-up (50%), limited resources for monitoring and evaluation (42%), language barriers and low maternal literacy (33%), difficulties in reaching the most vulnerable or marginalized populations (33%), and a lack of long-term program sustainability (25%).

Importantly, the findings indicate that interventions combining nutrition education with food-based support or supplementation were more effective in addressing economic barriers than education-only approaches. Studies by Desai et al. and Yao et al., which integrated IYCF counseling with fortified complementary foods or small-quantity lipid-based nutrient supplements, demonstrated more consistent improvements in animal-source food consumption and child nutritional outcomes. These combined strategies temporarily alleviated affordability constraints, enabling households to translate knowledge into practice despite financial limitations.

In contrast, education-only interventions, while effective in increasing knowledge, showed more modest and less sustained effects on feeding practices in contexts characterized by poverty and food insecurity. This comparison suggests that, in resource-constrained settings, multisectoral and multi-component intervention strategies are more likely to produce meaningful and sustained behavioral change than stand-alone educational approaches. Nevertheless, reliance on supplementation raises concerns regarding cost, sustainability, and long-term dependency, underscoring the importance of promoting locally available and affordable animal-source foods as part of durable solutions.

Overall, these findings emphasize that the success of CHW-based interventions depends not only on individual-level behavior change strategies but also on supportive system-level and socioeconomic conditions. Aligning CHW capacity building with broader food security, health system strengthening, and social protection efforts is essential to achieve sustained and equitable improvements in animal-source protein intake among young children.

Conceptual Framework of CHW-Based Interventions

Based on the synthesis of enabling and inhibiting factors identified in this review, a conceptual framework is proposed to explain how community health worker (CHW)-based interventions influence complementary feeding practices, particularly the intake of animal-source protein among children under two years of age. The framework integrates four interrelated components: inputs, processes, contextual factors, and outcomes.

Inputs refer to CHW-related resources and capacities, including standardized training on Infant and Young Child Feeding (IYCF) and animal-source protein, the availability of educational materials and

counseling tools, supportive supervision, and the provision of financial or non-financial incentives. These inputs determine the readiness and capability of CHWs to deliver effective nutrition interventions.

Processes describe the mechanisms through which interventions are implemented at the community and household levels. These include home visits, group education sessions, individual counseling, behavior change communication strategies, and broader community engagement activities involving family and community members. The quality, intensity, and frequency of these processes mediate the translation of inputs into behavioral change.

Contextual factors encompass the broader environmental conditions that shape intervention effectiveness. These include household economic capacity, availability and affordability of animal-source foods, sociocultural beliefs and norms, health system support and coordination, and CHW workload. Contextual factors may function as either enabling or inhibiting forces, moderating the impact of CHW inputs and processes.

The dynamic interaction between inputs, processes, and contextual factors ultimately determines outcomes, which include improvements in maternal knowledge, complementary feeding practices, dietary diversity, animal-source food consumption, and child nutritional status. This framework underscores that successful and sustainable outcomes are not achieved through isolated intervention components, but rather through the alignment of strong CHW capacity, effective delivery processes, and supportive socioeconomic and health system contexts.

Implications for Policy, Practice, and Research

For policy makers

Policies should move beyond education-only models by integrating CHW-based nutrition interventions with social protection schemes, food subsidies, or livelihood programs. Reducing CHW workload through task prioritization and providing financial or non-financial incentives are essential to maintain motivation and program quality.

For practitioners and program implementers

CHW training programs should include standardized modules on animal-source protein nutrition, locally affordable food options, counseling skills, and strategies to address cultural misconceptions. Intervention design should prioritize locally available animal-source foods and involve key family members, such as fathers and grandparents, to strengthen household-level support.

For researchers:

Future studies should prioritize randomized controlled trials comparing different CHW intervention models, particularly education-only versus combined education and supplementation approaches. There is also a need for qualitative research exploring CHW motivation, workload, and retention, as well as studies explicitly testing strategies to overcome economic barriers to animal-source protein intake. Additionally, evidence from underrepresented regions, such as Latin America, and long-term follow-up studies assessing sustainability remain critically lacking.

Conclusions

This scoping review confirms that community-based interventions led by community health workers (CHWs) are effective in improving animal-source protein intake and complementary feeding practices among children under two years of age in low- and middle-income countries. Consistent improvements were observed in maternal knowledge, dietary diversity, feeding frequency, and, in several studies, child nutritional status. Nevertheless, the review also identifies critical research gaps. Evidence comparing different CHW intervention models remains limited, particularly randomized controlled trials assessing the added value of combining education with food or supplementation support. There is insufficient research explicitly addressing economic barriers to animal-source protein consumption, a challenge identified universally across studies. Qualitative insights into CHW motivation, workload, and long-term engagement are also scarce, as is evidence from certain regions, especially Latin America. Addressing these gaps is essential to inform the design of sustainable, scalable, and context-sensitive nutrition interventions.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this research. There are no personal circumstances or interests that could be perceived as inappropriately influencing the representation or interpretation of the reported research results.

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