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REVIEW

Mobile App-Based Interventions to Support Maternal Roles in Child Nutrition and Development: A Scoping Review

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Background: Early childhood is crucial for long-term health, growth, and development, with mothers playing a central role in nutrition and stimulation. Mobile health (mHealth) technologies have potential to support maternal practices through real-time, context-specific guidance. However, evidence on how mobile applications specifically enhance maternal roles in child nutrition and development is limited and fragmented.

Objective: This scoping review aimed to map and synthesize evidence on mobile app–based interventions that support maternal roles in child nutrition and development.

Methods: Following Arksey and O'Malley's framework and the PRISMA-ScR checklist, we systematically searched PubMed, Scopus, Web of Science, CINAHL, PsycINFO, and grey literature for studies published between 2013 and 2025. Eligible studies evaluated mHealth interventions targeting maternal behaviors for children under five. Data were extracted and analyzed thematically.

Results: Twenty-five studies met the inclusion criteria. Most interventions addressed breastfeeding, complementary feeding, and developmental stimulation. Common app features included educational modules, growth monitoring, real-time guidance, and peer support. Positive outcomes were observed in breastfeeding practices, child growth, and developmental milestones. Key barriers included low digital literacy and limited access to technology, particularly in marginalized populations.

Conclusion: mHealth applications show promise in supporting maternal roles and improving child nutrition and development outcomes. Future research should focus on digital equity, broader accessibility, and the cost-effectiveness and scalability of these interventions, especially in underserved settings.

Keywords: child nutrition, digital health interventions, early childhood development, mobile health, nutrition

Introduction

Early childhood is a critical period for growth, brain development, and the establishment of health-related behaviors that influence lifelong outcomes. The first five years of life, particularly the first 1000 days from conception to age two, are foundational for long-term cognitive, emotional, and physical health.[1,2] During this sensitive window, mothers and primary female caregivers are central agents in shaping a child's nutrition, development, and overall well-being.[3,4] Maternal knowledge, attitudes, and confidence directly affect child outcomes such as exclusive breastfeeding, dietary adequacy, and responsive caregiving.[5,6] Empowering mothers with timely, accurate, and actionable information is therefore essential to prevent developmental delays and malnutrition, especially in resource-constrained settings.

Digital health technologies have emerged as a promising strategy to address gaps in maternal and child health service delivery. Tools such as SMS, teleconsultation, decision-support algorithms, and mobile applications offer new avenues to

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support maternal practices.[7] Among these, mobile applications are particularly well-suited for promoting maternal roles due to their capacity to provide interactive, multimedia-rich, and personalized content. Mobile apps can deliver real-time feedback, track behaviors, provide peer and expert support, and offer structured educational modules, all of which have been linked to improved caregiving and feeding practices.[6,8] Their scalability, offline functionality, and increasing global smartphone penetration make app-based interventions relevant across urban and rural contexts.

Although several reviews have examined digital health strategies in maternal and child health, most focus broadly on mHealth, combining diverse modalities such as SMS, interactive voice response, telehealth, and apps, which can obscure the specific mechanisms and benefits of mobile applications.[9,10] Few studies have explicitly addressed how mobile apps enhance maternal roles in child nutrition and development, particularly in terms of behavior change, decision-making, and psychosocial empowerment.

To address this gap, this scoping review aims to identify, map, and thematically analyze mobile app–based interventions targeting maternal engagement in child nutrition and early development. This review also examines the scope, functionality, and outcomes of these interventions while considering implementation processes, user engagement, and contextual relevance across diverse populations. By consolidating current evidence, this study seeks to inform the design of future digital tools, guide research priorities, and support policies that advance maternal and child health equity.

Methods

Study Design and Framework

This scoping review systematically identified, categorized, and synthesized evidence on mobile application–based digital health interventions supporting maternal roles in early childhood nutrition and development. The review focused on how mobile apps enhance maternal practices, including child feeding, nutritional decision-making, and stimulation activities for children aged 0–5 years. The methodological framework followed Arksey and O'Malley's five-stage process (2005): (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) data charting, and (5) collating, summarizing, and reporting the results. Enhancements recommended by Levac et al,[11] including iterative team discussions, were incorporated to improve rigor. The review adhered to the PRISMA-ScR checklist to ensure transparency and reproducibility.[12]

Eligibility Criteria

Eligibility was defined using the Population–Concept–Context (PCC) framework from the Joanna Briggs Institute.

- Population: mothers or female caregivers of children aged 0–5 years.
- Concept: mobile application–based interventions aimed at improving maternal behaviors related to child nutrition and development.
- Context: both high- and low-resource settings.

Inclusion Criteria

Primary research (qualitative, quantitative, mixed methods), focus on mobile app interventions for maternal roles in child feeding, nutrition, or early development, full text in English, published between January 2013 and May 2025. Grey literature with methodological detail was included. Exclusion criteria: editorials, reviews, conference abstracts, opinion papers, and non-app mHealth interventions (eg, SMS-only, teleconsultation).

Information Sources and Search Strategy

Five databases were searched: PubMed, Scopus, Web of Science, CINAHL, and PsycINFO. Grey literature was sourced from Google Scholar, WHO Digital Health Atlas, UNICEF innovation databases, and relevant NGO repositories. Reference lists of included studies were also screened. Search strategies combined MeSH and free-text terms for maternal behavior, child nutrition, early development, and mobile applications, tailored to each database. Filters included English language and publication years 2013–2025. Final search: May 12, 2025. Detailed search strategies are in Supplementary Table S1.

Study Selection Process

Two-stage screening was performed. Duplicates were removed, then titles and abstracts screened. Full texts were assessed independently by two reviewers using Rayyan. Discrepancies were resolved by discussion, with a third reviewer consulted if needed. Screening is documented in a PRISMA-ScR flowchart.

Data Charting Process

A standardized charting form captured study characteristics, participant demographics, study design, intervention features, and maternal/child outcomes. Additional data included user engagement, technological components, cultural adaptation, and implementation factors. Data extraction was conducted independently by two reviewers, with discrepancies resolved through consensus. Descriptive patterns were analyzed; no meta-analysis was performed due to heterogeneity.

Methodological Quality Assessment

Interpretive assessment of methodological rigor was conducted using design-appropriate tools: Joanna Briggs Institute (JBI) checklists and the Mixed Methods Appraisal Tool (MMAT). Domains assessed included selection, performance, detection, attrition, and reporting bias, rated as low, moderate, or high. Two reviewers conducted assessments independently, with a third reviewer consulted if needed.

Synthesis of Results

Quantitative and qualitative data were synthesized descriptively. Thematic analysis identified patterns in intervention components, maternal behavior change strategies, and child health outcomes. Findings are presented narratively.

Ethical Considerations

No human participants or primary data were involved; all sources were publicly available. Ethical approval was not required.

Results

Search Results

The initial search across five databases and grey literature sources yielded 1756 records. After removing 523 duplicates, 1233 records were screened at the title and abstract level, of which 1102 were excluded for not meeting inclusion criteria. A total of 131 full-text articles were retrieved; 15 could not be obtained, leaving 116 for full-text assessment. During eligibility screening, 91 studies were excluded due to irrelevant population (n = 28), non-aligned intervention scope (n = 24), inappropriate context (n = 16), or unsuitable study design (n = 23). Ultimately, 25 studies met all inclusion criteria. Inter-rater agreement was high (Cohen's kappa = 0.82). The selection process is illustrated in the PRISMA-ScR flow diagram (Figure 1).

Characteristics of Included Studies

The 25 studies were conducted in high-income and low- to middle-income countries, with most published between 2015 and 2024. Study designs included 11 quantitative studies (randomized controlled trials, quasi-experimental), 7 qualitative studies, and 7 mixed-methods studies. Sample sizes ranged from fewer than 30 participants to over 500. Most interventions targeted mothers of children under 2 years, with some including caregivers of children up to 5 years. Key study characteristics are summarized in Table 1.

Intervention Characteristics

All interventions were delivered via mobile applications, with some integrating SMS reminders or multimedia components. Common app features included:

- Educational modules on breastfeeding, complementary feeding, responsive parenting, and child stimulation
- Real-time feedback based on input from users (eg, feeding logs, child growth data)

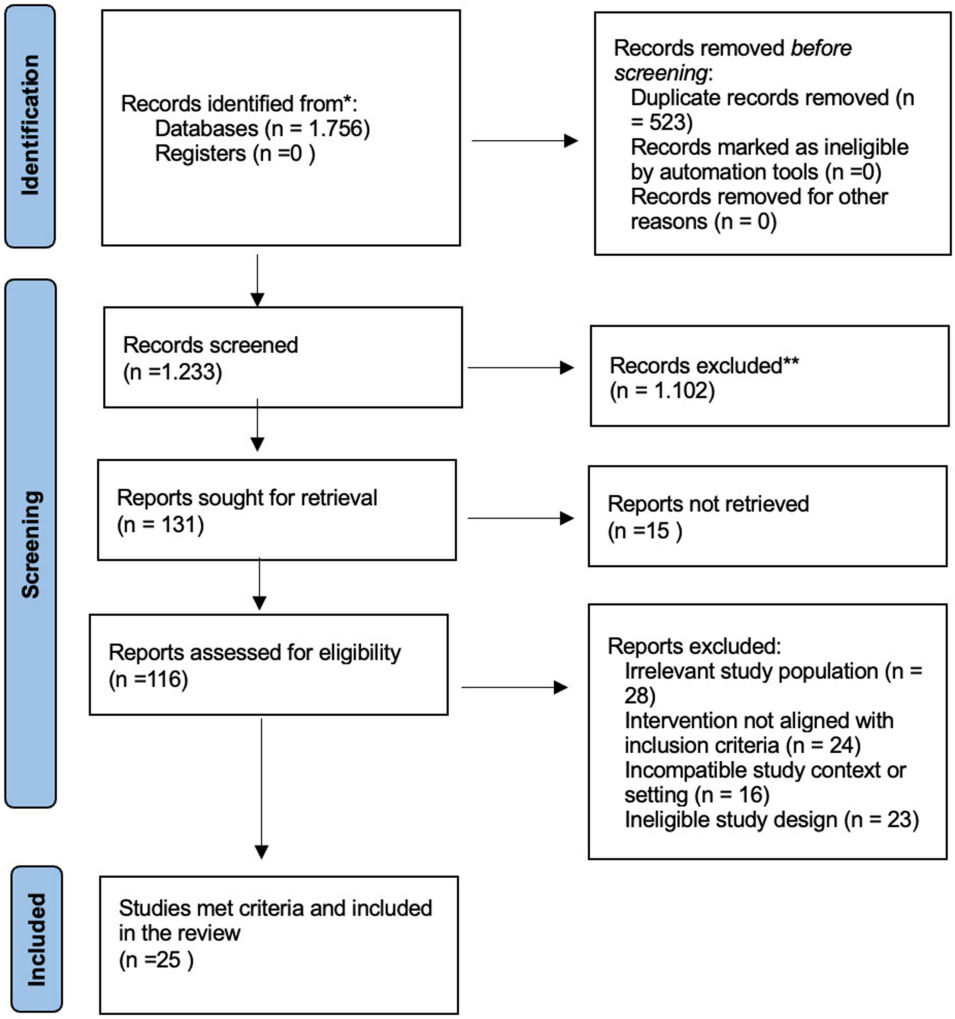

Figure 1 PRISMA 2020 flow diagram of the study selection process. The diagram illustrates the process of study identification, screening, eligibility assessment, and inclusion in accordance with the PRISMA 2020 guidelines. Records were identified through database searching and other sources, duplicates were removed, titles and abstracts were screened, full-text articles were assessed for eligibility, and the final studies were included in the review.

- Tracking tools, including growth charts, feeding diaries, and immunization reminders
- Social or peer support functions, such as community chat groups or forums moderated by healthcare professionals.
- Gamification elements to promote engagement and adherence

Several interventions were co-designed with end users to improve cultural relevance and usability, particularly for underserved populations. Objectives varied, including extending breastfeeding duration, promoting responsive feeding, supporting growth monitoring, enhancing maternal self-efficacy, and promoting early stimulation.

Outcomes

Outcomes were consistently positive across four main domains (Table 1):

1. Maternal Knowledge and Behavior:
   Increased knowledge of infant feeding, higher confidence in caregiving, and improved responsive feeding practices.
2. Child Health and Developmental Outcomes:
   - Longer breastfeeding duration (e.g,[32])

Table 1 Characteristics of Included Studies

Author(s)	Year	Country	Design	Population	Intervention Details	App Features & Behaviors
[13]	2025	USA	Randomized Controlled Trial	Pregnant women (32–36 weeks gestation), n=93 (45 intervention, 48 control)	Smartphone-based breastfeeding support app	Feeding tracker, real-time lactation support, moderated peer groups
[14]	2024	Turkey	Randomized Controlled Trial	73 mothers on the first postpartum day were hospitalized in the postpartum service of a university hospital	Mobile application-based breastfeeding training program (MABBP)	Breastfeeding training, monitoring breastfeeding initiation and continuation, tracking breastfeeding problems, and supporting exclusive breastfeeding
[15]	2019	USA (Urban pediatric clinic)	Pre-post study	61 English- or Spanish-speaking families with children aged 2 to 12 months	6-month multifaceted clinic-based intervention called Talk It Up, including Language Environment Analysis word counts, clinician feedback, coaching, and twice-weekly instructional videos via a smartphone application	Instructional videos delivered twice-weekly, clinician feedback on word counts and parent-child conversational turns, coaching on language development
[16]	2019	USA (local libraries)	10-week randomized control and intervention pilot study	30 parents and children aged 3–8 years, convenience sample	Mobile Jump2Health website, Facebook posts, and text messages to deliver the nutrition intervention	Nutrition intervention delivered via website, social media, and text messages; aims to increase fruit and vegetable intake
[17]	2017	USA (Chinese immigrant population)	Randomized pilot study, 8 weekly sessions	32 mother-child dyads, low-income Chinese mothers with preschool-aged children, low acculturation	Tablet computer-based intervention tailored for Chinese immigrant mothers	Multimedia tablet-based education targeting maternal behaviors, including eating behaviors, physical activity, and child-feeding practices
[18]	2024	France (Dijon area)	Double-blinded monocentric 2-arm randomized controlled trial	First-time parents, 118 participants (59 in each arm), with children aged 3 to 36 months	A web-based smartphone application providing 106 age-adapted messages, dietary recommendations, educational advice, recipes, and tips. Printed brochures provided as well.	The app delivers tailored messages for improving maternal feeding practices and promoting healthy child eating behavior, encouraging responsive feeding and appetite control skills.
[19]	2022	Netherlands	Two-armed randomized controlled trial	357 Dutch parents with infants aged 5–15 months at baseline, including families with lower socioeconomic position (SEP)	The Samen Happie! An app-based program aimed to encourage healthy energy balance-related parenting practices	The app delivers tailored messages to improve maternal feeding practices and promote healthy eating behaviors in children, encouraging responsive feeding and appetite control skills.
[20]	2021	Iran (Urmia)	Randomized controlled trial with one intervention arm (smartphone application) and one control arm (treatment-as-usual)	110 mothers with undernourished children aged under 3 years in a food-secure, middle-income community	Smartphone-based maternal nutritional education program for complementary feeding	App delivered educational content on child feeding, including guidelines, behavioral methods for feeding, and the introduction of complementary foods

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Table 1 (Continued).

Author(s)	Year	Country	Design	Population	Intervention Details	App Features & Behaviors
[8]	2022	Singapore	2-group parallel prospective longitudinal design	Expecting parents, both aged ≥21 years, with low-risk pregnancies and smartphone/internet access.	The Supportive Parenting App (SPA) provides psychoeducational content, peer support, expert advice, discussion forums, and tailored parenting information. The app's purpose is to enhance parenting during the perinatal period, aiding in child development.	SPA includes features for parenting education, emotional support from peer volunteers, expert parenting advice, and discussion forums. The app encourages improved parent-child interactions.
[21]	2022	Somalia	2 × 2 factorial cluster-randomized controlled trial	Households in IDP camps, with mothers receiving a cash transfer. Children aged 0–59 months were the focus.	mHealth intervention with pre-recorded audio messages about health and nutrition, delivered to participant's phones.	Audio messages covering topics such as vaccination, water, sanitation, hygiene (WASH), infant and young child feeding (IYCF), diet diversity, and health knowledge.
[22]	2023	Iran	Randomized controlled trial	Mothers of preschool children aged 2–6 years with undernutrition.	MyKid'sNutrition mobile application with content on healthy eating, childhood underweight, loss of appetite, and child growth assessment.	The app provides educational content on children's nutrition, undernutrition, and feeding practices, along with evaluations.
[23]	2024	Global (Literature Review)	Systematic review	Mothers and children aged 0–24 months (first 1000 days of life)	The review examines mHealth interventions focusing on maternal and child nutrition through mobile apps with content on healthy eating, child growth, breastfeeding, etc.	Features include educational content, communication tools, support services, data collection, and culturally appropriate materials.
[24]	2024	Bangladesh	Community-based cluster randomized trial (c-RCT) with mixed-methods design, including 17 visits per mother-child dyad	Mothers and children in rural Bangladesh	Android platform-based customized app and web-linked system used by community health workers (CHWs) in rural Bangladesh	The app facilitates the delivery of targeted nutrition interventions, provides real-time visit information, task scheduling, and content navigation. Targeted behaviors include improving maternal and child nutrition.
[25]	2024	France	Pilot study using a randomized controlled trial (RCT) design, involving an intervention and a control group.	Parents of young children aged from birth to 2 years old. 137 participants were recruited, with 60 in the intervention group and 77 in the control group.	The Gazouyi app offers developmentally appropriate play activities designed to promote parenting skills and foster positive interactions with children.	The app offers play activities in four key areas of child development: language, motor skills, sensory development, and social skills. It encourages parents to perform four activities per week.
[7]	2023	United States	A qualitative evaluation of 6 commercially available apps, using the App Quality Evaluation tool	Health professionals who work with mothers with infants, particularly from low-income backgrounds and ethnic minorities	Apps were evaluated using the App Quality Evaluation tool, which covers seven domains of app quality.	Evaluated app functionality, appropriateness, and how well it provided infant-feeding education

[26]	2023	Pastoral population in a rural setting	The study utilized a smartphone application to collect high-frequency health and nutrition data, with a focus on longitudinal data collection over a 12-month period.	Caregivers from a pastoral population, including those with limited literacy and smartphone experience.	A smartphone application was developed for caregivers to measure, record, and submit high-frequency health and nutrition data of themselves and their children.	The app utilized a simple icon-based interface, with an audio-based approach to guide users in taking measurements and submitting data.
[6]	2023	United States, Texas	Pilot randomized controlled trial with 73 parents of children aged 1–3 years. The intervention lasted for 8 weeks.	Parents with children aged 1–3 years from low-income families.	The intervention group received educational videos, cooking tutorials, and text messages. The control group received a nutrition booklet.	The app focused on improving child fruit and vegetable intake and reducing screen time. It used a theory-based educational approach and digital content to engage parents and children.
[27]	2022	South Africa	A randomized controlled design with three groups: an mHealth intervention group, a conventional awareness campaign group, and a control group.	Caregivers of young children from a low-resource setting were recruited from a primary healthcare facility.	The mHealth intervention consisted of delivering developmental literacy content via mobile technology over three months.	The mHealth intervention provided digital information aimed at enhancing caregivers' developmental literacy and promoting early stimulation behaviors.
[28]	2021	South Africa	Cross-sectional within-subject validation study	Caregivers of 276 preschool children from low-income communities	mHealth-based developmental screening using the Parents' Evaluation of Developmental Status (PEDS) tool	Mobile application collected caregiver concerns; targeted early identification of developmental delays across domains, particularly literacy
[17]	2017	United States	Randomized pilot study	The study involved 32 low-income Chinese immigrant mothers with preschool-aged children. Low levels of acculturation characterized participants and put them at high risk for obesity.	An 8-week home-based educational intervention delivered through tablet computers. The content focused on maternal self-efficacy, eating habits, physical activity, and parenting practices aimed at preventing child obesity.	Multimedia educational content was culturally tailored to promote healthy eating, increase physical activity, and improve child-feeding practices among mothers.
[29]	2019	India	Cluster randomized controlled trial (study protocol)	Rural women up to 20 weeks pregnant from 244 villages in India; total of 2501 participants supported by 297 ASHAs and five trained counselors	M-SAKHI is a mobile health intervention delivered via trained ASHAs to support maternal and infant health from early pregnancy until 12 months postpartum	Provides structured, stage-specific behavior change messages on antenatal care, maternal nutrition, breastfeeding, complementary feeding, and hygiene practices, delivered by ASHAs via mobile phones

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Table 1 (Continued).

Author(s)	Year	Country	Design	Population	Intervention Details	App Features & Behaviors
[30]	2025	Indonesia	A Cross-Sectional study design with a pretest-post-test control group approach.	Mothers of children aged under five years old living in rural areas with varying education levels and household incomes.	The intervention involved a mobile application called "e-MCH Handbook" designed to support maternal practices in nutrition and child development.	The application featured educational materials, interactive health recording, developmental tracking tools, and reminder functions aimed at enhancing maternal knowledge and behavior in child feeding and development monitoring.
[9]	2022	Sub-Saharan Africa (16 studies), Southern Asia (7 studies)	Systematic literature review of quantitative comparative studies	Pregnant women and mothers in LMICs in Sub-Saharan Africa and Southern Asia	mHealth interventions delivering SMS and voice reminders targeting maternal and child health	Messaging focused on ANC, PNC, vaccination, and skilled birth attendance
[31]	2015	India (Gujarat)	Pilot study, using the Medical Research Council (MRC) framework for developing complex interventions	Village-based Accredited Social Health Activists (ASHAs) work with pregnant women, newborns, and young children, particularly in tribal rural areas of Gujarat, India.	The intervention utilized the ImTeCHO mobile phone and web application to support ASHAs in scheduling tasks, implementing behavior change communication (BCC), diagnosing patients, managing patient care, and providing supervision.	The app helped ASHAs with scheduling, task reminders, BCC with multimedia videos, diagnosis support through algorithms, and real-time supervision to address complications in maternal and child health.
[10]	2022	Developing countries (low- and middle-income countries)	Scoping review using the five-stage framework developed by Arksey and O'Malley	Focus on MCH services, child immunization, and nutrition services in low- and middle-income countries	mHealth interventions aimed at increasing the utilization of MCH services, including child immunization and nutrition services	mHealth interventions focused on improving access to and utilization of MCH services.

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- Better anthropometric outcomes (e.g,[16])
- Early identification of developmental delays[28]

3. Developmental Gains:
   Modest improvements in cognitive, motor, and socioemotional development; integration of milestone tracking with targeted educational messages.
4. Service Utilization:
   Increased attendance at growth monitoring and immunization sessions; better adherence to national nutrition programs.

Implementation and Engagement

Successful interventions incorporated culturally tailored content, co-design with users, interactive features (eg, gamification, personalized feedback), and human support components such as healthcare professionals or trained peer counselors. These elements promoted sustained app use and user satisfaction. Key barriers included limited digital literacy, inconsistent internet access, language or cultural mismatches, and concerns over long-term sustainability (Table 2).

Risk of Bias

Methodological quality was generally acceptable Most studies demonstrated low to moderate overall risk of bias, with one study rated high risk.[7] Low-risk studies exhibited robust participant selection, intervention delivery, outcome measurement, and reporting.[33–35] Moderate-risk studies were affected by performance or attrition bias,[15,19,28] and one study had high overall risk due to evaluation of commercial apps without controlled conditions. Reporting bias was minimal across studies, supporting confidence in outcome validity (Figure 2).

Summary

Overall, mobile app-based interventions improved maternal behaviors, child nutrition, and developmental outcomes, while highlighting the importance of implementation quality, user engagement, and context-specific adaptations to maximize effectiveness.

Discussion

This scoping review mapped the current evidence on mobile applications designed to support maternal behaviors in promoting child nutrition and development, directly addressing the study's objective of identifying app-based strategies, their functionalities, and their outcomes across diverse populations. Across the 25 included studies, mobile applications consistently improved maternal knowledge, confidence, and responsive feeding practices, as well as child nutrition and developmental outcomes. These findings confirm the potential of digital interventions to enhance maternal roles in early childhood health, aligning with the review's aim of evaluating both behavioral and developmental impacts.

Unlike earlier reviews focusing narrowly on breastfeeding,[6] or digital parenting interventions.[36] This study integrates maternal behavior change strategies, app functionalities, implementation processes, and child-level outcomes. Prior reviews largely emphasized usability or effectiveness without examining contextual factors, co-design processes, or equity considerations. By including studies from both high-income countries (HICs) and low- to middle-income countries (LMICs), this review extends the evidence base, providing a more nuanced understanding of how mobile applications operate in different contexts.[16,17]

Interventions in HICs often leveraged high smartphone penetration, stable internet access, and advanced app features such as interactive gamification, sophisticated feedback algorithms, and integration with electronic health records.[37,38] These studies reported strong improvements in maternal behaviors and developmental outcomes, particularly in well-resourced urban populations. In contrast, interventions in LMICs faced challenges such as limited digital literacy, intermittent internet connectivity, and cultural or language mismatches. Despite these barriers, apps that incorporated co-design, culturally tailored content, peer support, and offline capabilities still achieved meaningful improvements in maternal behaviors and child nutrition.[39] This comparison underscores the importance of contextual adaptation, showing that even resource-constrained settings can benefit from mobile applications when interventions are carefully designed to meet local needs.

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Table 2 Summary of Findings

Author(s)	Year	Child Health Outcomes	Implementation	User Engagement	Technological Features
[13]	2025	Breastfeeding duration, exclusive breastfeeding at 6 months, and breastfeeding self-efficacy scores	Participants were randomly assigned to intervention and control groups. Surveys were administered at 32–36 weeks of gestation and 1 year postpartum.	Positive participant feedback on features like feeding trackers, real-time lactation support, and moderated peer groups	Real-time support, interactive components, peer groups
[14]	2024	Higher exclusive breastfeeding rates, fewer breastfeeding problems	Mothers in the MABBP group (experimental) received mobile-based training starting on the first postpartum day. Follow-up data were collected using various forms, including the Mobile Application Evaluation Form for the experimental group.	No significant differences were found between the groups in terms of engagement, but the MABBP group had higher exclusive breastfeeding rates and fewer breastfeeding problems.	Mobile application with features for breastfeeding education, tracking, and follow-up evaluation
[15]	2019	Significant improvements in adult word counts, parent-child conversational turns, and Developmental Snapshot score (no improvements in child vocalizations)	Enrolment at a single urban pediatric clinic, follow-up data collection through May 2018, analyses conducted between June and August 2018	Significant improvements in adult word counts, parent-child conversational turns, and child language development (Developmental Snapshot score); no improvements in child vocalizations	Commercially available smartphone application for delivering instructional videos, data collection on word counts, and feedback through the app
[16]	2019	Significant improvements in fruit and vegetable intake, measured via electronic food photos, surveys, and Veggie Meter to measure skin carotenoid levels	Intervention delivered during story time sessions at local libraries; data collected via electronic photos and surveys	Significant week × treatment interactions for both children and parents ($P < 0.001$) in the intervention group compared with the control group	Mobile website, Facebook posts, text messages, and Veggie Meter for measuring skin carotenoid levels
[17]	2017	Improved maternal self-efficacy, eating behaviors, physical activity, and child-feeding practices; reduction in maternal body mass index and waist circumference	8 weekly sessions delivered using tablet-based education, focusing on dietary and exercise behaviors for mothers	Feasible among low-income Chinese mothers, showing large sizes in improving maternal behaviors related to diet and exercise	Tablet-based multimedia education, designed for low-acculturation mothers, provides culturally tailored content
[18]	2024	Primary outcome: Body mass index (BMI) z-score at 36 months. Secondary outcomes: Parent-child feeding practices, infant eating behaviors, and child growth assessments.	Delivered through the mobile app and printed brochures. Data collection from baseline to 36 months of child age.	The study expects a significant impact on improving maternal feeding practices, with follow-up measures at 36 months to assess effectiveness.	Web-based smartphone app, supplemented with printed materials, designed for first-time parents to promote healthy eating behaviors and child growth.
[19]	2022	Primary outcome: Body mass index (BMI) z-score at 36 months. Secondary outcomes Include Parent-Child feeding practices, infant eating behaviors, and child growth assessments.	Delivered through the mobile app and printed brochures. Data collection from baseline to 36 months of age.	Low levels of sustained app use and moderate app acceptability. Frequent app users showed benefits, especially among children of parents with lower educational levels or higher BMI.	mHealth app designed to support behavior change related to energy balance behaviors and child weight development, with functionalities for tracking and providing educational content.

[20]	2021	Primary outcome: Change in weight-for-height z-score (WHZ), secondary outcomes: Changes in underweight, stunting, and malnutrition status (WAZ, HAZ), maternal nutritional literacy	App delivered to the intervention group for 6 months, with weekly updates and reminders sent by clinicians. The control group received standard care with regular check-ups and basic nutritional information.	Moderate app engagement with weekly updates and clinician interaction via the app; 90% of mothers completed the intervention period	Smartphone-based app developed to deliver maternal education on complementary feeding, with a chat feature for clinician consultations
[8]	2022	Infants in the intervention group showed improved communication, cognition, motor, and social-emotional development at 9 and 12 months postpartum, with better communication and motor skills than control group.	The SPA intervention was available from recruitment until 6 months postpartum, with periodic data collection at 1, 2, 4, 6, 9, and 12 months. Parents were randomly assigned to intervention or control groups.	Engagement was monitored via app usage statistics, with participants accessing tailored information and interacting with peer volunteers.	The app includes multimedia resources (articles, videos, audio), expert content, and peer volunteer support. Features aimed to provide personalized content to parents based on their infant's age.
[21]	2022	Coverage of vaccinations (measles, pentavalent), household diet diversity, child diet diversity, caregiver health knowledge. No significant change in malnutrition or mortality.	Cash transfers (US$70/month for 3 months, US$35/month for 6 months). Conditionality: health screening of children. mHealth messages broadcast twice weekly.	High engagement with the mHealth audio messages throughout the study period (>85%).	Mobile phones used for distributing cash transfers and health messages. Mobile SIM cards and transfer systems provided to mothers.
[22]	2023	Changes in children's growth indicators, maternal nutritional knowledge, attitude, and practices.	Participants randomized into two groups: (a) treatment as usual with the app and (b) treatment as usual alone.	116 participants, randomized 1:1. Engagement assessed based on app usage and maternal knowledge improvement.	Mobile app with content on children's nutrition, undernutrition, and feeding practices accessible on smartphones.
[23]	2024	Aims to improve maternal and child nutrition during the first 1000 days of life, addressing undernutrition, appetite loss, and promoting child growth.	8 articles were reviewed from Google Scholar, PubMed, and Science Direct (2017–2022).	mHealth apps offer resources for parents through educational content and peer support, thereby enhancing engagement.	Mobile apps with educational articles, audio, videos, and peer support functionalities for maternal and child care.
[24]	2024	Improved nutrition intervention coverage and effectiveness in rural settings; key focus on increasing maternal and child nutrition.	The mHealth system was integrated with CHWs' visits, with real-time documentation, task management, and supervisor monitoring for quality assurance.	High coverage was achieved across the arms (>90%), except during perinatal periods due to cultural practices; the app facilitated high engagement during routine visits.	The app featured portable devices, easy-to-navigate content, pictorial demonstrations, and automated task scheduling. Technical challenges included device charging, unstable internet, and device safety.

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Table 2 (Continued).

Author(s)	Year	Child Health Outcomes	Implementation	User Engagement	Technological Features
[25]	2024	Improvements in parenting sense of competence, awareness, and attitudes regarding child development. No significant differences were found between groups, but regression analyses highlighted associations between sociodemographic factors and parental competence.	The intervention was delivered through the app, with both groups completing the EPAQ, QAECEP, and KIDI questionnaires at the beginning and after 3 months.	Frequent users of the app exhibited better outcomes in terms of parental awareness and competence, particularly to child gender and delivery term.	The app offers a user-friendly interface with content including play activities, developmental tips, and milestones for early childhood development.
[7]	2023	Found that no apps were rated highly for appropriateness or for providing high-quality feeding information, especially for mothers with low income	The apps were evaluated by health professionals using questionnaires	The engagement levels were low for the most part, particularly in providing culturally appropriate content for minority groups	Technical features were focused on app functionalities, such as ease of navigation, but the quality of information was rated poorly
[26]	2023	The study found consistent participation over a 12-month period, with high-frequency submissions of data like mid-upper arm circumference (MUAC) and child health measurements.	Caregivers made frequent and consistent measurements and submissions in 48 out of 52 weeks of the study.	Caregivers' participation rates were high, and they provided frequent data submissions despite limited literacy and smartphone experience.	The app was simple to use, with a focus on icon-based interaction and audio prompts, suitable for users with minimal literacy.
[6]	2023	The children in the intervention group increased their intake of fruits and vegetables and decreased their screen time. Parents showed improvements in self-efficacy and feeding practices.	The intervention used a parent-administered questionnaire at baseline and post-intervention. Linear models were used for data analysis.	The intervention group demonstrated high participation and engagement, resulting in significant improvements in child nutrition behaviors and parental self-efficacy.	The intervention included educational videos, cooking tutorials, and text messages, all of which were delivered through a digital platform.
[27]	2022	There was a statistically significant improvement in caregivers' developmental literacy from pre-test to post-test across all groups ($p = 0.000$), although no significant difference was found between the intervention and control groups ($p = 0.359$).	The intervention was delivered over three months, with information presented through mobile technology for the mHealth group and traditional formats for the other group. All participants underwent face-to-face interviews during pre-assessment.	User engagement was not directly measured, but face-to-face interviews with healthcare professionals may have influenced the outcomes and supported participant engagement.	Mobile technology was used to deliver educational content; specific app features were not detailed in the study.
[28]	2021	The mHealth PEDS tool identified 85.9% of children at risk of developmental delays, showing high sensitivity (92.6%) but low specificity (22.5%) compared to the Vineland-3 standard. Literacy delays were most common.	Screening conducted in community settings using mobile devices; results were compared with standardized Vineland-3 assessments	User engagement was not quantitatively assessed; participation inferred through caregiver completion of the digital screening tool	Digital tool allowed mobile screening, automatic data capture, and comparison with normative criteria; accessible for low-resource settings

[17]	2017	Significant improvements were observed in maternal BMI, waist circumference, eating behavior, and self-efficacy. These changes in maternal behavior are strongly associated with the prevention of childhood obesity.	The intervention was implemented through weekly sessions using tablet computers in the home, making the program accessible and culturally appropriate.	High feasibility and acceptability were reported. Participants successfully engaged with the weekly sessions, demonstrating strong adherence despite low levels of acculturation.	Tablets were used to deliver interactive multimedia content. The technology supports cultural competence.
[29]	2019	Primary: Reduction in child stunting at 18 months. Secondary: Maternal dietary diversity, birth weight, feeding practices, infant development, and morbidity.	Implemented through a network of 297 trained ASHAs, five counselors, and monitored by 51 field research officers	User engagement facilitated through repeated interactions between ASHAs and participants across pregnancy and postpartum; quantitative engagement levels not reported	Mobile app used by community health workers with audiovisual and prompt-based structured counseling features tailored to pregnancy and infant stages
[30]	2025	Significant improvements were observed in maternal knowledge and practices related to child nutrition and stimulation activities.	The app was introduced through community health workers with training sessions for mothers, and data collection occurred before and after the intervention.	High user engagement was noted, supported by frequent usage monitoring and support from health workers.	The app was developed for Android smartphones, featuring an intuitive interface, offline accessibility, and secure login.
[9]	2022	Indirect improvement in early development via increased ANC/PNC attendance and immunization coverage; nutrition outcomes not directly reported	Implemented via existing mobile phone networks and local health systems using basic communication tools	Engagement inferred from increased attendance and service uptake; direct metrics not specified	SMS and voice reminders using basic mobile phones; no use of advanced apps or innovative technologies
[31]	2015	Increased awareness and adoption of health practices such as breastfeeding and immunization through improved counseling and supervision. The app also helped in managing complications for pregnant women and children.	ASHAs were trained and supported by SEWA Rural, with real-time tracking of performance. The intervention was tested in a rural area over a period of 7 months. Feedback from users helped refine the intervention.	High engagement from ASHAs, with 88% login rates, but lower engagement from medical officers (17%). ASHAs completed 71% of assigned tasks.	Mobile application (Android-based) with scheduling, risk stratification, diagnosis algorithms, BCC videos, and a web interface for supervisor monitoring. The system allowed for offline use and supported multiple languages.
[10]	2022	Improved access to MCH services, child immunization, and nutrition services. Barriers to mHealth utilization were also identified.	A systematic review of 573 studies was conducted, focusing on observational, cross-sectional, and RCT studies.	User engagement was categorized by healthcare worker and beneficiary adoption.	Mobile phones and digital tools were used to increase access to MCH services.

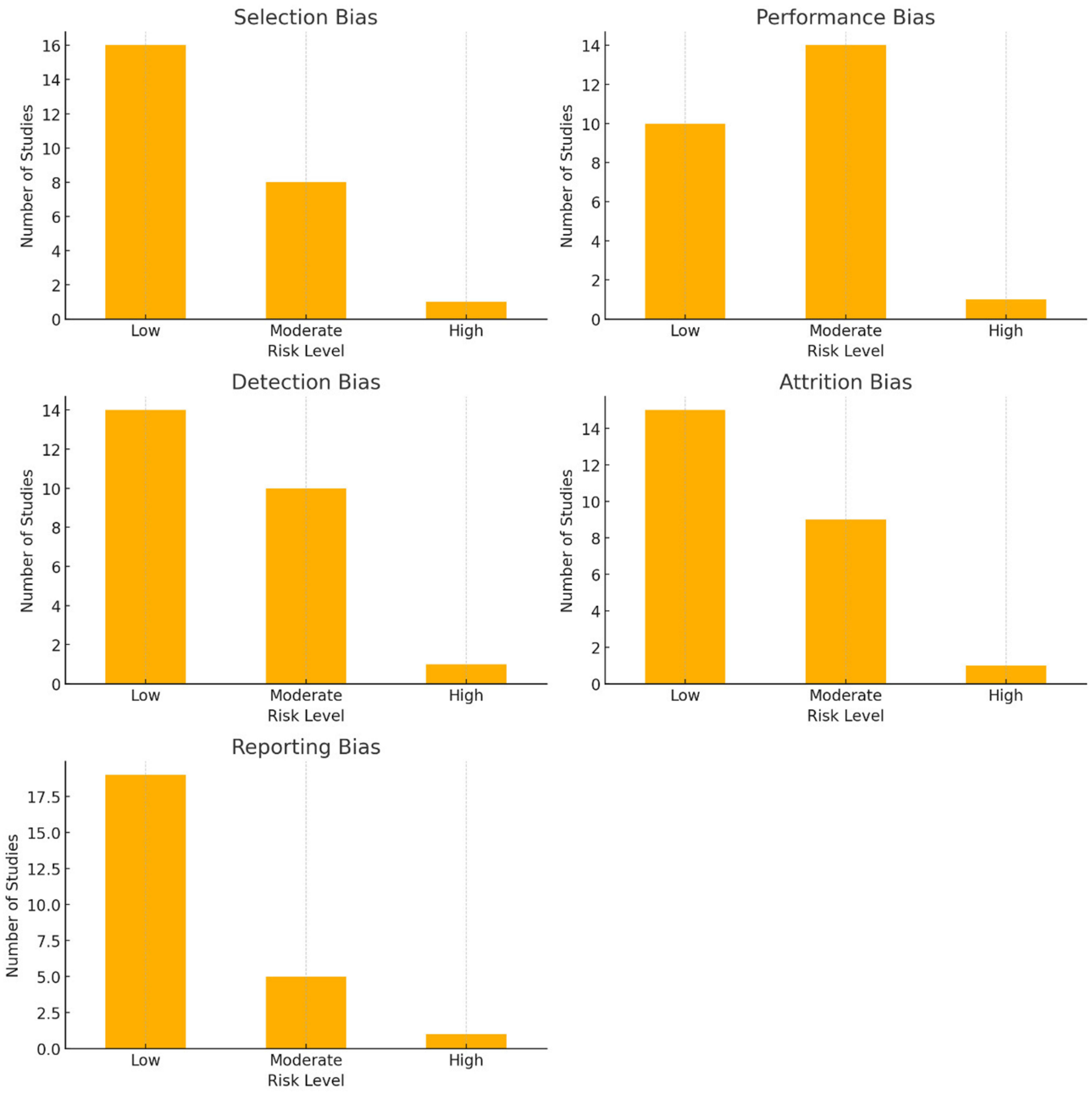

Figure 2 Risk of bias distribution for each indicator across the 25 included studies. The figure presents the proportion of studies rated as low risk, high risk, or unclear risk of bias for each methodological domain assessed. The distribution reflects the overall methodological quality across the included studies.

Across contexts, successful interventions combined interactive content, real-time feedback, milestone tracking, and human support components (eg, healthcare professionals or peer counselors). These features promoted sustained engagement, particularly among populations with limited access to conventional maternal and child health services. Barriers to implementation included low digital literacy, connectivity issues, and sustainability concerns in donor-funded programs. These findings highlight that app design alone is insufficient; human support and health system integration are essential to maximize adoption and impact.

By including quantitative, qualitative, and mixed-methods studies, this review provides a holistic understanding of mobile application interventions and their contextual use. Limitations include small sample sizes, short follow-up periods, inconsistent engagement measures, and lack of standardized outcomes, which constrain comparability across studies. Few studies addressed potential unintended consequences, such as misinformation, privacy concerns, or screen time overexposure.

This review emphasizes the potential of mobile applications to enhance maternal behaviors and child health outcomes across diverse contexts. Future research should focus on long-term effectiveness, scalability, cost-effectiveness, and digital equity, particularly in LMICs. Contextual adaptation, co-design with end users, and integration into existing health systems remain critical for achieving sustainable impact.

Mobile applications represent a versatile and promising approach to supporting maternal roles in child nutrition and development. When contextually adapted and coupled with implementation support, these interventions can promote positive behavioral and developmental outcomes, addressing both immediate needs and long-term health equity goals in both high- and low-/middle-income countries.

Strength and Limitation

This review also has several strengths. It included a wide range of study designs including qualitative, quantitative, and mixed-methods that enabling a rich understSilwanah ng of both outcomes and implementation processes. The diversity of target populations across contexts enhances the generalizability of findings. However, limitations were noted. Small sample sizes and inconsistent definitions of user engagement reduced comparability between studies. Moreover, few studies employed standardized outcome measures or evaluated long-term health impacts.

Implications for Practice, Research, and Policy

mHealth applications can serve as complementary tools to in-person care, especially in settings where healthcare resources are limited. Integration into existing maternal and child health services, supported by community health workers, can help extend the reach of evidence-based care. However, interventions must be tailored to users' cultural, linguistic, and technological contexts, particularly among populations with limited digital literacy. There is a critical need for long-term studies to evaluate the sustained effects of mHealth tools on maternal practices and child outcomes. Additionally, cost-effectiveness analyses are crucial for informing decisions about scaling up these interventions in resource-limited settings. Future studies should explore personalization strategies that adapt interventions to demographic, behavioral, and cultural factors. Governments and public health agencies have a window of opportunity to invest in digital health infrastructure, including affordable mobile access and regulatory frameworks for quality assurance. National digital health strategies should explicitly incorporate maternal and child health priorities and set standards to ensure that mHealth tools are evidence-based, user-centered, and free from misleading or harmful content.

Conclusion

This scoping review identified and mapped 25 studies involving mobile health interventions aimed at supporting maternal roles in early childhood nutrition and development. The findings suggest that mHealth applications can effectively enhance maternal practices, including breastfeeding, dietary decision-making, and developmental stimulation, thereby contributing to improved child health outcomes. The diversity of interventions and target populations suggests that mobile tools are adaptable across various settings, including underserved communities. However, successful implementation depends on addressing challenges such as digital access, user engagement, and sustainability. Further high-quality studies are needed to examine the long-term effectiveness, integration with existing health services, and cost-effectiveness of digital interventions in real-world conditions. As digital health technologies continue to evolve, they hold significant potential to advance maternal and child health equity, particularly in low-resource contexts.

Data Sharing Statement

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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