



Teacher Strategies for Fostering Early Childhood Independence Through the Free Nutritious Meal Program

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Abstract:

This study aimed to synthesize empirical evidence regarding teachers' strategies for fostering young children's independence through the implementation of Indonesia's School Nutritious Meal Program (Makan Bergizi Gratis/MBG). A qualitative Systematic Literature Review (SLR) was conducted following the PRISMA 2020 guidelines. Relevant studies published between 2021 and 2026 were retrieved from Scopus, Web of Science, ERIC, ScienceDirect, SpringerLink, Taylor & Francis, Google Scholar, and nationally accredited journals. Data were analyzed using the interactive qualitative analysis model of Miles, Huberman, and Saldaña through data condensation, data display, and conclusion drawing. The findings identified four major pedagogical strategies: structured routines and habituation, family-style dining, integration of character education through mealtime etiquette, and creative approaches to children's eating challenges. Their effectiveness was influenced by teachers' pedagogical competence, supportive learning environments, adequate facilities, and school-family collaboration. The review concludes that MBG functions not only as a nutrition program but also as a pedagogical platform for promoting children's independence and character development. These findings contribute to early childhood pedagogy by integrating nutrition and character education while providing evidence-based recommendations for teachers, school leaders, and policymakers to optimize the educational value of the MBG program.

INTRODUCTION

Early childhood education constitutes a critical foundation for lifelong development because experiences during the early years shape children's cognitive, social, emotional, and behavioral capacities (Boll et al., 2025). In addition to preparing children for formal learning, early education is increasingly expected to foster independence as an essential component of children's social and personal development. Children who develop self-regulation and autonomy are better positioned to make simple decisions, solve everyday problems, and participate responsibly in their social environments (Kharroubi & ElMediouni, 2024; Yuliani & Hanif, 2026). In early childhood, independence involves performing age-appropriate daily activities autonomously, regulating behavior, taking responsibility, and gradually reducing reliance on adults through guided

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experiences (Diani & Pranoto, 2025; Etokabeka, 2025). These competencies do not emerge automatically but require systematic support through meaningful routines and interactions in educational settings (Hayashi et al., 2022). Teachers consequently occupy a central position in transforming ordinary classroom experiences into opportunities for developing autonomy, responsibility, and self-management. Strengthening independence at an early age is therefore important for nurturing resilience, lifelong learning, and active participation in increasingly complex social environments (Hoang et al., 2024).

Despite its importance, fostering independence remains challenging in many early childhood education settings (Turienzo & Manzano-Soto, 2024). Children may continue to depend heavily on teachers or caregivers for routine activities such as organizing learning materials, eating, cleaning up after activities, and making simple decisions (Boll et al., 2025; Kharroubi & ElMediouni, 2024; Yuliani & Hanif, 2026). Such dependence may be associated with overprotective parenting, teacher-centered classroom practices, insufficient opportunities for autonomous practice, and instructional orientations that emphasize task completion rather than character development (Ryan et al., 2026). Previous studies further indicate that independence is sometimes addressed through isolated moral instruction rather than embedded in authentic situations in which children repeatedly practice responsible behavior (Chuang et al., 2025; Rahkola et al., 2026). As a result, opportunities to strengthen self-confidence, responsibility, and self-regulation may remain insufficiently utilized. This condition underscores the need for contextual pedagogical approaches that incorporate independence-building experiences into children's everyday activities rather than treating character development as a separate instructional component.

Within the Indonesian context, the Free Nutritious Meal Program (Program Makan Bergizi Gratis/MBG) represents a contemporary educational setting with potential to support such development. Officially implemented beginning in 2025, the program forms part of the national strategy to improve children's nutritional conditions and human resource quality in support of Indonesia Emas 2045 (Malaka et al., 2025; Putawara et al., 2025). Although its primary objective concerns children's nutritional needs, the implementation of meal routines in educational settings creates opportunities for broader educational processes (Herwawan et al., 2026). During meal activities, teachers may guide children to queue appropriately, wash their hands independently, collect meal boxes, pray before eating, use eating utensils responsibly, and clean the surrounding environment after meals (Hari et al., 2026; Humaeroh et al., 2025). Because these activities occur repeatedly within children's daily routines, they provide authentic contexts for practicing independence, discipline, responsibility, cooperation, and self-management. Thus, MBG can potentially function not only as a nutritional intervention but also as a pedagogical context in which character development is integrated into habitual daily experiences through teacher guidance and repeated practice (Sianturi, 2025).

Nevertheless, existing research on MBG has primarily approached the program from nutritional, public health, educational policy, and implementation perspectives (Christian et al., 2026). Previous investigations have largely examined its contribution to nutritional status, concentration, learning readiness, food security, and educational participation (Khoirunnisa & Ramadhan, 2025; Lee et al., 2026). While these studies demonstrate the relevance of school meal programs to

children's physical and educational well-being, they provide comparatively limited insight into the pedagogical processes that take place during meal implementation. In particular, insufficient attention has been given to how teachers intentionally organize and guide meal routines as opportunities for cultivating children's independence. Consequently, the educational significance of MBG has largely been discussed in relation to health and learning outcomes rather than the instructional strategies through which teachers may promote character development in authentic daily contexts (Buaton et al., 2025; Mas'amah et al., 2026).

Research in early childhood education has established that independence can be fostered through teacher scaffolding, experiential learning, classroom routines, and social interaction (Khaerunnisa et al., 2022; Venard et al., 2023). From constructivist perspectives, teachers support autonomy by progressively transferring responsibility to children through modeling, guided participation, positive reinforcement, and repeated opportunities for practice. However, existing studies have generally examined independence development within conventional learning contexts, including play-based learning, project-based activities, and routine classroom instruction (Julian & Pranata, 2025; Sujianto et al., 2026). Comparatively little attention has been given to school meal programs as everyday pedagogical environments for developing children's independence. This creates a fragmented body of knowledge in which nutrition interventions and character education are largely examined as separate domains, with limited understanding of how teachers can integrate the two through routine meal activities. A systematic synthesis is therefore needed to clarify the pedagogical mechanisms and contextual conditions underlying this potential.

Addressing this gap, the present study conceptualizes the Free Nutritious Meal Program as more than a government nutrition intervention and examines it as a pedagogical context in which teachers can facilitate children's independence through authentic daily experiences. Rather than concentrating exclusively on nutritional outcomes or policy implementation, this study systematically synthesizes evidence concerning teachers' strategies for supporting independent behavior during meal-related activities. The study contributes a more integrated perspective by connecting school nutrition, early childhood pedagogy, teacher practices, and character education within a single analytical framework. Particular attention is given to strategies such as scaffolding, habituation, modeling, environmental organization, and positive reinforcement, which may enable teachers to transform routine meal activities into repeated opportunities for children to exercise autonomy and responsibility.

Accordingly, this study employs a Systematic Literature Review (SLR) to identify, analyze, and synthesize empirical evidence concerning teachers' strategies for fostering independence among young children through the implementation of the Free Nutritious Meal Program. The review addresses three research questions: (1) What pedagogical roles do teachers perform during MBG implementation? (2) What instructional strategies are used to cultivate children's independence through meal activities? and (3) What contextual factors facilitate or constrain the effectiveness of these strategies? This study proposes that the educational significance of MBG extends beyond nutritional improvement by creating authentic opportunities for children to develop independence through teacher-guided daily routines. The findings are expected to contribute to

theoretical discussions in early childhood pedagogy and character education while providing evidence-informed insights for teachers, school leaders, and policymakers seeking to maximize the educational potential of the MBG program.

RESEARCH METHODS

This study employed a qualitative research design using a Systematic Literature Review (SLR) approach to identify, evaluate, synthesize, and interpret empirical evidence concerning teachers' strategies for fostering independence among young children through the Free Nutritious Meal Program (Program Makan Bergizi Gratis/MBG). The SLR approach was adopted because it facilitates the systematic integration of findings from multiple studies, enabling the identification of recurring patterns, conceptual relationships, and evidence-based insights that may not be apparent from individual studies. It also provides a transparent and structured procedure for reducing potential selection bias and developing a comprehensive understanding of the educational phenomenon under investigation. To ensure methodological transparency and reproducibility, the review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework proposed by Page et al. (2021), covering the stages of identification, screening, eligibility assessment, and inclusion.

The literature was retrieved from internationally recognized academic databases, including Scopus, Web of Science, ERIC, ScienceDirect, SpringerLink, Taylor & Francis Online, and Google Scholar, as well as nationally accredited journals indexed through Garuda/SINTA. These sources were selected because they provide access to peer-reviewed publications relevant to education, early childhood education, pedagogy, and school nutrition. The search focused on studies published between 2021 and 2026 to capture recent evidence and contemporary educational practices relevant to the study focus. The literature search was conducted from January to March 2026.

The search strategy targeted empirical studies examining teacher strategies, pedagogical practices, or educational interventions related to children's independence in school meal programs or comparable early childhood education contexts. The reviewed literature included studies involving early childhood teachers, preschool children, school leaders, and other educational practitioners relevant to the research questions. Boolean operators were used to combine the principal search terms: ("early childhood" OR "preschool" OR "PAUD") AND ("independence" OR "autonomy" OR "self-reliance") AND ("teacher strategy" OR "teacher role" OR "scaffolding") AND ("free nutritious meal" OR "school meal program" OR "MBG"). Retrieved records were exported to Mendeley for duplicate identification and removal before proceeding to title screening, abstract screening, and full-text assessment.

The selected studies were analyzed using the interactive qualitative analysis model developed by Miles, Huberman, and Saldaña (2014), as adapted for systematic literature reviews by Sudibya and Prasojo (2025). The analysis involved three stages: data condensation through extracting, coding, and categorizing findings; data display through synthesis matrices comparing study characteristics, participants, teacher strategies, and principal findings; and conclusion drawing and verification through iterative comparison to identify consistent patterns and themes. Methodological trustworthiness was strengthened through adherence to

PRISMA 2020, transparent documentation, explicit inclusion and exclusion criteria, and triangulation across peer-reviewed publications. An audit trail documented analytical decisions, while extracted information was cross-checked against original publications to minimize errors and strengthen credibility, dependability, confirmability, and methodological rigor.

RESULTS AND DISCUSSION

Results

Characteristics of the Analyzed Studies

The characteristics of the analyzed studies describe the general profile of the literature included in this systematic review, covering research approach, study design, publication period, research setting, participants, and research focus (Steil et al., 2022; Sudibya & Prasajo, 2025). Examining these characteristics provides an overview of methodological patterns and contextual variations in research addressing teachers' strategies for fostering independence among young children through shared mealtime programs. This synthesis also provides an important contextual basis for interpreting the thematic findings presented in the subsequent sections.

The reviewed literature was predominantly qualitative, particularly employing descriptive qualitative and case study designs (Simon-Tillaux et al., 2022; Vediya et al., 2025). These approaches enabled researchers to examine teachers' pedagogical practices, teacher-child interactions, and children's experiences during shared mealtime activities in natural educational settings. Data were commonly generated through classroom observations, teacher interviews, and document analysis, allowing researchers to capture the processes through which teachers guide children toward greater independence in everyday routines (Lockett, 2025; Osorio & Azad, 2025).

The studies represented diverse early childhood education settings, including urban and rural institutions in Indonesia, reflecting varied social, cultural, and institutional environments in which shared mealtime activities are implemented (Bojcic et al., 2024; Trujillo & Fontana, 2026). Despite these contextual differences, the reviewed studies consistently emphasized teachers' roles in integrating nutritional activities with character development by encouraging self-help skills, responsibility, routine adherence, and independent mealtime practices. Methodologically, the predominance of qualitative inquiry indicates a focus on understanding the processes and interactions underlying children's independence rather than merely measuring behavioral outcomes. Furthermore, variations in educational settings demonstrate that shared mealtime practices operate within diverse sociocultural conditions, while teachers remain central pedagogical actors in fostering independence, responsibility, and self-regulation through structured daily routines.

Table 1. Characteristics of the Analyzed Studies

Aspect	Synthesized Findings	Indicator
Research Approach	Predominantly qualitative	Exploration of teaching and learning processes
Research Design	Descriptive qualitative and case study	In-depth investigation of teachers' practices

Research Setting	Early childhood education institutions in urban and rural areas	Diverse implementation contexts
Publication Period	2023–2026	Research development following the introduction of school meal programs
Research Focus	Teachers’ strategies for fostering children’s independence	Teachers’ pedagogical roles during shared mealtime

Table 1 indicates that research on teachers’ strategies for fostering children’s independence through shared mealtime programs is largely qualitative and process-oriented. The frequent use of descriptive qualitative and case study designs suggests that existing research has primarily sought to understand pedagogical practices, teacher–child interactions, and contextual conditions rather than quantify the effects of mealtime programs. This methodological orientation is particularly relevant to character development because independence emerges through repeated interactions, guided participation, and contextualized daily experiences.

The diversity of research settings further indicates that shared mealtime programs are implemented under varying institutional and sociocultural conditions. Although resources, organizational practices, and community characteristics may differ, the reviewed literature consistently positions teachers as important pedagogical agents in transforming mealtime into an educational experience. The evidence therefore suggests that the educational contribution of shared mealtime extends beyond food provision and depends substantially on how teachers organize, guide, and contextualize children’s participation.

Teachers’ Role in Facilitating Children’s Independence

Teachers’ role in facilitating children’s independence refers to the pedagogical responsibilities through which teachers support young children in gradually performing daily mealtime activities with greater autonomy (Marconi et al., 2022). Within the context of the School Nutritious Meal Program (Makan Bergizi Gratis/MBG), this role extends beyond supervising food consumption to include the development of self-help skills, responsibility, self-regulation, and appropriate social behavior (Malaka et al., 2025). Across the reviewed literature, teachers were consistently represented as facilitators, role models, motivators, character educators, and learning managers who transform routine mealtime activities into opportunities for children’s development.

As facilitators, teachers provide structured guidance while progressively transferring responsibility to children. Rather than completing tasks on behalf of children, teachers demonstrate procedures, provide verbal prompts, monitor participation, and gradually reduce assistance as children’s competence increases (Anggereni et al., 2023; Cerino, 2023). This approach allows children to practice age-appropriate self-care behaviors, including preparing eating utensils, managing food and drinks, maintaining cleanliness, and following established routines with increasing independence.

Teachers also function as behavioral role models. The reviewed studies indicate that children learn through observing teachers’ eating behaviors, hygiene practices, communication, and social etiquette during shared meals (Etchebehere et al., 2024; Fadlillah et al., 2025; Usoltsev et al., 2025). Modeling is particularly relevant in early childhood because children can internalize expected behaviors through repeated observation and imitation. In parallel, teachers employ praise,

encouragement, and constructive feedback to strengthen children's confidence and motivation to complete tasks without excessive adult assistance (Marconi et al., 2022).

Beyond facilitation and modeling, teachers integrate character education into everyday mealtime experiences. Independence, responsibility, discipline, cooperation, and respect are developed through repeated participation in structured routines rather than through isolated moral instruction. Teachers therefore assume a broader educational function by organizing mealtime as a learning environment in which children can practice and gradually internalize desirable behaviors.

Table 2. Synthesized Roles of Teachers in Facilitating Children's Independence

Teachers' Role	Synthesized Evidence	Key Indicator
Facilitator	Teachers provide scaffolding and gradually reduce assistance during mealtime activities.	Guided practice and independent task completion
Role Model	Teachers demonstrate appropriate eating behaviors, hygiene practices, and social etiquette.	Modeling and observational learning
Motivator	Teachers use praise, encouragement, and positive reinforcement to strengthen children's confidence and willingness to act independently.	Self-confidence and sustained motivation
Character Educator	Teachers integrate independence, responsibility, discipline, cooperation, and respect into mealtime routines.	Character development through daily practice
Learning Manager	Teachers organize mealtime as a structured learning experience rather than merely a feeding activity.	Pedagogical organization and classroom management

Table 2 demonstrates that teachers perform multiple and interconnected roles within shared mealtime programs. Their responsibilities extend beyond nutritional supervision to include facilitating children's participation, modeling appropriate behavior, providing motivational support, integrating character education, and organizing the learning environment. These roles collectively create conditions in which independence can develop through repeated practice, observation, reinforcement, and gradually increasing responsibility.

Teachers' Strategies for Fostering Children's Independence

The synthesized literature identifies several complementary strategies used by teachers to foster children's independence during the implementation of the School Nutritious Meal Program (MBG) (Malaka et al., 2025). Shared mealtime is presented as an authentic pedagogical context in which children can develop autonomy, responsibility, self-regulation, and positive social behaviors through repeated participation and teacher guidance (Brandisauskiene et al., 2022, 2023).

The first strategy involves establishing structured routines and habituation. Teachers encourage children to wash their hands, queue appropriately, collect meal boxes, pray before eating, consume food independently, dispose of waste, and clean eating utensils or surrounding areas after meals. Repeated participation in these predictable routines provides children with opportunities to practice self-help behaviors and gradually perform everyday tasks with less adult assistance (Cerino, 2023).

The second strategy involves family-style dining and active participation. In this approach, children are encouraged to participate in activities such as serving food, pouring drinks, selecting appropriate portions, and maintaining the dining environment. Such participation positions children as active contributors rather than passive recipients and provides opportunities to exercise decision-making, responsibility, cooperation, and self-confidence.

The third strategy involves integrating character education directly into mealtime routines. Teachers encourage children to pray before and after eating, practice appropriate table manners, appreciate available food, avoid unnecessary waste, and express gratitude. These practices allow values such as discipline, respect, responsibility, and self-control to be practiced within authentic daily situations rather than presented as separate moral lessons (Razza & Brann, 2025; Zahra et al., 2024).

The fourth strategy concerns adaptive and creative approaches to children's eating challenges. Teachers employ storytelling, picture books, interactive discussions, playful food presentation, and repeated positive exposure to unfamiliar foods to create supportive experiences around eating. Rather than relying primarily on coercion, these approaches provide children with opportunities to make age-appropriate choices while gradually developing positive eating habits.

Overall, the synthesized evidence suggests that structured routines provide an important foundation for independence, while active participation strengthens children's autonomy and confidence. Character education is embedded within everyday meal activities, and teachers adapt their strategies to children's developmental needs. These complementary practices demonstrate how shared mealtime can become a meaningful context for developing independence alongside healthy eating behaviors.

Factors Influencing the Effectiveness of Teachers' Strategies

The fourth theme concerns the conditions that facilitate or constrain the effectiveness of teachers' strategies for fostering children's independence during MBG implementation (Hari et al., 2026; Simpson et al., 2022). These factors include both internal teacher-related conditions and external contextual conditions. Internal factors encompass pedagogical competence, understanding of child development, emotional capacity, and responsiveness, whereas external factors include school facilities, time allocation, institutional support, parental involvement, and collaboration among educational stakeholders (Polymeropoulou & Lazaridou, 2022; Sarfraz et al., 2022). Together, these conditions influence whether mealtime can function as a sustained learning experience rather than merely a nutritional activity (Iqbal et al., 2022).

Teacher pedagogical and emotional competencies emerged as important internal conditions. Teachers with stronger knowledge of early childhood development are better positioned to design age-appropriate experiences, provide appropriate scaffolding, and adjust the level of assistance according to children's developmental readiness (Mohebbi et al., 2022; Zhao et al., 2025). Patience, empathy, consistency, and responsiveness also support teachers in guiding children through repetitive routines without creating unnecessary dependence or frustration. Reflective practice further enables teachers to modify their approaches

when children encounter difficulties, thereby maintaining a supportive environment for gradual independence.

External conditions also influence the implementation of independence-oriented strategies. Adequate facilities, sufficient time for mealtime activities, supportive school leadership, and collaboration with parents can expand children's opportunities to practice independent behaviors consistently (Roka et al., 2024; Zahra et al., 2024). Parental involvement is particularly relevant because behaviors practiced at school are more likely to become established when similar expectations are reinforced in the home environment. At the same time, the literature identifies practical constraints, including limited instructional time, increased teacher workload, and additional responsibilities associated with MBG implementation. Such constraints may reduce opportunities for individualized guidance and continuous supervision, potentially limiting the consistency of independence-building practices.

Discussion

The findings of this systematic literature review demonstrate that teachers play a pivotal role in fostering young children's independence through the School Nutritious Meal Program (Makan Bergizi Gratis/MBG). Across the reviewed studies, teachers were identified as facilitators, role models, motivators, and character educators who transformed mealtime activities into meaningful learning experiences rather than treating them solely as nutritional interventions (Mohebbi et al., 2022; Simpson et al., 2022). This finding is consistent with Vygotsky's Social Constructivist Theory, which explains that children's autonomy develops through guided participation and scaffolding provided by more knowledgeable adults (Lei & Bakar, 2025). Similarly, Bronfenbrenner's Ecological Systems Theory emphasizes the influence of teachers within children's microsystem, particularly through everyday interactions that contribute to developmental outcomes (El Zaatari & Maalouf, 2022). While previous studies have predominantly emphasized the nutritional benefits of school meal programs, the present review highlights the pedagogical contribution of teachers as an equally important dimension (Etchebehere et al., 2024; Fadlillah et al., 2025). Thus, the findings broaden the understanding of school meal programs by connecting nutritional provision with character formation and developmental learning.

The review further indicates that structured routines and family-style dining represent important pedagogical strategies for cultivating children's independence during mealtime activities (Burakgazi, 2024; Lei & Bakar, 2025). Repeated participation in structured routines provides children with opportunities to practice and gradually internalize independent behaviors through consistent and meaningful experiences. This pattern can also be understood through Bandura's Social Learning Theory, which emphasizes that children acquire behaviors through observation, imitation, and reinforcement from significant adults (Bandura, 2024; Rayes & Albelaihi, 2023; Vijayalakshmi & Rajakumari, 2025). When teachers consistently demonstrate appropriate hygiene, table manners, and responsible eating behaviors, children are provided with concrete behavioral models that can be observed and imitated. Family-style dining further strengthens this process by involving children in serving food, selecting portions, pouring drinks, and maintaining the cleanliness of dining areas. Such participatory

practices extend beyond teacher-directed feeding by providing opportunities to develop confidence, cooperation, self-regulation, and social responsibility.

A further finding concerns the integration of character education into everyday mealtime activities, suggesting that MBG has educational significance beyond improving children's nutritional status. The reviewed studies indicate that teachers intentionally incorporate moral and spiritual values by encouraging children to pray before and after meals, appreciate food, avoid waste, demonstrate respectful table manners, and express gratitude (Herwawan et al., 2026; Marconi et al., 2022). These practices are consistent with holistic educational perspectives that emphasize the interconnected development of cognitive, affective, and behavioral dimensions through authentic learning experiences. Importantly, the present synthesis indicates that character education can be embedded naturally within routine activities rather than delivered exclusively through separate instructional sessions (Etokabeka, 2025; Sarfraz et al., 2022). Mealtime therefore provides a practical context in which responsibility, empathy, discipline, ethical awareness, and independent behavior can be developed simultaneously through repeated everyday practice.

Despite the generally positive evidence concerning teachers' instructional strategies, the synthesis also reveals that their effectiveness is influenced by contextual conditions. Previous studies indicate that teachers' pedagogical competence, classroom management skills, and understanding of child development affect their capacity to implement independence-building practices effectively (Herwawan et al., 2026). The present review extends this understanding by highlighting the importance of institutional support, adequate facilities, sufficient time, and collaboration between schools and families. Reinforcement of independent behaviors within the home environment can strengthen habits developed through school-based mealtime routines. Conversely, inadequate logistical support, limited resources, and additional administrative responsibilities may constrain teachers' opportunities to provide meaningful guidance and sustained interaction with children during MBG activities (Hari et al., 2026; Malaka et al., 2025). These findings are consistent with ecological perspectives in which children's development is shaped by interactions among interconnected learning environments, suggesting that the effectiveness of MBG as a pedagogical context depends not only on teachers' practices but also on broader institutional and family support.

CONCLUSION

This systematic literature review concludes that the School Nutritious Meal Program (Makan Bergizi Gratis/MBG) extends beyond its nutritional function by providing a meaningful pedagogical context for fostering young children's independence and character development. The synthesis indicates that structured routines, family-style dining, character integration, and adaptive pedagogical approaches enable teachers to transform mealtime activities into authentic learning experiences that promote autonomy, responsibility, social competence, and moral values. The central contribution of this review lies in synthesizing fragmented evidence concerning teachers' pedagogical roles and strategies within the MBG context, thereby extending discussions in early childhood education, character education, and school meal programs. However, the review is limited by

its reliance on published literature, which may not fully represent contextual variations across educational settings. Future research should employ longitudinal qualitative and mixed-methods approaches to investigate the sustained effects of these strategies and examine their implementation across diverse socio-cultural contexts. Such research could provide stronger empirical foundations for developing evidence-informed practices and policies that integrate nutritional provision with children's broader developmental needs.

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CONFLICTS OF INTEREST

The authors confirm that there are no conflicts of interest associated with the research, authorship, or publication of this study. No financial, professional, or personal interests influenced the conduct of the research or the preparation of the manuscript.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

AI-assisted technology was employed during the manuscript preparation process to support language editing, improve academic expression, refine sentence structure, and enhance the overall clarity and coherence of the manuscript. All AI-assisted outputs were critically examined, modified where necessary, and verified by the authors. The authors retain full responsibility for the content, scientific accuracy, originality, and academic integrity of the final manuscript.

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