Review Paper

Evaluation of Nutritional Assistance Education Models: A Systematic Review

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ABSTRACT

Background: The establishment of good eating practices that begins in infancy will impact lifelong nutritional habits and overall health. This study evaluates effective educational models to increase parents' knowledge and awareness in the field of nutritional assistance to toddlers through published articles from 2010 to 2021.

Methods: PubMed, ScienceDirect, Web of Science, Cochrane, and Wiley online library were searched according to PRISMA (Preferred Reporting Item for Systematic Reviews and Meta-analysis) guidelines to identify published studies from January 2010 to December 2021 based on the inclusion and exclusion criteria. Two authors independently extracted the related data. The extracted data were synthesized thematically by collecting the main findings, the design, and the applied interventions. The quality of the included articles was assessed using the EPHPP (quality assessment tool of the Effective Public Healthcare Panacea Project) and the McMaster critical appraisal tool.

Results: Search results from five databases yielded 842 related articles. However, only 7 articles met the inclusion criteria. The number of participants in these studies varied from 20 to 300 mothers of toddlers. The study designs included randomized controlled trials, quasi-experimental, cross-sectional, and qualitative. Home talks, nutrition education, and counseling were the educational methods used. The duration of the intervention varied from 2 weeks up to 9 months. Home talks seem to be a more effective method with direct (teacher-directed), interactive (discussion, sharing), and experiential (learner-centered, activity-oriented) delivery methods.

Conclusion: Three of the 7 studies had strong quality, and the rest had moderate quality. The evidence presented in this review has identified characteristics that may contribute to the effectiveness of interventions in increasing parents' knowledge and awareness of nutritional assistance for toddlers. The overall result from this review reveals the need to improve the standards and procedures in intervention design and randomized controlled trials to improve their effectiveness.

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Highlights

- The establishment of good eating practices that begins in infancy will impact lifelong nutritional habits and overall health.
- Parents are responsible for modeling healthy food choices and dietary practices, shaping toddlers' food preferences and eating behaviors.
- There is a dearth of information on the evaluation and the overall quality of intervention studies in increasing parents' knowledge and awareness of nutritional assistance for toddlers.
- Approaches to the application of the educational model, including home talks, seem to be more effective.

Plain Language Summary

Increasing parents' knowledge and awareness of nutritional assistance for toddlers play an important role in meeting the nutritional needs of their children and preventing the risk of malnutrition. Thus, parents should be provided with appropriate educational intervention. Home talks, nutrition education, and counseling have been found as educational methods in this review study. However, home talks seem to be a more effective method.

1. Introduction

Nutritional problems are still a serious and vital issue (Taki, 2018). Malnutrition is the cause of one-third of child deaths in the world (WHO team, 2020). Undernutrition and overnutrition are still problems that must be addressed (Huizar, Arena, and Laddu, 2021). Nutrition is a significant and fundamental issue in human life. Malnutrition can cause health problems (morbidity, mortality, and disability) and reduce the quality of human resources of a nation (Saunders and Smith, 2010). Nutritional problems are different from disease problems, meaning that the state of malnutrition does not occur suddenly. A healthy child's status to malnutrition takes a minimum of 3 to 6 months, characterized by insufficient weight gain. Several factors can affect nutritional status, including physical conditions (Shrestha et al., 2020), disease or infection (Suchdev et al., 2014), medication (Fisher and Swift, 2015), nutritional intake (Galgamuwa et al., 2017), physical activity (Akdemir, Donmez, and Polat, 2017), the role of cadres (Community Health Workers), parenting patterns, and parents' feeding styles (Hidayat, Marini and Tyas, 2020).

The establishment of good eating practices that begins in infancy will impact lifelong nutritional habits and overall health. Children acquire the motor skills needed to feed themselves and develop preferences that influence their food choices during this period. Classifications for the low weight (also called stunted growth or failure to thrive) and overweight are based on the World Health Organization (WHO) child growth standards for children under two years of age and growth charts by the CDC (the Centers for Disease Control and Prevention) for children two years and older (Riley, Rupert, and Boucher, 2018).

Parenting plays a role in the nutritional status of children. One of the parenting patterns related to the nutritional status of children is the pattern of feeding. Children's feeding patterns are always related to feeding activities which will ultimately contribute to their nutritional status. The practice of feeding children has a decisive role in child nutrition. Feeding children and eating habits in the family have a considerable impact, and children usually follow what their parents and siblings eat (Istiany, 2019).

Food parenting refers to specific behaviors, or rules parents use to control what, how much, or when their child eats, whereas parent feeding styles are defined as general parent-child interactions across food-related situations (Hersch et al., 2014). Parents are responsible for modeling healthy food choices and dietary practices, shaping children's food preferences and eating behaviors. Parents should avoid practices that lead to overeating in toddlers (e.g., feeding to calm or put the child to sleep, giving excessive portions, encouraging the child to "clean his plate," punishing with food, force-feeding, allowing frequent snacking). Generally, parents should use approaches such as "parents provide, the child decides," where parents provide healthy food choices, and

children choose which foods to eat and how much (Riley, et al., 2018).

Increasing parents' knowledge and awareness of nutritional assistance for toddlers are essential because they play an essential role in meeting the nutritional needs of their children and preventing the risk of malnutrition. Thus, parents should be provided with appropriate educational intervention. Several studies have been conducted regarding the model of parental education as the most responsible party for meeting the nutritional needs of toddlers. This review explored effective education models applied to increase parents' knowledge and awareness of nutritional assistance for toddlers through published articles.

2. Materials and Methods

Review protocol

This systematic review was conducted using PRISMA (the Preferred Reporting Items for Systematic Reviews and Meta-analyses) statement (Moher et al., 2009) in the time frame between January 2010 to December 2021 and sought to answer the question of "which educational models increase parents' knowledge and awareness of nutritional assistance to toddlers?" PICO format (Patient, Intervention, Comparison, Outcome) was used to ask a focused question in quantitative studies.

Sources of information and search strategies

International electronic databases, including PubMed, ScienceDirect, Web of Science, Cochrane, and Wiley online library, were searched for articles published from 2021 to 2010. The keywords were selected based on the Medical Subject Headings (MeSH) standard. Boolean operators and a combination of keywords were used, including ("parenting education"[MeSH Terms] OR "parents"[MeSH Terms] AND ("nutritional intakes"[MeSH Terms] OR "nutrition disorder, infant"[MeSH Terms] OR "infant nutrition"). These keywords are mainly used in PubMed. Meanwhile, for search on ScienceDirect and Cochrane, the keywords were "Improving," "Parent Knowledge," and "Infant Nutrition Assistance."

Eligibility criteria

The selected articles (quantitative and qualitative) met the following criteria: 1) they were performed on parents of infants, 2) evaluated the structured form of education for child nutrition assistance, 3) quasi-experimental studies that presented the results of structured interventions, 4) explored the concept of parental education for child nutrition, 5) were in English, and 6) had a sample of more than 20 participants. In addition, review articles, editorials, comments, full texts, case reports, and meta-analytical or systematic review articles were excluded from this review study. Eligibility criteria were according to PICOS (population, intervention, comparison, outcome, and study design).

Population: Parents of toddlers with a minimum sample of 20. Studies with a sample below 20 were excluded from the study.

Intervention: interventions on nutrition, healthy eating/diet, dietary intake, anemia, fruits, and vegetables were included in the study.

Comparison: A comparison group with no intervention or other trial interventions was included (for experimental studies).

Outcome: Studies with knowledge or attitude or practice or awareness as the study outcome were included.

Study design: Quasi-experimental, randomized controlled trials/clustered randomized control trials, correlational studies, and qualitative studies were included. Studies that did not mention these designs were excluded.

Studies with irrelevant titles, not available (only abstract), literature reviews, systemic reviews, books, conference proceedings, reports, thesis, and case studies were excluded from this review.

Data extraction and quality assessment

The two authors (RM, EN) independently extracted the data from studies that met the inclusion criteria. The obtained data were synthesized in two ways: 1) research design and intervention strategies were presented, and 2) the findings of each study were analyzed qualitatively by collecting the main findings with the design and intervention applied. Furthermore, data extraction was carried out to provide a brief description of the articles' substance, such as the characteristics of the respondents and the characteristics of the study. The extracted data included author, year, location, sample population, study design, and the intervention method (Table 1). The researchers then examined each extracted study, and any discrepancies were discussed until a consensus was reached.

Table 1. Characteristics of the Included Studies

Study Quality	Outcome Assessed, Significance	Evaluation Strategy	Intervention Delivered	Intervention	Design	Participants	Country	Authors, Year, Title
High	Knowledge (P<0.0001)	Pretest-Posttest: Direct Question after 3 months	Direct (teacher-directed), interactive (discussion, sharing) and experiential (learner-centered, activity-oriented).	Home talks for 2 months (15 – 30 minutes per session)	Quasi-experimental	Mothers (Mean age 30)	Uganda	(Moon et al., 2020) An educational intervention in rural Uganda: Risk-targeted home talks by village health workers
Moderate	Knowledge about parenting (P<0.001), exclusive breast feeding (P<0.001), and preparation of complementary foods menu (P<0.001)	Pre-test-post-test: questionnaire	Lecture, playing cards on concerning myths, role-playing using parenting materials	Two weeks of Nutrition education (180 minutes)	Quasi-experimental	30 mothers	Indonesia	(Mitra et al., 2020) Effect of nutritional education on improving mother's knowledge and nutritional status of malnourished toddlers in Pekanbaru City, Indonesia
High	Maternal level of knowledge and practice	Structured questionnaires, observation checklists	Lecture, Counseling, Training	Nutrition education and counseling for 9 months (10 – 15 minutes) in three sessions	Randomized control trial	Intervention: 300 mothers Control: 300 mothers	Tanzania	(Kulwa et al., 2014) Effectiveness of a nutrition education package in improving feeding practices, dietary adequacy, and growth of infants and young children in rural Tanzania: rationale, design, and methods of a randomized cluster trial
Moderate	Knowledge	Questionnaire, Interview	Lecture	Education on healthy nutrition for 180 minutes divided into 3 sessions	Quasi-experimental	Twenty parents	Turkey	(Göbel et al., 2021) Evaluating the knowledge, attitudes, and practices of adults on food safety: a cross-sectional sample from Turkey
Moderate	KAP* Z-score	Questionnaire, interview	Lecture	Five months (twice a month, 60 to 90 minutes each)	Quasi-experimental	A total of 240 mothers	Indonesia	(Sukandar et al., 2015) Nutrition knowledge, attitude, and practice of mothers and children's nutritional status improved after five months of nutrition education intervention
High	Family access (views) and interaction (comments and likes), phone interviews	The number of views, comments,and likes for all posts as a reflection of parent engagement.	Facebook group, Puppet mascot, and windy wise the owl.	We inspired Smart Eating (WISE) curricula for 8 months.	Cross-sectional, mixed methods	A total of 283 mothers	United Stated	(Whiteside-Mansell and Swindle, 2017) Together we inspire smart eating: a preschool curriculum for obesity prevention in low-income families
Moderate	Eating-patterns, Knowledge	Interviews, Likert-type scaled questionnaire	Booklet	Eat Healthy (EH) program for six weeks	Qualitative	23 parents of preschool-age children	United Stated	(Reznar et al., 2014) An interactive parents' guide for feeding preschool-aged children: pilot studies for improvement

KAP*: Knowledge, Attitude, and Practice.

Table 2. Effective Public Healthcare Panacea Project (EPHPP) Quality Assessment Ratings

Study	Global Rating	Selection Bias	Study Design	Confounders	Blinding	Data Collection Methods	Withdrawals and Dropouts
	Strong=no weak ratings Weak=>1 weak rating	Strong = participants very likely to be representative of the target population and >80% participation Weak= participants not likely to be representative of the target population and <60% participation	Strong = randomized controlled trial or controlled clinical trial Weak=any design other than randomized controlled trial, controlled clinical trial, cohort analytic, case-control, cohort, interrupted time series	Strong = controlled for at least 80% of relevant confounders Weak=controlled for <60% relevant confounders	Strong = outcome assessor not aware of intervention status of participants and participants not aware of the research question Weak=both aware of the above	Strong = data collection tools shown to be valid and reliable Weak = data collection tools not shown to be valid	Strong = follow-up rate 80% or greater Weak = follow-up rate <60%
Moon et al., 2020	Strong	Moderate	Strong	Moderate	Moderate	Strong	Moderate
Mitra et al., 2020	Moderate	Moderate	Strong	Moderate	Moderate	Moderate	Weak
Kulwa et al., 2014	Strong	Moderate	Strong	Moderate	Moderate	Strong	Weak
Gobel et al., 2021	Strong	Moderate	Strong	Moderate	Moderate	Strong	Moderate
Sukandar et al., 2015	Moderate	Moderate	Strong	N/A	N/A*	Moderate	Weak
Whiteside et al., 2017	Moderate	Moderate	Weak	Moderate	Moderate	Strong	Moderate

N/A: not applicable.

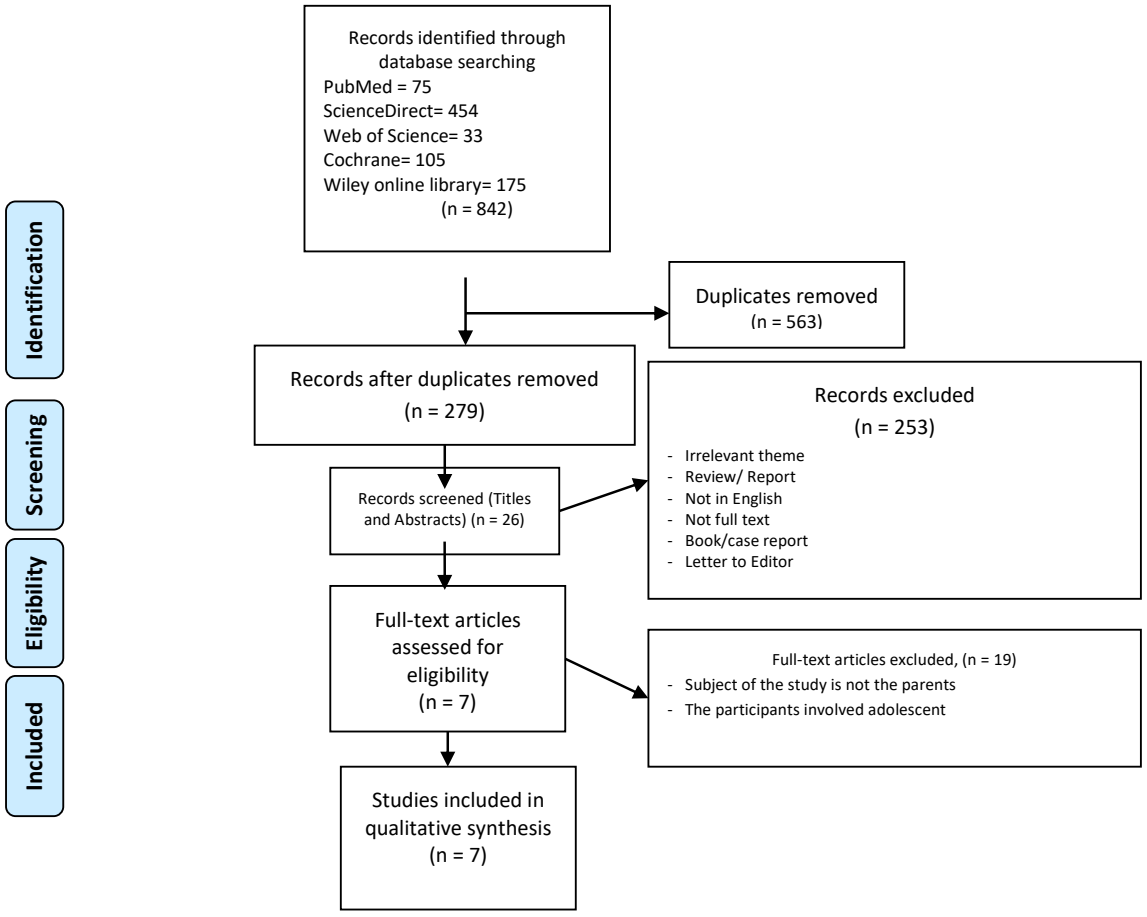

Figure 1. PRISMA flowchart for study selection

The quality of the included quantitative articles was measured using an assessment tool for the Effective Public Healthcare Panacea Project (EPHPP), which allows experts to apply this tool to articles on any public health topic. This tool uses strong, moderate, and weak categorizations based on the assessment results of eight components: selection bias, study design, confounders, blinding, data collection methods, withdrawals, dropouts, intervention integrity, and analyses. Articles in the strong category are the articles that gained four strong components from the EPHPP components without any weak component; the category is considered moderate if four components are rated strong and one component weak, and the weak category is given if two or more components reach a weak value (Berghs et al. 2016) (Table 2). Critical appraisal of qualitative studies was performed using the McMaster Critical Review Form for qualitative studies (v2.0) (Letts L. et al., 2007) (Table 3).

3. Results

Search results

Search results from five databases yielded 842 articles according to the keywords applied. Duplicates (563 articles) were eliminated, leaving 279 articles. The screening stage was carried out on the remaining articles. Next, 253 articles were excluded because they did not discuss the parents' nutritional assistance for the toddler. At the end of the screening, seven articles met the inclusion criteria (Figure 1). These articles were included in the moderate and strong categories based on the EPHPP assessment tool for article quality assessment. The process of identifying and screening articles was done using the Mendeley Reference Manager to eliminate duplicate articles.

Study characteristics

The articles reviewed in this study were conducted in several countries such as Indonesia (Sukandar et al., 2015; Mitra et al., 2020), the USA (Reznar et al., 2014; Whiteside-Mansell and Swindle, 2017), Uganda (Moon et al., 2020),

Table 3. Critical review for the included qualitative study

Criteria for the Reznar et al. study (2014)		Result
Study purpose	Was the purpose and or research question stated clearly?	Ö
Literature	Was relevant background literature reviewed?	Ö
Study design	Was a theoretical perspective identified?	Ö
Sampling	Was the process of purposeful selection described?	Ö
	Was sampling done until redundancy in data was reached?	Ö
	Was informed consent obtained?	Ö
Data collection	A clear and complete description of data?	Ö
	A clear and complete description of participants?	Ö
	Role of researcher and relationship with participants?	Ö
	Identification of assumptions and biases of researcher?	NR*
	Procedural rigor was used in data collection strategies?	Ö
Data analysis	Data analyses were inductive?	Ö
	Findings were consistent with and reflective of the data?	Ö
	Decision trail developed?	Ö
	Process of analyzing the data was described adequately?	Ö
	Did a meaningful picture of the phenomenon under study emerge?	Ö
Overall rigor	Was there evidence of the four components of trustworthiness?	
	Credibility	Ö
	Transferability	Ö
	Dependability	Ö
	Confirmability	Ö
Study conclusions and implications	Conclusions were appropriate given the study findings?	Ö
	The findings contributed to theory development and future practice/research?	Ö

NR*: not rated.

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Tanzania (Kulwa et al., 2014), and Turkey (Göbel et al., 2021). The study designs used by the included articles were quasi-experimental (Sukandar et al., 2015; Mitra et al., 2020; Moon et al., 2020; Göbel et al., 2021), randomized control trial (Kulwa et al., 2014), cross-sectional (Whiteside-Mansell and Swindle, 2017), and qualitative (Reznar et al., 2014).

Intervention Characteristics

In this review, the articles used different educational methods, such as lectures (Kulwa et al., 2014; Sukandar et al., 2015; Mitra et al., 2020; Moon et al., 2020; Göbel et al., 2021), playing cards (Mitra et al., 2020), counseling (Kulwa et al., 2014), role playing (Mitra et al., 2020), social media (a Facebook group) (Whiteside-Mansell and Swindle, 2017), and Booklet (Reznar et al., 2014). The duration of the intervention varied from 2 weeks to 9 months. The educational session took 10 to 180 minutes in the included articles.

Topics in the articles were not only about nutritional education, and some articles expanded the topics to breathing and respiratory problems, family planning, HIV, diar-

rhea (Moon et al., 2020), home food environment, food modeling, praise and encouragement, making mealtime fun, and how to handle difficult behaviors (Reznar et al., 2014), growth and development, exclusive breastfeeding (Mitra et al., 2020), breastfeeding, complementary feeding, selection and preparation of locally available foods, feeding during illness, healthcare-seeking, hygiene, and home environment sanitation (Kulwa et al., 2014), parenting tips, and cost savings idea (Whiteside-Mansell and Swindle, 2017), malnutrition problems (Sukandar et al., 2015), and healthy eating (Göbel et al., 2021).

Evaluation strategy and outcomes

The studies' evaluation of the effectiveness of parent education programs was carried out using various measures, both qualitatively and quantitatively, which had been adapted to the features and processes of the program (e.g., pretest and posttest based on questionnaires and interviews). Regardless of the outcome measures, there were positive gains and improvements for parents in various functions such as parenting competence and post-program nutritional problem-solving skills. Several evaluation methods were carried out, including pretest and or posttest using a questionnaire (Reznar et al., 2014; Sukandar et al., 2015; Mitra et al., 2020; Moon et al., 2020; Göbel et al., 2021), supervision (Kulwa et al., 2014), and posting responses (e.g., views, comments, and like) (Whiteside-Mansell and Swindle, 2017).

Among the outcomes of the studies were knowledge (Reznar et al., 2014; Mitra et al., 2020; Moon et al., 2020; Göbel et al., 2021), KAP (knowledge, attitude, practice) (Kulwa et al., 2014; Sukandar et al., 2015), and perception (Whiteside-Mansell and Swindle, 2017).

4. Discussion

The present systematic review identified the interventions designed to improve parents' knowledge and awareness in assisting the nutritional status of toddlers and determined whether some strategies were more effective than others.

In a previous review, Peters et al. (2012) highlighted a dearth of quality intervention research with parents of preschoolers that attempt to address and promote specific parenting practices and skills that may optimize healthy diets in young children. In particular, intervention design should focus on implementing and evaluating specific parenting practices that may complement nutrition education and empower children to develop and instill healthy eating habits. Our review focused on the studies that reported strategies to improve the knowledge and awareness of parents as a basis for good practice in their children's nutritional status. This review provided an overview of the studies carried out in both high and lower-middle income countries. The results of this review can provide answers to previous review studies that focused only on developed countries (Charles Shapu et al., 2020), as well as previous review studies that focused on developing countries only (Salam et al., 2014). The effectiveness of the intervention in this review also concurs with other health education interventions regarding the knowledge, attitudes, and practices regarding the health of the mother and infants (Imdad, Yakoob, and Bhutta, 2011).

Insufficient knowledge and non-nutritional behavior of families directly influence the feeding of preschool-age children and toddlers and lead to problems such as obesity, weakness, and developmental retardation (Şanlıer, 2013). At this age, most children undergo preschool education, which is an opportunity to develop age-specific nutritional behavior. A meta-analysis concluded that school-based nutrition education interventions effectively reduce the body mass index (BMI) of children and adolescents (da Silveira et al., 2013). Nurses and other health professionals working with parents of young children should discuss with the parents the importance of healthy food choices and appropriate eating environments. Parents need knowledge about feeding toddlers healthily, such as appropriate serving sizes and the need to taste a new food often. Parents should understand that a child-size portion is much smaller than the amounts served to adults.

Limited access to several primary databases was a significant obstacle that affected the literature search results. It is suggested that future research explore more extended time frames using more databases.

5. Conclusion

Health and nutrition education interventions to increase parents' knowledge and awareness of nutritional assistance for toddlers demonstrated variable success. The evidence presented in this review has identified characteristics that may contribute to the effectiveness of interventions in increasing parents' knowledge and awareness of nutritional assistance for toddlers. The overall evidence from this review reveals the need to improve the standards and procedures in intervention design in randomized controlled trials to improve their effectiveness.

Ethical Considerations

Compliance with ethical guidelines

All listed authors have made a valuable contribution to the process and approved the final manuscript. 'Guest authorship' and 'ghost authorship' were avoided. Redundant (duplicate) publications were excluded. Data were extracted independently by two authors, and any discrepancies were resolved. Also, the decision on which data to include is agreed upon by all authors.

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Authors' contributions

Conceptualization and Investigation: Rusmimpong Rusmimpong, Asni Johari, Intan Intan, Guspiyanto Guspiyanto; Data collection: Rusmimpong Rusmimpong, Asni Johari; Writing-original draft: Asni Johari, Guspiyanto Guspiyanto; Writing – review & editing: All authors.

Conflict of interest

The authors declared no competing interests.

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