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Association Between Early-Life Nutritional Practices and Children's Feeding and Swallowing Skills

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ABSTRACT

Background: Children's feeding and swallowing abilities are vital functions that support optimal growth and development, involving the complex coordination of muscles and neural systems to ensure the safe and efficient consumption of food. This study aimed to analyze the role of early-life nutritional practices in the development of feeding and swallowing abilities among children in the Surakarta region using logistic regression analysis.

Subjects and Method: This cross-sectional study was conducted in Surakarta, Central Java, from April to August 2025 and involved 50 children selected through purposive sampling. The independent variables were lactation-based early nutrition and post-lactation complementary nutrition practices, while feeding and swallowing abilities served as the dependent variables. Data were collected through interviews, observations, questionnaires, and the Dysphagia Disorder Survey (DDS). Associations between variables were analyzed using logistic regression in Stata 13.

Results: The results of this study indicated that both a history of appropriate lactation-based early nutrition and appropriate post-lactation complementary nutrition practices were significantly associated with children's feeding and swallowing abilities. Children with a history of lactation-based early nutrition (b= 3.13; 95% CI= 0.97 to 4.27; p= 0.002) and appropriate post-lactation complementary nutrition practices (b = 2.48; 95% CI = 0.49 to 4.23; p = 0.013) were more likely to demonstrate appropriate feeding abilities. Similarly, children with a history of lactation-based early nutrition (b = 3.11; 95% CI= 1.08 to 4.76; p= 0.002) and appropriate post-lactation complementary nutrition practices (b= 3.03; 95% CI= 1.10 to 5.18; p= 0.002) were more likely to exhibit appropriate swallowing abilities.

Conclusion: This study concludes that both lactation-based early nutrition and appropriate post-lactation complementary nutrition practices are significant determinants of feeding and swallowing abilities in children.

Keywords: Feeding and swallowing abilities; lactation-based early nutrition history; post-lactation complementary nutrition history.

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BACKGROUND

The early-life period, spanning from pregnancy to two years of age (the first 1,000 days of life), represents a critical window for the development of children's feeding and swallowing abilities (Hidayati, Yulastini and Fajriani, 2022; Kirtishanti *et al.*, 2024). Adequate nutrition during this

period not only influences physical growth but also supports the development of oral motor skills, tongue–jaw coordination, texture management, and the establishment of sustainable eating behaviors (Nurliyana *et al.*, 2016; Kalhoff *et al.*, 2024).

Energy intake and essential micronutrients, including iron, zinc, docosahexaenoic acid (DHA), iodine, vitamins A and B complex, as well as calcium and phosphorus, are required to support brain cell differentiation, cranial nerve myelination, and the strength of the oral and pharyngeal muscles involved in swallowing (Gómez-Pinilla, 2008; Ernawati et al., 2023). Environmental factors, including responsive caregiving, adequate oral stimulation, and access to nutritious foods, also play important roles in shaping the developmental trajectory of swallowing abilities as children grow (Cichero, 2018; Heselo et al., 2025).

A study by Saunders *et al.* (2023) demonstrated that breastfeeding practices, the timely introduction of complementary feeding after lactation, and dietary diversity contribute to feeding quality and tolerance of different food textures, although the magnitude of these effects may be influenced by cultural contexts and national nutrition policies (Watna et al., 2023).

Three primary pathways explain how early-life nutritional practices may shape feeding and swallowing abilities. First, the oral–muscular pathway, through which the intake of high-quality protein, healthy fats, and essential micronutrients supports the development of oral musculature and enhances jaw and tongue strength and mobility. Second, the neurological pathway, whereby the development of brain structures and neural networks responsible for coordinating swallowing movements is supported by nutrients such as DHA, iron, copper, zinc, and iodine. Third, the feeding behavior pathway, which is influenced by exposure to different food textures, feeding experiences, and children's responses to dietary variety (Manno et al., 2005; Carbone and Pasiakos, 2019; Qiu et al., 2024). Adequate early oral stimulation during infancy, including the gradual introduction of food textures and positive parent–child feeding interactions, can facilitate the acquisition of swallowing skills and reduce resistance to texture transitions (Lau, 2016; Tournier et al., 2021). Furthermore, the balance of the gut microbiota, which is influenced by lactation-based early nutrition, post-lactation complementary feeding practices, and dietary habits, may modulate gut–brain signaling pathways that affect taste perception, energy availability, and feeding behavior (Berding et al., 2021; Davis et al., 2022).

According to the findings of Ayukarningsih, Mutiara and Febrianti (2023) adequate nutritional intake during the first 1,000 days of life is closely associated with developmental outcomes, including feeding and swallowing abilities. The first 1,000 days are considered a critical developmental window, during which protein–energy malnutrition, micronutrient deficiencies, and recurrent infections may adversely affect oral muscular development and swallowing coordination (Dewi et al., 2024; Hijrawati et al., 2021; Melisa Agustin et al., 2024).

Several studies have demonstrated that appropriate lactation-based early nutrition is associated with improved readiness for the gradual introduction of complementary feeding and greater dietary diversification, both of which contribute to enhanced texture tolerance and adequate daily caloric intake (Abeshu et al., 2016; Youwe et al., 2020; Boy et al., 2023; Samura, 2024). Specific nutritional interventions during the first 1,000 days of life, such as supplementation with iron, DHA, and other essential

nutrients, have the potential to improve fine motor development and swallowing abilities by enhancing oral muscle strength and sensorimotor coordination efficiency (Gutiérrez, 2021; Rhee *et al.*, 2023). Furthermore, Khotimah *et al.* (2025) emphasized the importance of parental nutrition literacy, healthcare professional education, and access to nutrition support programs through community health posts and primary healthcare facilities to ensure continuous monitoring of child development during this critical period. Nevertheless, stronger longitudinal and multi-site studies are needed to improve the generalizability of these findings across diverse cultural and socioeconomic settings in Indonesia (Naim, 2024).

Several studies have emphasized that early-life nutritional practices play an important role in the development of feeding and swallowing abilities through both physiological mechanisms and feeding behavior pathways, with particular attention to texture stimulation, dietary quality, and the progressive improvement of chewing and swallowing skills as children grow (Lasschuijt and Forde, 2024; Scudine *et al.*, 2024; Tournier and Forde, 2024).

These studies suggest that improved nutrient intake during the first 1,000 days of life contributes to enhanced cognitive function and oral motor development, which in turn facilitates successful transitions to complementary feeding and supports long-term nutritional adequacy (Manullang and Anto, 2025). In Indonesia, both previous and recent studies have highlighted the importance of community-based interventions, parental education, and supportive policies that integrate prenatal, perinatal, and early childhood nutrition services to promote the consistent implementation of responsive feeding practices (Nelista, Keytimu and Toto, 2021; Trinanda, 2023; Darlis, Rusnita and Khasanah, 2024).

This body of evidence supports the development of integrative policies that combine prenatal, perinatal, and early childhood nutrition services within a comprehensive child-care framework. Parental education aimed at improving nutrition literacy, along with healthcare professional training in responsive feeding counseling, is essential for enhancing feeding practices during the first 1,000 days of life.

Valid feeding and swallowing developmental screening tools should be incorporated into routine clinical practice to facilitate the early identification of feeding difficulties and enable nutritional interventions to be tailored according to developmental stages. In the Indonesian context, local dietary culture, the availability of nutritious foods, and access to primary healthcare services are critical determinants of the effectiveness of first 1,000 days programs. Further research is needed to explore the specific mechanisms linking key nutrient intake to oral motor function, as well as the role of social and environmental factors in moderating the effects of nutrition on children's feeding and swallowing abilities.

SUBJECTS AND METHOD

1. Study Design

This analytic observational study employed a cross-sectional design to examine the association between early-life nutritional practices and feeding and swallowing abilities among children. The study was conducted in Surakarta, Central Java, Indonesia, from April to August 2025.

2. Population and Sample

The target population of this study consisted of children aged 4–6 years residing in Surakarta. A total of 50 participants were selected using purposive sampling. The inclusion criteria were: (1)

children aged 4–6 years and (2) parental or guardian willingness to provide informed consent. The exclusion criteria included children with a history of severe neurological or developmental disorders.

3. Study Variables

The independent variables were the history of lactation-based early nutrition and the history of post-lactation complementary feeding practices. The dependent variables were feeding ability and swallowing ability in children.

4. Operational Definition of Variables

Feeding Ability: The child's ability to consume food independently, including chewing skills, the use of eating utensils, the selection of foods appropriate to their developmental stage and texture tolerance, and the maintenance of age-appropriate eating behaviors.

Swallowing Ability: The physiological and behavioral process by which a child safely and effectively transfers food or liquid from the oral cavity to the esophagus without signs of aspiration, such as coughing, choking, or vomiting.

History of Lactation-Based Early Nutrition: The provision of breast milk exclusively, without any additional food or drink (including water), during the first six months of life.

History of Post-Lactation Complementary Feeding Practices: The pattern and timing of complementary feeding after six months of age, including the age of introduction, feeding frequency, types of foods provided, and food texture progression.

5. Study Instruments

Data were collected using the following methods: Questionnaires: A structured questionnaire adapted from previous studies was used to assess the history of lactation-based early nutrition and post-lactation complementary feeding practices. Feeding and swallowing abilities were assessed using the Dysphagia Disorder Survey (DDS), a validated instrument for evaluating feeding and swallowing function in children. Observation: Children's feeding and swallowing behaviors were observed during mealtime activities at school. Interviews: Structured interviews were conducted with parents or guardians to obtain additional information regarding children's feeding practices and eating habits at home.

6. Data analysis

Data were analyzed using Stata version 13. Statistical analyses included: Descriptive Analysis: Descriptive statistics were used to summarize participant characteristics and the distribution of study variables. Bivariate Analysis: The chi-square test was employed to examine the associations between the independent variables and the dependent variables. Multivariable Analysis: Logistic regression analysis was performed to identify the dominant predictors of children's feeding ability and swallowing ability. Statistical significance was determined at a p-value of less than 0.05.

7. Research Ethics

This study was reviewed and approved by the Health Research Ethics Committee of Muhammadiyah University of Purwokerto. Ethical approval was granted under reference number: KEPK/UMP/143/VII/2025.

RESULTS

1. Sample Characteristics

As presented in Table 1, among the 50 study participants, the largest proportion of mothers had completed senior high school education (42%, n=21). Mothers aged≥35 years represented the largest age category (38%, n=19). More than half of the children were aged ≥60 months (52%, n=26), and the majority were female (68%, n=34).

Table 1. Descriptive Characteristics of the Study Participants

Variable	Frequency (n)	Percentage (%)
Parental Education		
Elementary School	4	8
Junior High School	6	12
Senior High School	21	42
Diploma/Bachelor's Degree	19	38
Maternal Age		
< 25 years	13	26
25- 35 years	18	36
≥ 35 years	19	38
Child's Age		
< 60 months	24	48
≥ 60 months	26	52
Sex		
Female	34	68
Male	16	32

As shown in Table 2, the mean age of the children was 61.10 months (SD=7.52), ranging from 48 to 72 months. The mean maternal education score was 3.10 (SD= 0.90), corresponding to a range from elementary school education to diploma/ bachelor's degree. The mean maternal age was 30.64 years (SD=7.10), with a range of 20–45 years. The mean scores for lactation-based early nutrition and post-lactation complementary feeding practices were 6.96 (SD= 1.49) and 10.12 (SD=1.75), respectively. The average feeding ability score was 4.66 (SD= 1.18), while the average swallowing ability score was 4.74 (SD = 1.36).

Table 2. Descriptive Statistics of Continuous Study Variables

Variabel	N	Mean	SD	Min	Maks
Child's Age	50	61.1	7.52	48	72
Maternal Education	50	3.1	0.9	1	4
Maternal Age	50	30.64	7.1	20	45
History of Lactation-Based Early Nutrition	50	6.96	1.49	3	10
History of Post-Lactation Complementary Feeding Practices	50	10.12	1.75	6	14
Feedung skills	50	4.66	1.18	3	7
Swallowing skills	50	4.74	1.36	2	7

2. Bivariate Analysis

Bivariate analyses were performed to investigate the relationships between early-life nutritional practices and children's feeding and swallowing abilities. As shown in Table 3, both a history of appropriate lactation-based early nutrition (OR=26.5; p<0.001) and appropriate post-lactation complementary feeding practices (OR= 33.7; p<0.001) were significantly associated with higher odds of appropriate feeding ability among children.

Table 3 presents the results of the bivariate analysis using the Chi-square test. A history of lactation-based early nutrition was significantly associated with children's feeding ability (OR= 26.5; p <0.001). Similarly, appropriate post-lactation com-

plementary feeding practices were significantly associated with feeding ability (OR= 33.7; p<0.001). These findings indicate that both lactation-based early nutrition and appropriate complementary feeding practices are significant factors associated with improved feeding ability in children.

Table 3. Bivariate Analysis of Factors Associated with Children's Feeding Ability

Variables	Feeding skills				OR	p
	Requiring Assistance		Good Feeding Ability			
	n	%	n	%		
History of Lactation-Based Early Nutrition						
No History of Lactation-Based Early Nutrition	17	80.9	4	19.1	26.5	<0.001
History of Lactation-Based Early Nutrition	4	13.7	25	86.3		
History of Post-Lactation Complementary Feeding Practices						
Not Appropriate for Nutritional Needs	15	88.2	2	11.8	33.7	<0.001
Appropriate for Nutritional Needs	6	18.2	27	81.8		

Table 4 presents the results of the bivariate analysis using the Chi-square test. A history of lactation-based early nutrition was significantly associated with children's swallowing ability (OR=23.00; p<0.001). Likewise, appropriate post-lactation complementary feeding practices were significantly associated with swallowing ability (OR=20.00; p<0.001). These findings indicate that both lactation-based early nutrition and appropriate complementary feeding practices are significant factors associated with improved swallowing ability in children.

Table 4. Bivariate Analysis of Factors Associated with Children's Swallowing Ability

Variables	Feeding skills				OR	p
	Requiring Assistance		Good Feeding Ability			
	n	%	n	%		
History of Lactation-Based Early Nutrition						
No History of Lactation-Based Early Nutrition	18	85.7	3	13.3	23.00	<0.001
History of Lactation-Based Early Nutrition	6	20.6	24	79.3		
History of Post-Lactation Complementary Feeding Practices						
Not Appropriate for Nutritional Needs	15	88.2	2	11.8	20.00	<0.001
Appropriate for Nutritional Needs	6	18.2	27	81.8		

3. Multivariate analysis

Multivariable analysis was conducted to examine the simultaneous effects of all independent variables on the dependent variables. Logistic regression analysis was performed using Stata version 13 to

determine the independent contributions of lactation-based early nutrition history and post-lactation complementary feeding practices to children's feeding and swallowing abilities.

Table 5 shows that a positive history of lactation-based early nutrition was significantly associated with children's feeding ability. Children with a favorable history of lactation-based early nutrition were more likely to demonstrate appropriate feeding ability than those with a poor history of lactation-based early nutrition (b= 3.13; 95%CI= 0.97 to 4.27; p= 0.002). This association was statistically significant.

Appropriate post-lactation complementary feeding practices were significantly associated with better feeding ability in children (b=2.48; 95% CI=0.49 to 4.23; p= 0.013).

Table 5. Logistic Regression Analysis of the Effects of Early-Life Nutritional Practices on Children's Feeding Skills

Independent Variables	Regression Coefficient (b)	95% CI		p
		Lower Limit	Upper Limit	
History of lactation-based early nutrition	3.13	0.97	4.27	0.002
History of post-lactation complementary feeding practices	2.48	0.48	4.23	0.013
N observation= 50				
Log likelihood =-19.86; R^2= 42.63%; p<0.001				

Table 6 shows that a favorable history of lactation-based early nutrition significantly influences children's swallowing ability. Children who received appropriate lactation-based early nutrition were 3.11 times more likely to demonstrate age-appropriate and adequate swallowing abilities compared with those who had a poor lactation-based early nutrition history (b= 3.11; 95%CI=1.08 to 4.76; p=0.002).

A history of appropriate post-lactation complementary nutrition was significantly associated with children's feeding ability. Children who received appropriate post-lactation complementary nutrition were 3.03 units more likely to demonstrate age-appropriate feeding abilities compared with those who had an inappropriate post-lactation complementary nutrition history (b=3.03; 95%CI= 1.10 to 5.18; p=0.002).

Table 6. Logistic Regression Analysis of Lactation-Based Early Nutrition History and Post-Lactation Complementary Feeding Practices Associated with Children's Swallowing Skills

Independent Variables	Regression Coefficient (b)	95% CI		p
		Lower Limit	Upper Limit	
History of lactation-based early nutrition	3.11	1.08	4.76	0.002
History of post-lactation complementary feeding practices	3.03	1.10	5.18	0.002
N observation= 50				
Log likelihood= -15.93; R^2 = 53.16%; p<0.001				

DISCUSSION

1. Effect of early lactation-based nutrition history on children's feeding ability

The results of the analysis indicate that early lactation-based nutrition history has a significant effect on children's feeding ability. This finding is supported by several studies highlighting the nutritional and developmental benefits of lactation-based early nutrition during infancy. Exclusive lactation-based nutrition during the first six months provides essential nutrients that support optimal growth and development, forming the foundation for children's ability to eat and process various types of food later in life.

According to Dwiantini et al. (2024) children with a history of lactation-based early nutrition demonstrate better developmental outcomes, including improved motor skills, communication, problem-solving, and social abilities, all of which are closely related to feeding competence and feeding skill development. This meta-analysis involving more than 22,000 children across various regions (America, Australia, Europe, Africa, and Asia) found that exclusive breastfeeding (EBF) significantly enhances child development across five major domains. These improvements directly influence feeding ability by strengthening fine motor control required for self-feeding and oral motor skills essential for chewing and swallowing.

In addition, lactation-based early nutrition positively influences cognitive development, which plays an important role in feeding behavior by regulating appetite, food preferences, and adaptation to new foods. A longitudinal study by Jedrychowski et al. (2012) found that children who received exclusive breastfeeding for six months had higher IQ scores that persisted into preschool age, indicating a more favorable neurocognitive trajectory that may also support stronger feeding abilities.

Furthermore, lactation-based early nutrition supports the development of appetite regulation mechanisms and healthier food preferences, reducing feeding difficulties and promoting better eating behavior in early childhood. The World Health Organization recommends exclusive breastfeeding for the first six months to achieve optimal growth and developmental outcomes, which indirectly enhances children's feeding ability (Pang *et al.*, 2020).

In conclusion, lactation-based early nutrition history plays an essential role in improving children's feeding ability by supporting physical (motor skills), cognitive, and behavioral development. These findings are consistent with WHO guidelines emphasizing exclusive breastfeeding for the first six months as a critical intervention for optimal child development.

2. Effect of post-lactation complementary nutrition history on children's feeding ability

Post-lactation complementary nutrition history plays an important role in shaping children's feeding ability by directly influencing their exposure to various food textures, tastes, and mealtime interactions. Studies indicate that infants and toddlers who are exposed to a wider variety of complementary foods tend to develop stronger food-related cognitive and language skills, which support better feeding competence.

Penelitian oleh Shapiro et al. (2024) found that children with greater exposure to complementary foods were perceived by caregivers as having a broader understanding of food-related vocabulary. This suggests that complementary feeding not only affects nutritional status but also supports language development related to

eating behavior, increasing familiarity with and acceptance of new foods.

Previous research also highlights that complementary feeding approaches, such as encouraging self-feeding and allowing infants to take a more active role in eating, can improve feeding ability and language production. A systematic review by Di Prete et al. (2025) showed that baby-led complementary feeding approaches are positively associated with improved language comprehension and vocalization. This indicates that active participation in eating promotes independence and food acceptance.

Conversely, inappropriate complementary feeding practices are associated with negative outcomes such as food neophobia and growth impairment, emphasizing the importance of timing, quality, and method in complementary feeding history. Overall, post-lactation complementary nutrition history influences children's feeding ability by promoting early sensory exposure, motor skill development, and cognitive growth related to food. Providing age-appropriate, diverse complementary foods while encouraging child participation in eating can optimize feeding ability and reduce feeding problems in early childhood.

3. Combined effect of lactation-based early nutrition and post-lactation complementary nutrition on children's feeding ability

Both lactation-based early nutrition history and post-lactation complementary nutrition history have a significant impact on children's feeding ability. Lactation-based early nutrition provides essential nutrients and bioactive factors that support optimal growth and development. Children who receive exclusive breastfeeding tend to have better nutritional status and higher developmental achievements in motor, communication, and social domains, which form the foundation of feeding competence.

Adequate nutrition and immunological protection from early lactation also promote gastrointestinal maturation and oromotor coordination, which are crucial for feeding skills (Boy et al., 2023; Dwiantini et al., 2024). This early foundation facilitates the transition to complementary feeding by supporting muscle strength, oral coordination, and sensory experience.

Appropriately timed complementary feeding further supports and maintains nutritional adequacy while promoting feeding skill development. Studies show that children who receive exclusive breastfeeding followed by timely complementary feeding are more likely to achieve age-appropriate feeding abilities (Molanda, 2020; Boy et al., 2023).

In conclusion, both feeding histories are essential for supporting nutrition and neurodevelopment, as well as the motor skills required for effective eating behavior. Promoting exclusive breastfeeding for six months followed by appropriate complementary feeding is crucial for optimizing children's feeding ability and overall development.

4. Effect of early lactation-based nutrition history on children's swallowing ability

Early lactation-based nutrition positively influences children's swallowing ability through the development and maturation of oral-motor functions essential for safe and efficient feeding. Breastfeeding provides natural oral stimulation that promotes proper coordination of rooting, sucking, and swallowing—foundational skills for later feeding competence.

Krüger, Kritzinger and Pottas (2017) found that breastfeeding influences early feeding behaviors such as rooting, latching, sucking bursts, and swallowing frequency. Breastfed infants demonstrated improved

oral phase swallowing function, including better bolus formation and oral transit time, which are critical for swallowing efficiency. This suggests that breastfeeding may reduce the risk of oral dysphagia in vulnerable infants through improved sensorimotor integration. Furthermore, lactation-based early nutrition is associated with long-term cognitive and neurodevelopmental benefits that indirectly support swallowing ability through overall neurological maturation (Jedrychowski et al., 2012).

In conclusion, lactation-based early nutrition promotes the development of oral-motor and neurological functions essential for effective swallowing, supporting both immediate feeding safety and long-term feeding competence.

5. Effect of post-lactation complementary nutrition history on children's swallowing ability

Post-lactation complementary nutrition significantly affects children's swallowing ability through the achievement of oral motor developmental milestones and neuromuscular readiness. Complementary feeding typically begins around 5–7 months of age, when the sucking reflex transitions into voluntary movements required for semi-solid food consumption.

Kalhoff *et al.* (2024) highlighted that swallowing solid and semi-solid foods depends on psychomotor development, including head control, jaw mobility, and fine oral motor skills. Complementary feeding promotes muscle maturation and reflex integration necessary for safe swallowing. Delayed or inappropriate introduction may disrupt this process and increase the risk of feeding difficulties. Penelitian Abeshu, Lelisa and Geleta (2016) further emphasized that timely and appropriate complementary feeding supports motor skill progression and sensory exposure, enabling infants to accept different food textures between 6 and 12 months of age.

6. Combined effect of lactation-based early nutrition and post-lactation complementary nutrition on children's swallowing ability

Lactation-based early nutrition history and post-lactation complementary nutrition history are important components that shape early child nutrition and development, including swallowing ability and eating behavior. Research indicates that infants exclusively breastfed for approximately 4–6 months demonstrate better feeding outcomes, including reduced food selectivity and improved acceptance of a variety of food textures and flavors during childhood.

One mechanism explaining this relationship is related to the sensory and motor experiences provided by lactation-based early nutrition. Lactation-based feeding exposes infants to a variety of flavors derived from the maternal diet, thereby promoting early taste learning and increasing acceptance of diverse foods during the subsequent complementary feeding phase his sensory exposure may enhance children's oral motor skills required for swallowing through gradual adaptation to different textures and tastes, facilitating a smoother transition from lactation-based nutrition to solid foods.

Specht et al. (2018) found that children who were breastfed for up to 4–5 months had a significantly lower likelihood of exhibiting picky eating behaviors compared with those breastfed for less than one month, suggesting that lactation-based early nutrition supports better feeding adaptation. The introduction of complementary feeding at around six months, in accordance with WHO guidelines, allows infants to further develop sustained

swallowing coordination while reducing feeding difficulties.

Furthermore, lactation-based early nutrition has been associated with improved nutritional status, which is indirectly related to swallowing function. A study by Boy et al. (2023) howed that toddlers who received lactation-based early nutrition followed by timely complementary feeding had a higher likelihood of achieving normal nutritional status compared with those who did not, highlighting the fundamental role of early feeding practices in overall health and developmental outcomes.

The transition from lactation-based early nutrition to complementary feeding requires the development of complex oral motor skills, including tongue movements and swallowing coordination. Breastfeeding naturally trains these muscles and reflexes more effectively than bottle feeding, which may contribute to improved swallowing ability. When complementary feeding is introduced in a timely and appropriate manner, it further stimulates the maturation of these skills, thereby reducing the risk of feeding disorders.

Conversely, delayed or inappropriate complementary feeding, as well as shortened duration of lactation-based early nutrition, may contribute to feeding difficulties, restrictive eating behaviors, and delayed oral motor development. As noted by Sağlam et al. (2019), various factors, including socioeconomic and cultural influences, affect breastfeeding and complementary feeding practices, highlighting the importance of appropriate guidance and support to optimize children's feeding development.

Overall, previous studies reinforce that both lactation-based early nutrition history and appropriate complementary feeding practices play a crucial role not only in children's nutritional status but also in their eating behavior and swallowing ability. These early experiences form the foundation for healthier dietary patterns, improved food acceptance, and essential oral motor skills required for safe swallowing and adequate nutrient intake during childhood and beyond.

7. Association of lactation-based early nutrition and post-lactation nutritional history with children's feeding and swallowing abilities

The influence of lactation-based early nutrition history and post-lactation complementary feeding history on children's feeding and swallowing abilities is an important area of early childhood development with significant implications for nutrition, growth, and motor skill acquisition. Exclusive breastfeeding during the first six months is widely recommended by the World Health Organization (WHO) due to its health benefits, including optimal nutrition, immune protection, and developmental support. Complementary feeding, introduced at around six months of age, involves the introduction of solid and semi-solid foods as a complement to breastfeeding, supporting the child's developing ability to safely chew and swallow a variety of food textures.

Research byi Białek-Dratwa et al. (2025) highlights that children who received lactation-based early nutrition tend to demonstrate more advanced feeding skills during the complementary feeding stage. A study comparing baby-led weaning (BLW) with traditional feeding methods found that infants who were more frequently breastfed were also more likely to initiate complementary feeding later (at 6–7 months) and showed greater autonomy as well as exposure to a wider variety of food textures, which strengthened their oral motor skills, including swallowing ability.

These findings support the notion that lactation-based early nutrition establishes fundamental oral motor coordination by promoting appropriate sucking and swallowing reflexes, which subsequently continue to develop during the transition to solid foods.

Complementary feeding methods that promote feeding independence, such as baby-led weaning (BLW), demonstrate positive effects that extend beyond nutritional outcomes. These approaches contribute to improved motor development and language skills associated with early feeding autonomy. Children introduced to family foods through baby-led approaches exhibit higher levels of vocalization and linguistic engagement, indicating a broader developmental synergy between feeding skills and communication abilities. These findings support previous research linking optimal complementary feeding practices with the development of oral motor coordination essential for effective eating and swallowing (Arslan, Kurtuncu and Turhan, 2023).

HO guidelines emphasize that complementary feeding should be timely (initiated at around six months of age), adequate in nutritional content, safe, and responsive to the child's hunger and satiety cues. Introducing complementary foods in accordance with the child's swallowing ability can help prevent the risk of choking and support the gradual acquisition of feeding skills. Feeding practices that promote a gradual transition in food textures, appropriate meal frequency, and responsive feeding behaviors can enhance feeding competence and reduce the risk of feeding difficulties (Abeshu et al., 2016).

Thus, exclusive breastfeeding during the first six months positively influences children's feeding and swallowing abilities by supporting essential oral motor development. Complementary feeding practices that encourage self-feeding and introduce a variety of food textures further refine these skills and contribute to overall growth and development. These findings are consistent with longstanding WHO recommendations that optimal lactation-based early nutrition and complementary feeding practices are key determinants of lifelong health and development. Future research should examine the long-term effects of early feeding practices on feeding independence and swallowing safety across diverse populations.

AUTHORS CONTRIBUTIONS

ARP: conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Writing – Review & Editing. RRDM: conceptualization, Methodology, Supervision, Validation, Writing – Review & Editing. All authors approved the final manuscript.

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CONFLICT OF INTEREST

The author declares that there are no conflicts of interest related to the publication of this study.

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