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Original Research

A Path Analysis of Environmental and Social Factors Affecting Feeding and Swallowing Abilities in Preschool Children

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ABSTRACT

Background: *Environmental and social factors influence the feeding and swallowing abilities of preschool children. However, understanding of how these factors interact to form eating and swallowing abilities is still limited. This study assesses the influence of environmental and social factors on children's feeding and swallowing abilities using various environmental and social indicators.*

Methods: *A cross-sectional study was conducted in Surakarta, Central Java (April–August 2025), with 81 purposively selected children. Feeding and swallowing ability was the dependent variable, while family, school, economic, social, and parenting factors served as predictors. Data were collected through interviews, observations, questionnaires, and the Dysphagia Disorder Survey, and analyzed using path analysis in Stata 13.*

Results: *Children's feeding and swallowing abilities were significantly associated with economic conditions and food availability (b = 2.09; 95% CI: 0.08–2.58; p = 0.037), parental support and social factors (b = 3.16; 95% CI: 0.79–3.41; p = 0.002), as well as feeding practices (b = 3.27; 95% CI: 0.82–3.27; p = 0.001). Indirectly, children's abilities were also influenced by social factors, parental support, appropriate feeding practices, school and peer environment, and social support.*

Conclusion: *Economic conditions, parental support, and feeding practices have a direct influence on children's feeding and swallowing abilities. In contrast, social factors, parenting styles, educational environments, and social support exert indirect effects. The main implication for health practices is the need for integrated interventions involving family economic support, parental education, social systems, and learning environments to support the development of feeding and swallowing abilities in preschool children.*

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INTRODUCTION

Feeding and swallowing abilities in kindergarten-aged children are essential for nutritional adequacy and safe food transfer from the oral cavity to the digestive tract. Previous studies consistently show that as children mature, oral motor coordination of the jaw, tongue, and lips supports improved chewing, texture tolerance, and swallowing efficiency, which are also influenced by cognitive and social development (Yavanoglu Atay, 2023). In Indonesia, most children aged 4–6 years can eat independently; however, feeding difficulties such as selective eating, chewing problems, and mild oral-motor impairments remain common and may negatively impact growth if not addressed (Cahyaningsih, 2023).

Mild to moderate feeding problems, including difficulties in chewing, swallowing, or refusal of certain foods, may potentially hinder growth and development if left unaddressed (Wahyuni et al., 2024). Appropriate interventions and strong support from both families and healthcare professionals are therefore essential to ensure optimal nutritional intake in this age group (Khotimah et al., 2025; Sindri et al., 2024). Research further indicates that environmental and social factors—such as household hygiene, food availability, parenting practices, and peer interactions—significantly shape children's feeding behaviors.

Inadequate parenting strategies or negative mealtime environments can induce stress and contribute to problematic behaviors such as food refusal or picky eating (Nurlianawati et al., 2023; Pebruanti & Rokhaidah, 2022). Parental feeding patterns and feeding practices strongly influence children's feeding abilities. Parents with healthier dietary habits who involve their children in food selection are more likely to foster positive feeding behaviors in their children (Khotimah et al., 2025).

Biologically, some children may experience digestive disorders or sensory sensitivities that affect their swallowing abilities (Nababan et al., 2024; Winarsih & Zumrotun, 2012). However, psychosocial stress or emotional disturbances arising from inappropriate parenting practices—such as excessive mealtime pressure or an unpleasant feeding environment—may further exacerbate feeding and swallowing problems. Children who are frequently forced to eat or exposed to mealtime pressure are more likely to refuse food or develop maladaptive feeding behaviors (Toga et al., 2024).

Social dynamics in kindergarten settings further contribute to feeding patterns, as children often mimic peers' eating behaviors (Fitri & Rusdiani, 2024; Melinda & Izzati, 2021). At the same time, external influences such as gadget use during meals and increased access to fast foods may reduce interest in nutritious foods (Asshar et al., 2024). Research by Tournier and Forde, (2024) Studies also highlight the importance of oropharyngeal motor coordination and early exposure to diverse textures for healthy feeding development.

Meanwhile, physical environmental conditions—such as household hygiene and feeding facilities—play a role in preventing digestive problems that may disrupt feeding (Ibrahim et al., 2025). In addition, social factors such as parenting practices and children's interactions with their social environment strongly influence feeding habits, including food acceptance and dietary variety (Ningning & Wenguang, 2023). On the other hand, several studies have also highlighted that physical environmental factors, such as household hygiene and feeding facilities, significantly affect children's digestive health and their ability to consume food safely without the risk of digestive disorders or infections (Heselo et al., 2025; Suparmi et al., 2025).

Social aspects also include support from family and peers, which can enhance children's comfort and success during meals, thereby contributing to better feeding development (Fierloos et al., 2023; Swanson et al., 2025). This study is novel in that it uses path analysis to comprehensively explore the influence of environmental and social factors on eating and swallowing abilities in preschool children, integrating biological, social, and environmental aspects that have rarely been analysed simultaneously in previous studies. This study aims to assess the influence of home physical conditions, eating facilities, parenting practices, family support, and peer interactions on children's feeding and swallowing abilities. The study can identify the direct and indirect pathways of influence of these factors, thereby providing a scientific basis for multidimensional interventions that support the eating and swallowing development of preschool children.

MATERIALS AND METHOD

This study employed a cross-sectional analytical design to examine the influence of environmental and social factors on the feeding and swallowing abilities of kindergarten-aged children. A cross-sectional approach was chosen because it allows researchers to assess multiple variables simultaneously at one point in time, making it suitable for identifying existing associations between environmental, social, and developmental factors. This design is also efficient for population-based behavioral studies, particularly when evaluating multifactorial influences on child feeding outcomes.

The study included 81 participants in Surakarta, selected using a simple random sampling technique. The sampling method was guided by the *Law of Statistical Regularity*, which states that when a sample is drawn at random from a sufficiently large population, the sample tends to represent the characteristics of the entire population (Yule & Kendall, 1950). This principle ensures that each subject in the sampling frame has an equal and independent probability of selection, allowing unbiased estimation of population parameters and strengthening the generalizability of the findings.

Data collection took place from April to August 2025. A simple random sampling technique was employed in accordance with the Law of Statistical Regularity, ensuring that every eligible toddler in the population had an equal and independent probability of being selected. This sampling approach was chosen to minimize selection bias and enhance the representativeness of the sample, based on the principle that a randomly drawn sample will typically mirror the characteristics of the larger population.

The dependent variable in this study was the eating and swallowing ability of preschool children, while the independent variables included environmental factors (home hygiene, sanitation, availability of eating facilities, food diversity) and social factors (family support, parenting practices, interaction with peers). Data collection was carried out using a structured questionnaire that had been tested for validity and reliability. The analysis was carried out using univariate, bivariate, and multivariate techniques.

Logistic regression was employed to assess the relationship between independent and dependent variables, which was further complemented by path analysis. This analytical approach was chosen to identify direct and indirect relationships between environmental and social factors and children's eating and swallowing abilities in a comprehensive manner. This study uses ethical clearance with the number

KEPK/UMP/56/VIII/2025 from Muhammadiyah University of Purwokerto, which was obtained on August 6, 2025.

In terms of ethical principles, this study was conducted in accordance with the health research code of ethics, including written consent from the children's parents/guardians, assurance of participant data confidentiality, and the participants' right to withdraw at any time without consequences. All research procedures were approved by the Muhammadiyah University of Purwokerto Health Research Ethics Committee under number KEPK/UMP/56/VIII/2025, which ensures that this study complies with the principles of non-maleficence, beneficence, autonomy, and justice in the protection of research participants.

RESULTS

Sample Characteristics

The description of the categorical sample data outlines the continuous variables of the study, including feeding and swallowing ability, family environment, school and peer environment, economic conditions and food availability, media exposure and other environmental factors, social support, feeding practices, family feeding habits, and family and social support. The results of the descriptive analysis of continuous sample data are presented in Table 1.

Table 1. Description of The Characteristics of Continuous Data Samples (n=81)

Variables	Mean ± SD	Min–Max
Feeding and Swallowing Ability	41.63 ± 9.31	24–69
Family Environment	18.53 ± 1.80	13–20
School Environment and Peers	14.04 ± 2.03	0–15
Economic Conditions and Food Availability	12.77 ± 2.19	2–15
Media Exposure and Other Environments	10.12 ± 2.27	3–15
Social Support	18.33 ± 2.10	11–20
Feeding Parenting Patterns	16.12 ± 2.53	10–20
Family Feeding Habits	8.44 ± 1.51	4–10
Social Factors and Family Support	13.08 ± 2.00	7–15

Table 1 shows that the average eating and swallowing ability is 41.63. The average for the family environment is 18.53, the school environment and peers are 14.04, economic conditions and food availability are 12.77, and media exposure and other environments are 10.12. Social support has an average of 18.33, feeding patterns 16.12, family eating habits 8.44, and social factors and family support 13.08.

Univariate Analysis

Table 2. Description of The Characteristics of Categorical Data Samples (n = 81)

Variable	Category	Frequency (n)	Percentage (%)
Feeding and Swallowing Ability	Not suitable	24	29.63
	Suitable	57	70.37
	Total	**81**	**100**
Family environment	Poor	19	23.46

Variable	Category	Frequency (n)	Percentage (%)
	Good	62	76.54
	Total	**81**	**100**
School environment and peers	Poor	19	23.46
	Good	62	76.54
	Total	**81**	**100**
Economic conditions and food availability	Poor	29	35.80
	Good	52	64.20
	Total	**81**	**100**
Media exposure and other environments	Poor	17	20.99
	Good	64	79.01
	Total	**81**	**100**
Social support	Low	34	41.98
	High	47	58.02
	Total	**81**	**100**
Feeding parenting patterns	Not suitable	17	20.99
	Suitable	64	79.01
	Total	**81**	**100**
Family feeding habits	Poor	17	20.99
	Good	64	79.01
	Total	**81**	**100**
Social factors and family support	Low	30	37.04
	High	51	62.96
	Total	**81**	**100**

Table 2 indicates that 70.37% of children demonstrated age-appropriate feeding and swallowing abilities, whereas 29.63% did not. Most children were characterized by a supportive family environment (76.54%), positive school and peer relations (76.54%), adequate economic conditions and food availability (64.20%), favorable media exposure and neighborhood environment (79.01%), high social support (58.02%), appropriate parental feeding practices (58.02%), healthy family feeding habits (79.01%), and strong social and family support (62.96%).

Bivariate Analysis

Table 3. Chi-Square Test of Factors of Feeding and Swallowing Ability in Children (n = 81)

Independent Variable	Ability to eat and swallow				OR	p
	Not suitable		Suitable			
	n	%	n	%		
Family environment						
Bad family environment	21	87.5	3	12.50	16.4	<0.001
Good family environment	17	29.82	40	70.18		
School Environment and Peer Relationships						
Poor	17	89.47	2	10.53	16.5	<0.001
Good	21	33.87	41	66.13		
Economic Conditions and Food Availability						
Poor	24	72.73	9	27.27	6.47	<0.001
Good	14	29.17	34	70.83		

Independent Variable	Ability to eat and swallow				OR	p
	Not suitable		Suitable			
	n	%	n	%		
Media Exposure and Other Environmental Factors						
Poor	19	65.52	10	34.48	3.3	0.012
Good	19	36.54	33	63.46		
Social support						
Low	14	82.35	3	17.65	7.78	0.001
High	24	37.50	40	62.50		
Feeding parenting patterns						
Not suitable	26	76.47	8	23.52	9.47	<0.001
Suitable	12	25.53	35	74.47		
Family feeding habits						
Poor	13	76.47	4	23.52	5.07	0.006
Good	25	39.06	39	60.94		
Social factors and family support						
Low	25	83.33	5	16.67	14.61	<0.001
High	13	25.49	38	74.51		

Table 3 presents the results of the bivariate analysis of factors associated with improved feeding and swallowing abilities in children. Significant predictors included: a supportive family environment (OR = 16.4; p < 0.001), a positive school and peer environment (OR = 16.5; p < 0.001), favorable economic conditions and food availability (OR = 6.47; p < 0.001), positive media exposure and other environmental factors (OR = 3.3; p = 0.012), high social support (OR = 7.78; p = 0.001), appropriate feeding practices (OR = 9.47; p < 0.001), healthy family feeding habits (OR = 5.07; p = 0.006), and strong social and family support (OR = 14.61; p < 0.001).

Multivariate Analysis

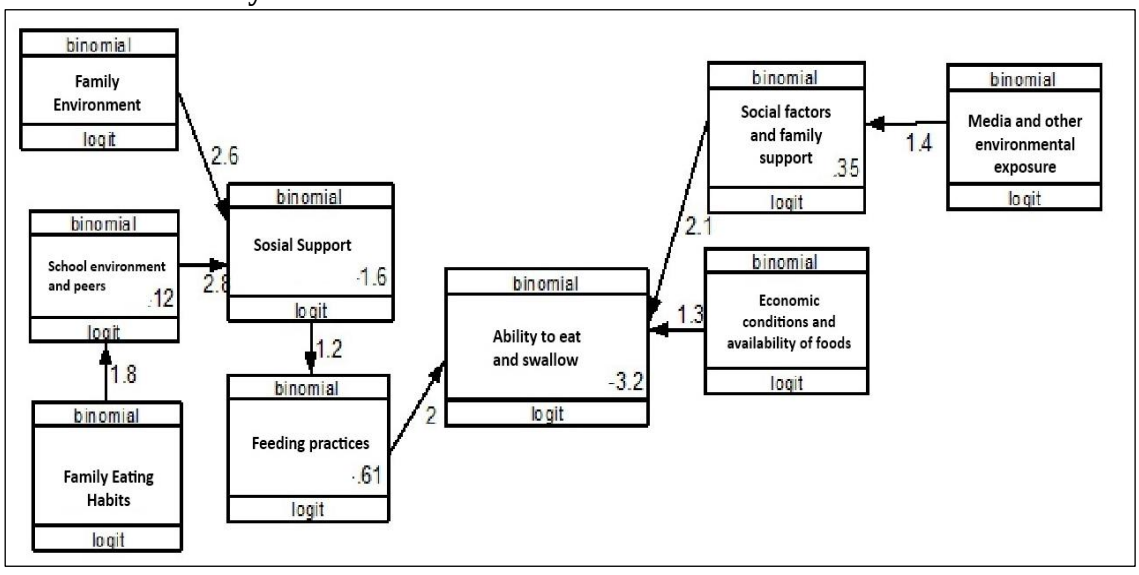

Figure 1. Path Analysis Model

Figure 1 shows a path analysis model that maps the structural relationships between environmental and social factors and eating and swallowing abilities in

preschool children. The family environment, school environment and peers, as well as family eating habits form pathways to social support and feeding patterns. The feeding pattern variable has a direct pathway to eating and swallowing abilities, while economic conditions and food availability also make a direct contribution.

The eating and swallowing ability variable is further connected to social factors and family support, which are then influenced by media exposure and other environments. This model illustrates the interrelationship between variables through direct and indirect pathways in explaining variations in eating and swallowing abilities.

Tabel 4. Path Analysis of Factors Influencing Children's Feeding and Swallowing Abilities (n = 81)

Dependent Variable		Independent Variable	Path Coefficient (b)	CI (95%)		p
				Lower Limit	Upper Limit	
Direct Effect						
Feeding and Swallowing Ability	←	Good Economic Conditions and Food Availability	2.09	0.08	2.58	0.037
	←	Social Factors and High Parental Support	3.16	0.79	3.41	0.002
	←	Good Feeding Practices	3.27	0.82	3.27	0.001
Indirect Effect						
High Social Factors and Strong Parental Support	←	Favorable Media Exposure and Other Environmental Factors	2.92	0.47	2.41	0.003
Appropriate Feeding Practices	←	High Social Support	2.08	0.06	2.30	0.038
Supportive School and Peer Environment	←	Healthy Family Feeding Habits	3.03	0.63	2.97	0.002
High Social Support	←	Supportive School and Peer Environment	3.62	1.29	4.33	< 0.001
	←	Family Environment	3.16	0.97	4.15	0.002
n observation = 81						
Log Likelihood = -198.713						

Table 4 shows the direct effects of economic conditions and food availability, social factors and parental support, and feeding practices on children's feeding and swallowing abilities. Specifically, economic conditions and food availability (b = 2.09; 95% CI = 0.08 to 2.58; p = 0.037), social factors and parental support (b = 3.16; 95% CI = 0.79 to 3.41; p = 0.002), and feeding practices (b = 3.27; 95% CI = 0.82 to 3.27; p =

0.001) were found to significantly improve children's feeding and swallowing abilities. Several variables were found to have an indirect effect on children's feeding and swallowing abilities, including social factors and parental support, appropriate feeding practices, supportive school and peer environment, and social support.

DISCUSSION

The results regarding the influence of economic conditions and food availability on children's feeding and swallowing abilities indicate that high coping strategies reduce the direct effect of favorable economic conditions and food availability on these abilities. This finding is consistent with the study by Weir et al., (2023) which showed that family economic conditions strongly determine a child's access to adequate nutrition. Families with limited economic resources often struggle to provide sufficient and nutritious food, which can exacerbate feeding and swallowing problems in children, particularly those with special needs or developmental disorders.

Moreover, economic constraints are often accompanied by uncertainty in food availability, putting children at risk of malnutrition and hindering the development of optimal feeding skills (da Fonseca et al., 2025). Another study by Lefton-Greif et al., (2014) found that children living in households experiencing food insecurity are more likely to encounter feeding difficulties compared to those with stable food access. This is because feeding problems are also influenced by family feeding habits and the availability of a variety of healthy foods at home.

The results regarding the influence of social factors and parental support on children's feeding and swallowing abilities indicate that high coping strategies reduce the direct effect of favorable economic conditions and food availability on these abilities. This is consistent with the study by da Fonseca et al., (2025) which demonstrated that parenting practices and family involvement directly affect mealtime dynamics and children's responses to various food textures and types. Parents who apply responsive feeding practices, recognizing their child's hunger and satiety cues, can support the development of self-regulation in feeding and foster a positive relationship with food. An open and structured family environment, free from distractions such as digital screens, further promotes healthy feeding habits.

Parents who create a pleasant mealtime atmosphere and provide food in a supportive manner help children form positive perceptions of food. Parental knowledge and skills in managing children's feeding patterns are also essential for monitoring and training children's feeding and swallowing abilities optimally. Additionally, positive interactions, such as two-way communication during meals, can reduce feeding difficulties and strengthen children's oral motor skills. Therefore, social support from the family is crucial in promoting effective feeding and swallowing abilities in children (Maharani & Soeyono, 2024).

The results of this study regarding the influence of parenting practices on children's feeding and swallowing abilities indicate a direct effect of parenting on these abilities. Parenting refers to the way parents educate, care for, and pay attention to their children, including feeding practices. Children tend to imitate the feeding habits and behaviors modeled by their parents at home. Therefore, a healthy parenting style, oriented toward good communication and support for children's feeding behaviors, can help children develop positive feeding habits and optimal swallowing abilities.

Democratic parenting, which emphasizes gentle guidance and meeting the child's food preferences and nutritional needs, has been shown to enhance children's food

acceptance and reduce feeding difficulties. In contrast, authoritarian parenting, characterized by coercion and strict demands without full guidance, is often associated with increased food refusal or picky feeding among preschool-aged children (Nyanyi et al., 2019). This relationship was also observed in a correlational study using parenting and child feeding behavior questionnaires, which reported a strong correlation coefficient (0.965), indicating that parenting style is closely related to children's feeding behaviors (A'yun et al., 2024).

In addition to parenting, other factors such as gastrointestinal disorders (food allergies, reflux) and discomfort during feeding (pain, nausea, or swallowing difficulties) also affect children's feeding abilities. Children experiencing discomfort or pain while feeding tend to refuse certain foods, appearing as feeding difficulties. Positive parenting that involves attention, affection, and consistent family feeding routines can help reduce these feeding problems by modeling healthy feeding behaviors and crfeeding a supportive mealtime environment (Khasanah et al., 2024).

The results of this study regarding the influence of media exposure and other environmental factors on social factors and parental support indicate an indirect effect of favorable media exposure and environmental conditions on children's feeding and swallowing abilities, mediated through social factors and parental support. This finding aligns with a meta-analysis by Zhang et al., (2025) which reported that excessive media exposure in children is often influenced by parental behaviors, particularly *technoference*—a phenomenon in which parents' attention is disrupted by technology, reducing parent–child communication and interaction. This, in turn, increases problematic media use among children as compensation for the lack of parental attention.

Furthermore, the way parents manage their children's media use is crucial. According to Lin, Vijayalakshmi and Laczniak (2019), parental mediation through media rules, active discussion, and co-supervision can help reduce the risks associated with excessive media exposure and improve children's understanding of media content. In other words, parental support in the form of supervision and active engagement serves as a protective factor, mitigating the negative impact of media on children's social development.

The results of this study regarding the influence of social support on feeding practices indicate an indirect effect of high social support on children's feeding and swallowing abilities, mediated through appropriate feeding practices. This finding is supported by a qualitative study of Chinese immigrant mothers in the United States, which highlighted how transnational and local social support networks shape infant feeding practices. The study identified three main themes: (1) gathering and processing feeding-related information from transnational sources, (2) aligning mothers' attitudes with culturally informed health beliefs from local social networks, and (3) enhancing maternal confidence in feeding interactions with their infants. These findings suggest that social support is closely linked to the formation of social norms and self-efficacy underlying feeding behaviors (Duh-Leong et al., 2023).

Furthermore, social support obtained online through social media platforms such as Facebook was found to contribute to increased breastfeeding self-efficacy among mothers. Higher self-efficacy positively influences the continuation of breastfeeding practices, which is an integral part of healthy feeding practices (Yasya, 2019). However, Handayani (2018) found that the influence of social support on breastfeeding practices is not always significant, particularly among working mothers, where knowledge,

attitudes, and self-efficacy play a more dominant role. Nevertheless, social support remains an essential component of educational programs and maternal support initiatives to ensure proper child feeding management.

The results of this study regarding the influence of family feeding habits on the school and peer environment indicate an indirect effect of healthy family feeding habits on children's feeding and swallowing abilities, mediated through a supportive school and peer environment. This is supported by several studies showing that families play a primary role in shaping children's feeding habits, especially in early childhood when direct interactions with parents and other family members are most frequent. The feeding patterns implemented by parents not only influence children's food choices but also affect their ability to self-regulate and maintain healthy feeding behaviors (Czarniecka-Skubina et al., 2023; Pereira et al., 2025).

The school and peer environment subsequently becomes a social context that further shapes children's feeding behaviors as they grow, particularly during adolescence. Peer influence at school can exert either positive or negative pressure on healthy food choices. For instance, if peers practice healthy feeding habits, children are likely to adopt similar behaviors through imitation and social adjustment. Conversely, if the peer environment promotes unhealthy habits, it may hinder children from maintaining the healthy feeding practices taught at home (Pereira et al., 2025; Street et al., 2024).

The interaction between family and school environments is crucial because children learn from both contexts simultaneously. Families provide foundational values and concrete examples that are highly influential, while schools and peers offer a broader social context and new challenges in sustaining healthy feeding habits (Ragelienė & Grønhøj, 2020). Findings from Czarniecka-Skubina, Gutkowska and Hamulka, (2023) indicate that active parental involvement in nutrition education and children's feeding habits can strengthen the positive impact of the school and peer environment in supporting healthy dietary behaviors.

The results of this study regarding the influence of the school and peer environment on social support indicate an indirect effect of a supportive school and peer environment on children's feeding and swallowing abilities, mediated through high social support. The school environment plays a significant role in shaping the social support experienced by students. A study by Yu et al., (2024) showed that social support from teachers significantly mediates students' social adjustment in secondary school, with emotional and evaluative aspects of teacher support having a greater impact on female students compared to male students. This highlights that teachers are not only academic instructors but also a primary source of emotional support that helps students adapt to their school environment. Support from the school environment, particularly from teaching staff, can enhance students' subjective well-being and psychological resilience, both of which are closely related to their ability to socially adapt.

Meanwhile, peer influence is equally important. Peer support provides crucial emotional protection for students' mental well-being and encourages the achievement of long-term educational goals. In this context, peers help reduce feelings of loneliness, anxiety, and depression among students, indirectly strengthening their psychological resilience in coping with school-related pressures Wang et al., (2024). Positive social interactions with peer groups also allow students to develop essential social skills, which subsequently contribute to more effective social adaptation

The results of this study regarding the influence of the family environment on social support indicate an indirect effect of a supportive family environment on children's feeding and swallowing abilities, mediated through high social support. This is consistent with the findings of An et al., (2024) which showed that perceived family support significantly contributes to individuals' emotional, social, and psychological well-being. A supportive family environment provides a sense of security, love, and acceptance, which plays a crucial role in emotional development and individual stability.

A positive family environment fosters open communication and empathy among family members, enabling individuals to feel comfortable expressing emotions and seeking help when facing stress or emotional difficulties. Such support not only strengthens social relationships within the family but also influences broader social networks. In other words, family support forms a foundational basis for the development of wider social support in the community (Assegap et al., 2025; Hosokawa & Katsura, 2024).

Furthermore, An et al., (2024) showed that strong family support can reduce stress, anxiety, and depression while strengthening self-confidence and overall psychological well-being. These findings offer practical implications for clinicians, educators, and public health practitioners. Clinicians should adopt family-centered approaches when addressing feeding and swallowing difficulties. Educators can foster supportive classroom environments that promote healthy eating routines and positive peer modeling.

Public health practitioners may develop community programs that enhance parental knowledge and reinforce healthy feeding practices at home. This study has several limitations. Its cross-sectional design prevents causal interpretation, self-reported data may introduce recall bias, and the limited sample size and single geographic setting reduce generalizability. Future studies should consider longitudinal designs, observational methods, and larger, more diverse samples.

In addition, it is recommended that future studies strengthen their methodological rigor, particularly in the areas of sampling, instrument validation, and model assessment. Larger and more diverse samples would enhance representativeness and improve the generalizability of findings. More robust instrument validation, including construct validation and repeated reliability testing—would ensure stronger measurement accuracy. Furthermore, evaluating model fit through additional goodness-of-fit indices and alternative analytical models would improve the adequacy and robustness of statistical analyses. These methodological refinements would reinforce the study's contribution and better guide future research in this field.

CONCLUSION

Path analysis using Stata 13 revealed that children's feeding and swallowing abilities are directly affected by family economic conditions, food availability, parental support, and feeding practices. Indirect influences were observed from media and environmental exposure, social support, family feeding habits, and school and peer environments, as well as the overall family environment. The main implication for health practice is that improving feeding and swallowing abilities in preschool children requires comprehensive intervention that integrates family economic support, strengthening parental literacy, the role of a supportive social system, and the provision of an optimal learning environment.

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