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Food Neophobia and Animal Protein Intake in Children Aged 3-5 Years: A Cross-Sectional Study in Indonesia

Neofobia Makanan dan Asupan Protein Hewani pada Anak Usia 3-5 Tahun: Studi Cross-Sectional in Indonesia

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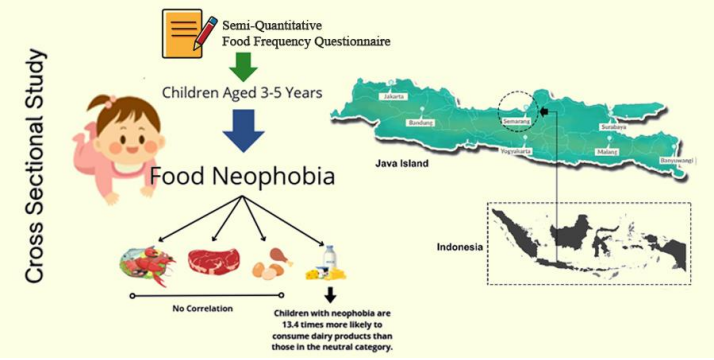
Abstract
Food neophobia, defined as the avoidance of unfamiliar or familiar foods due to fear and negative perceptions, can significantly influence children's dietary variety and nutritional adequacy. Previous studies have highlighted inconsistent findings on its relationship with protein intake, yet limited evidence exists in Indonesia. This study aimed to examine the association between food neophobia and animal protein consumption among toddlers aged 3–5 years in Semarang City, Indonesia. An observational analytic study with a cross-sectional design was conducted from May to July 2024. Data were collected through interviews with parents/caregivers using the Child Food Neophobia Scale (CFNS) and a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Statistical analysis applied Chi-Square tests and logistic regression at a 95% confidence level ($p < 0.05$). A total of 73 toddlers participated in the study. Findings revealed a significant correlation between food neophobia and frequency of dairy product consumption ($p < 0.001$), with neophobic children being 13.4 times more likely to consume dairy products than food-neutral children. However, no significant associations were observed with the adequacy or frequency of seafood, poultry, or red meat consumption. These findings indicate that while food neophobia may restrict dietary variety, the preference for dairy can serve as a compensatory nutrient source, particularly for calcium and protein, supporting growth and development. In the Islamic perspective, the inclusion of milk as a wholesome and pure food aligns with Quranic teachings, reinforcing family health practices that integrate both nutritional and spiritual well-being.

Abstrak
Food neophobia, yaitu perilaku menghindari makanan baru maupun makanan yang sudah dikenal karena adanya rasa takut dan persepsi negatif, dapat memengaruhi preferensi makan dan keberagaman konsumsi anak. Penelitian sebelumnya menunjukkan hasil yang beragam terkait hubungannya dengan asupan protein, namun bukti di Indonesia masih terbatas. Penelitian ini bertujuan untuk mengetahui hubungan antara food neophobia dengan konsumsi protein hewani pada balita usia 3–5 tahun di Kota Semarang. Penelitian analitik observasional dengan desain potong lintang ini dilakukan pada Mei–Juli 2024. Data dikumpulkan melalui wawancara dengan orang tua/pengasuh menggunakan kuesioner Child Food Neophobia Scale (CFNS) dan Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). Analisis statistik dilakukan dengan uji Chi-Square dan regresi logistik pada tingkat kepercayaan 95% ($p < 0,05$). Sebanyak 73 balita ikut serta dalam penelitian ini. Hasil menunjukkan adanya hubungan signifikan antara food neophobia dengan frekuensi konsumsi produk susu ($p < 0,001$), dimana balita neofobik 13,4 kali lebih mungkin mengonsumsi susu dibanding balita netral. Namun, tidak ditemukan hubungan signifikan dengan kecukupan atau frekuensi konsumsi makanan laut, unggas, dan daging merah. Temuan ini menunjukkan bahwa meskipun food neophobia dapat membatasi variasi diet, preferensi terhadap susu dapat menjadi sumber kompensasi nutrisi, terutama kalsium dan protein, yang mendukung pertumbuhan dan perkembangan. Dalam perspektif Islam, susu dipandang sebagai makanan yang baik dan murni sebagaimana tercantum dalam Al-Qur'an, sehingga dapat memperkuat praktik kesehatan keluarga yang mengintegrasikan gizi dan nilai spiritual.

Graphical Abstract



Keyword
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INTRODUCTION

The first five years of life, known as the golden age, are crucial for optimal growth and development, as children experience rapid motor, physical, and cognitive progress (Sutapa et al., 2022). During this period, proper nutrition plays a pivotal role in shaping children's future health and developmental outcomes. The United Nations Sustainable Development Goals (SDGs), particularly Goal 2 (Zero Hunger) and Goal 3 (Good Health and Well-being), emphasize the importance of adequate nutrition to prevent stunting and malnutrition in children under five (United Nations, 2018). However, despite these global commitments, nutritional deficiencies remain prevalent, especially in low- and middle-income countries, including Indonesia, where protein intake among children often falls below recommended standards (Wrottesley et al., 2023).

Protein, particularly from animal sources, is irreplaceable in supporting growth, immunity, and cognitive development. Limited animal protein consumption among toddlers has been consistently linked to nutritional problems, including stunting and wasting, which have long-term consequences on public health and socioeconomic development (Suryawan et al., 2022; Zaharia et al., 2021). This issue is not unique to Indonesia; global evidence shows disparities in animal protein consumption patterns across countries, reflecting socioeconomic, cultural, and behavioral factors (Khusun et al., 2022; Klink et al., 2022). Addressing these disparities is essential for improving child health outcomes in alignment with international health agendas.

Despite its crucial role in child development, animal protein consumption among Indonesian toddlers remains insufficient, with dietary patterns still dominated by cereals and tubers (FAO, 2019; Endrinikapoulos et al., 2023). Behavioral challenges, particularly food neophobia—defined as reluctance or refusal to try new foods—further limit the diversity of children's diets and contribute to inadequate protein intake (Torres et al., 2020). Therefore, strategies to improve children's dietary patterns must address both nutritional availability and behavioral barriers, particularly by understanding the relationship between food neophobia and animal protein consumption.

Food neophobia is a natural developmental behavior that peaks in early childhood, particularly between ages two and six (Dos Anjos et al., 2021; Estay et al., 2023). Research from various countries demonstrates its strong association with reduced dietary diversity and lower intake of animal-based foods. For instance, studies in the United Kingdom and Poland revealed that highly neophobic children had significantly lower consumption of meat, fish, and eggs (Długońsk et al., 2025; Helland et al., 2017). Similarly, a study in Australia showed that children with high food neophobia tended to avoid both animal and plant-based proteins, with some families adopting vegetarian dietary practices as a result (Farahnaky et al., 2023). These findings suggest that food neophobia can significantly hinder protein adequacy in toddlers.

However, the evidence is not conclusive. Several studies indicate no significant association between food neophobia and specific protein sources. For example, Australian research found no relationship between food neophobia and consumption of dairy products or pork (Farahnaky et al., 2023), while a large-scale Saudi Arabia survey reported no significant link with intake of protein and a number of important nutrients (Kutbi et al., 2022). These discrepancies highlight the complexity of the phenomenon, suggesting that cultural, socioeconomic, and parental feeding practices may moderate the relationship between food neophobia and protein consumption patterns.

While food neophobia has been widely studied in high-income countries, research focusing on its influence on animal protein consumption in Indonesian children remains limited. National surveys indicate that animal protein intake among toddlers is low (Khusun et al., 2022), yet few studies have examined behavioral contributors such as food neophobia (Faria et al., 2022; Günden et al., 2024; Siddiqui et al., 2022). This gap is critical, as Indonesia continues to face persistent challenges of stunting and malnutrition despite policy interventions aimed at improving child nutrition (Jaya et al., 2025; Meher et al., 2023). A better understanding of how food neophobia affects animal protein consumption could inform more effective interventions that integrate both nutritional and behavioral dimensions.

This study seeks to fill the gap by exploring the correlation between food neophobia and animal protein consumption among toddlers in Semarang City. The novelty of this research lies in its focus on behavioral factors influencing protein intake within the Indonesian context, an area that has received limited scholarly attention. By addressing this gap, the study aims to contribute to public health strategies that promote adequate nutrition and support optimal growth during the critical early years of life, in alignment with SDG targets on child health and nutrition.

METHODS

This study was categorized as public nutrition research with an analytic observational research design using a cross-sectional approach, conducted from May to July 2024 in Tembalang Sub-district, Semarang City, Central Java, Indonesia. Ethical approval was obtained from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Diponegoro University / Dr. Kariadi Central General Hospital with Ethical Clearance Number 217/EC/KEPK/FK-UNDIP/V/2024. All participants were given complete information about the study and signed written informed consent prior to participation.

The study population consisted of mothers or caregivers of children aged 3–5 years residing in Tembalang Sub-district. The sample size was calculated using a correlative analytic formula with a correlation coefficient (r) of 0.396, resulting in a total of 73 subjects after adjusting for an anticipated dropout rate of 10%. The

Table 1
Characteristics of Respondents

Variables	n	%
Age		
3–4 years	35	47.90
4–5 years	38	52.10
Gender		
Male	33	45.20
Female	40	54.80
Eating Behavior		
Food Neophilia	13	17.80
Food Neutral	47	64.40
Food Neophobia	13	17.80
Total Animal Protein Intake		
Inadequate	53	72.60
Adequate	20	27.40
Frequency of Seafood Consumption		
Rare (≤2×/week)	48	65.80
Often (≥3×/week)	25	34.20
Frequency of Poultry Consumption		
Rare (≤2×/week)	14	19.20
Often (≥3×/week)	59	80.80
Frequency of Red Meat Consumption		
Rare (≤2×/week)	60	82.20
Often (≥3×/week)	13	17.80
Frequency of Dairy Product Consumption		
Rare (≤2×/week)	51	69.90
Often (≥3×/week)	22	30.10

sampling technique employed was non-probability sampling with a consecutive sampling method.

The inclusion criteria were: (1) mothers/caregivers of children aged 3–5 years, (2) willingness to provide informed consent, and (3) ability to read and communicate well. The exclusion criteria included incomplete data, withdrawal during the study, illness, or relocation outside Semarang City during the study period.

The independent variable in this study was food neophobia behavior, while the dependent variable was the pattern of animal protein consumption (type, amount, and frequency). Confounding variables included maternal education level, nutritional knowledge, and family income.

Data on food neophobia were collected through parent/caregiver interviews using the Child Food Neophobia Scale (CFNS) questionnaire for children aged 3–5 years, consisting of six items measured on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." The CFNS had previously demonstrated acceptable validity ($p < 0.05$) and reliability (Cronbach's Alpha = 0.70). Total scores ranged from 6 to 42, with categories as follows: food neophilia (≤18), food neutrality (19–34), and food neophobia (≥35) (Costa et al., 2019; Estay et al., 2023).

Data on animal protein consumption patterns were obtained using a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), covering the last one month. Animal protein intake was classified into seafood, poultry, red meat, and dairy products. Adequacy of animal protein intake was determined using the standard of 21 grams/day, based on the Indonesian Ministry of Health's guidelines (PMK No. 41 of 2014), where one serving (50 grams) equals 7 grams of protein. Adequacy levels were categorized as sufficient (≥21 grams/day) and insufficient (<21 grams/day). Frequency was categorized as rarely (≤2 times/week) and usually (≥3 times/week).

Confounding variables were measured through direct interviews. Maternal education level was categorized into basic to intermediate (no schooling to high school) and high (college graduates). Nutritional knowledge was assessed using a 14-item questionnaire with a reliability coefficient of Cronbach's Alpha = 0.90. Scores ≤7 indicated low knowledge, while >7 indicated adequate knowledge. Family income was classified as low if below the 2024 Semarang City minimum wage of Rp3,243,969, and high if equal to or above.

Data analysis was performed using IBM SPSS version 25. Univariate analysis was conducted to describe frequency distributions of each variable. Bivariate analysis employed the Chi-Square test to examine the relationship between food neophobia and animal protein consumption patterns. Multivariate analysis using logistic regression was performed to control for confounding variables. A significance level of $p < 0.05$ was applied.

RESULTS

Table 1 presents the socio-demographic and dietary behavior characteristics of toddlers aged 3 to 5 years. The sample was relatively balanced by age group, with 52.1% aged 4–5 years and 47.9% aged 3–4 years. In terms of gender, 54.8% were female and 45.2% were male. Regarding eating behavior, the majority of respondents were food neutral (64.4%), while 17.8% exhibited food neophilia and another 17.8% showed signs of food neophobia.

Table 2
Family Characteristics and Their Distribution Based on Children's Eating Behavior

Variables	Eating Behavior						Total	
	Food Neophilia		Food Neutral		Food Neophobic			
	n	%	n	%	n	%	n	%
Mother's Education								
Elementary–Middle School	11	84.60	37	78.70	8	76.70	56	76.70
High School and Above	2	15.40	10	21.30	5	23.30	17	23.30
Maternal Nutrition Knowledge								
Poor (score ≤ 7)	6	46.20	12	25.50	7	53.80	25	34.20
Good (score ≥ 7)	7	53.80	35	74.50	6	46.20	48	65.80
Family Income								
Low (< Minimum Wage – IDR 3,243,969)	7	53.80	17	36.20	8	61.50	29	39.70
High (≥ Minimum Wage – IDR 3,243,969)	6	46.20	30	63.80	5	38.50	44	60.30

Nutritionally, the majority (72.6%) had inadequate animal protein intake. Poultry was the most frequently consumed animal protein, with 80.8% consuming it ≥3 times per week, while seafood and red meat were consumed less frequently—only 34.2% and 17.8%, respectively, reported frequent intake. Dairy products were consumed often by 30.1% of respondents, though most (69.9%) consumed them less than three times per week. These patterns suggest a strong preference for poultry over other animal protein sources among toddlers, likely influenced by sensory preferences and family dietary habits.

Table 2 presents the distribution of family characteristics, including maternal education, maternal nutrition knowledge, and household income, and their association with children's eating behavior. The majority of mothers had completed only elementary to middle school education (76.7%), while only 23.3% had attained higher education. In terms of nutritional knowledge, 65.8% of mothers demonstrated good knowledge (score ≥ 7). Regarding household income, 60.3% of families had an income above the Semarang City minimum wage, while 39.7% were below the threshold.

When analyzed by children's eating behavior categories, food neophobic children were more commonly found in families with lower maternal education (76.7%), lower maternal nutrition knowledge (53.8%), and lower income (61.5%). Conversely, food-neutral children were more likely to come from families with good maternal nutrition knowledge (74.5%) and higher income (63.8%). This pattern suggests that higher levels of maternal education and nutrition awareness, as well as better household economic conditions, may contribute positively to children's openness to various food types and reduce the likelihood of food neophobia.

Table 3 displays the relationship between children's eating behavior and their patterns of animal protein consumption. Across all eating behavior categories (neophilia, neutral, and neophobia), the majority of children had inadequate total animal protein intake, though this association was not statistically significant ($p = 0.897$). Similarly, there were no significant associations observed with the frequency of seafood ($p = 0.217$), poultry ($p = 0.505$), or red meat ($p = 0.510$) consumption. Most children in all groups consumed poultry more frequently than seafood or red meat, with rare consumption of red meat particularly high among food neophobic children (92.3%).

Interestingly, the only statistically significant association observed was with the frequency of dairy product consumption ($p < 0.001$). A substantial proportion of food neophobic children (76.9%) consumed dairy products frequently (≥3×/week), which contrasts sharply with food neophilic and food-neutral children, where most had infrequent dairy consumption. This suggests that children with food neophobia may prefer dairy products, likely due to their mild flavor, smooth texture, and familiarity. These findings underscore the need for dietary strategies tailored to sensory preferences and eating behavior types in early childhood nutrition interventions.

DISCUSSION

This study revealed that 17.8% of toddlers exhibited food neophilia, 64.4% were categorized as food neutral, and 17.8% demonstrated food neophobia. Food neophilia, food neutrality, and food neophobia are behavioral tendencies toward food that are influenced by individual perceptions and emotional responses (Tarinc et al., 2023). Children with food neophilia tend to explore and try unfamiliar foods (Białek-Dratwa & Kowalski, 2023), while those with food neophobia typically reject both novel and familiar foods due to negative emotional reactions (Costa et al., 2025). In contrast, food-neutral children neither actively seek new foods nor avoid them, reflecting a more indifferent response. Food neophobia often manifests in selective eating behaviors characterized by a narrow food repertoire, often driven by aversions to specific sensory characteristics such as smell, texture, color, or shape (Helland et al., 2023).

A deeper exploration of dietary intake revealed that insufficient animal protein consumption was prevalent among toddlers across all food behavior categories, with 76.9% of food neophilic, 63.5% of food-neutral, and 69.2% of food-neophobic children not meeting the recommended intake. Children with food neophilia commonly consumed seafood and poultry, while food-neutral children

Table 3
Association Between Eating Behavior and Animal Protein Consumption Patterns

Variables	Eating Behavior						p-value
	Food Neophilia		Food Neutral		Food Neophobia		
	n	%	n	%	n	%	
Total Animal Protein Intake							
Inadequate	10	76.9	33	63.5	9	69.2	0.897
Adequate	3	23.1	14	25.5	4	30.8	
Frequency of Seafood Consumption							
Rare (≤2×/week)	6	46.2	32	68.1	10	76.9	0.217
Often (≥3×/week)	7	53.8	15	31.9	3	23.1	
Frequency of Poultry Consumption							
Rare (≤2×/week)	1	7.7	10	21.3	3	23.1	0.505
Often (≥3×/week)	12	92.3	37	78.7	10	76.9	
Frequency of Red Meat Consumption							
Rare (≤2×/week)	11	84.6	37	78.7	12	92.3	0.510
Often (≥3×/week)	2	15.4	10	21.3	1	7.7	
Frequency of Dairy Product Consumption							
Rare (≤2×/week)	11	84.6	37	78.7	3	23.1	0.001*
Often (≥3×/week)	2	15.4	10	21.3	10	76.9	

Note: *p-value < 0.05 indicates statistical significance.

predominantly consumed poultry. Food-neophobic children also consumed poultry and dairy products more frequently, with red meat and seafood being consumed less often. Notably, 100% of food-neophobic children disliked the fishy odor of seafood, particularly fish, and 53.8% expressed aversion to the strong odor of red meat. In terms of texture, 76.9% disliked the dense texture of red meat, and 30.7% reported disliking the shape of fish and oysters. Fear-related aversion was also observed, with 15.3% expressing fear of seafood such as crabs and lobsters due to their claws.

The relationship between food neophobia and dairy product consumption was statistically significant. This aligns with findings from Portuguese research in 2017, which indicated that children with food neophobia prefer familiar foods, particularly milk (Costa et al., 2020). In this study, 76.9% of children with food neophobia frequently consumed dairy products, especially milk, either in the form of formula or UHT milk. However, other dairy products were less frequently consumed: cheese (61.5%), ice cream (30.8%), and yogurt (7.7%). These preferences are supported by evidence indicating that children with food neophobia favor homogeneous and low-particle foods (Skouw et al., 2023; Chow et al., 2024). Milk, being liquid and smooth, fits this preference, unlike textured or particulate foods which are commonly rejected (Puleo et al., 2021).

Multivariate logistic regression analysis confirmed that food neophobia significantly influenced dairy product consumption frequency, with neophobic children being 13.4 times more likely to consume dairy products frequently than food-neutral children. Potential confounding variables such as maternal education level, nutritional knowledge, and household income showed no significant association, indicating that food neophobia was the primary determinant.

In contrast, no significant relationship was found between food neophobia and seafood consumption frequency. Although 76.9% of children with food neophobia rarely consumed seafood, this was not statistically significant. Previous studies, including a large-scale UK survey, similarly reported food neophobia (FN) is negatively associated with acceptance of processed seafood products (surimi-based products) in Sweden (Costa et al., 2023). However, qualitative interviews indicated that aversions were primarily due to sensory characteristics. Fishy odor, unusual appearance (e.g., claws or fins), and the soft, unstable texture of seafood contributed to rejection (Costa et al., 2025). Additionally, caregiver perceptions that seafood poses contamination risks may further discourage its consumption (Taylor et al., 2025).

Furthermore, no significant relationship was observed between food neophobia and poultry consumption. Despite this, 76.9% of food-neophobic children frequently consumed poultry. This finding contrasts with studies from Portugal and Norway, which reported reduced meat intake among neophobic children (Costa et al., 2020; Helland et al., 2017). The high frequency of poultry intake in this study may be influenced by family dietary habits and proper cooking methods that produce softer textures, making poultry more acceptable to children with food neophobia (Cappellotto & Olsen, 2021).

Similarly, red meat consumption did not significantly correlate with food neophobia behavior. However, 60% of children with food neophobia rarely consumed red meat, consistent with studies from Brazil and Australia indicating that neophobic children tend to avoid red meat due to its strong odor, fibrous texture, and negative associations (De Almeida et al., 2024; Farahnaky et al., 2023). Discrepancies with other studies may be attributed to gender differences, as 69.2% of neophobic subjects in this study were female, and prior research shows males typically consume more meat (Michel et al., 2021). Additionally, economic factors may influence red meat consumption, given its higher cost compared to other protein sources (Hopkins et al., 2023).

Lastly, there was no significant relationship between food neophobia and total animal protein intake. This aligns with findings from Hazley et al. (2022), which also reported no link between macronutrient intake and food neophobia. However, other research has shown that neophobic children generally have lower protein intake due to limited consumption of meat, fish, and eggs (Del Campo et al., 2024; Xie et al., 2024). In the current study, despite frequent consumption of poultry and dairy products, total protein adequacy was not achieved, likely due to insufficient portion sizes.

From an Islamic perspective, ensuring that children consume a diverse range of *halal* and *thayyib* (pure and wholesome) foods is central to maintaining holistic well-being. The Qur'an in QS. Al-Baqarah/2:168 emphasizes the consumption of lawful and good provisions, as stated:

> *"O mankind, eat from whatever is on earth [that is] lawful and good, and do not follow the footsteps of Satan. Indeed, he is to you a clear enemy"*

This principle not only safeguards physical health but also strengthens spiritual development, as dietary practices are intertwined with obedience to divine guidance (Niri et al., 2021). In the context of food neophobia, guiding children to gradually accept diverse sources of animal protein such as milk, poultry, and seafood within the framework of *halal* and *thayyib* reinforces balanced nutrition while cultivating gratitude (*shukr*) for Allah's blessings. Positive reinforcement and mindful parental modeling in food choices also align with Islamic teachings on moderation (*wasatiyyah*) and responsibility in child upbringing (Elgharbawy & Azmi, 2022).

Furthermore, milk occupies a special status in Islam as a symbol of nourishment and purity. The Qur'an in QS. An-Nahl/16:66 describes milk as *"pure milk, palatable to drinkers"*, highlighting its role as a wholesome provision. This directly resonates with the findings of the present study, where neophobic children were more likely to consume dairy products, suggesting milk as an accessible and culturally acceptable nutrient source that complements growth and development. Integrating this perspective, parents are encouraged not only to provide nutritionally adequate foods but also to instill values of gratitude, moderation, and mindfulness in children's dietary habits. Such integration of nutritional science and Islamic guidance fosters both physical health and spiritual resilience, thereby supporting the broader goals of family and community well-being (Arslan & Aydın, 2024).

This study has several strengths, including its focus on the underexplored relationship between food neophobia and animal protein consumption among toddlers in Indonesia. The use of validated instruments such as the Child Food Neophobia Scale (CFNS) and Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) further strengthens the reliability of the findings. However, certain limitations should be acknowledged. The categorization of food frequency by type rather than by specific items may have reduced the granularity of the analysis, potentially obscuring variations in children's acceptance of particular foods. In addition, the study did not assess the sensory-based reasons behind food rejection, such as taste, texture, or smell, which could provide a deeper understanding of the behavioral motivations in food neophobic children. Despite these limitations, the study offers valuable insights for both nutritional science and Islamic perspectives on healthy and mindful eating, thereby contributing to future research and family health promotion.

CONCLUSIONS

This study demonstrated a significant relationship between food neophobia and the frequency of dairy product consumption, while no significant relationship was found with the amount of animal protein intake, or the frequency of poultry, red meat, and seafood consumption. These findings highlight that food neophobia may selectively influence dietary patterns, particularly in relation to dairy products, which has important implications for family health and nutrition management. The results suggest that food neophobia should be considered in dietary counseling and health promotion programs, especially in guiding families toward balanced and diverse food consumption.

Future research is recommended to examine food neophobia in relation to specific food groups, considering sensory aspects such as color, taste, aroma, texture, and appearance, as well as psychological and cultural influences. Such studies may provide deeper insights into the mechanisms underlying food neophobia and its impact on family dietary practices. While this study contributes to advancing knowledge in family nutrition by integrating psychosocial and behavioral factors, its limitation lies in not exploring the detailed causes of food neophobia. Addressing these aspects in future research will enhance the development of more targeted interventions to promote healthier eating behaviors within families.

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AUTHORS' CONTRIBUTIONS

Novia T. Khoirunnisa wrote the manuscript, collected data, enrolled participants, analyzed the data, revised the manuscript, performed the fieldwork; Rachma Purwanti designed the study, formulated the concept, reviewed the manuscript, analyzed the data, performed the fieldwork, read and approved the final manuscript. Nuryanto Nuryanto and Ayu Rahadiyanti reviewed the manuscript, read and approved the final manuscript.

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COMPETING INTERESTS
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