# Food Neophobia Among Preschool Children in Kuantan, Pahang

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**ABSTRACT**

**Background:** Food neophobia, the reluctance to try unfamiliar foods, is common in young children and has been linked to unhealthy dietary habits, including low fiber intake and preference for energy-dense foods. In Malaysia, evidence on food neophobia among preschool-aged children remains limited, despite persistent concerns about child malnutrition, particularly stunting. This study aimed to assess food neophobia, dietary patterns, and their associations with sociodemographic and nutritional factors among preschool children in Kuantan, Pahang. **Methods:** A cross-sectional study was conducted among 44 children aged 4–6 years and their caregivers. Data were obtained through caregiver-administered, face-to-face questionnaires comprising the Child Food Neophobia Scale (CFNS), a Food Frequency Questionnaire (FFQ), and sociodemographic information. Children's anthropometric measurements were collected to assess their nutritional status. Data analysis was performed using descriptive statistics and chi-square tests with SPSS version 20. **Results:** In this study, children were categorized into low (25.0%), moderate (52.3%), and high (22.7%) food neophobia. The highest dietary intake was for beverages and cereal products, while the lowest was for nuts and bread spreads. Their nutritional status showed 6.8% underweight, 22.7% stunted, and 6.8% wasted. No significant associations were found between food neophobia and nutritional status or most sociodemographic variables. **Conclusion:** Although no significant associations were found, the presence of stunting and wasting underscores the importance of promoting dietary variety from early childhood. Early dietary interventions and active caregiver engagement are essential to improve food acceptance and support optimal growth and health among preschool-aged children.

**Keywords:**
food neophobia; preschool children; food consumption; association

## INTRODUCTION

Food neophobia, commonly observed in early childhood, refers to the reluctance or refusal to eat unfamiliar foods. This behaviour typically emerges during toddlerhood and peaks between the ages of two and six, which is a critical period for developing food preferences. (Nicklaus & Monnery-Patris, 2018; Zou et al., 2019). While considered a normal part of growth, persistent food neophobia can restrict dietary variety and lead to poor eating habits. Children with high levels of food neophobia often consume fewer fruits, vegetables, and protein-rich foods, preferring sweet, salty, and calorie-dense snacks. (de Almeida et al., 2020). However, such patterns may increase the risk of both undernutrition and overnutrition, negatively affecting growth and development. (Łoboś & Januszewicz, 2019).

Parental influence plays a significant role in the development of children's eating behaviours. Parents and caregivers are typically responsible for the types of foods offered and the overall mealtime environment. Research suggests that children are more likely to accept a wide variety of foods when exposed to them early and repeatedly in a positive setting. Additionally, practices such as using pressure to eat, lack of modelling, or inconsistent feeding routines may further discourage children from trying unfamiliar foods. Kaar et al. (2016) also found that parental practices more strongly influenced children's food neophobia than demographic factors, and that a failure to introduce vegetables early was associated with increased food refusal and weight concerns.

Socioeconomic and environmental factors also contribute to food neophobia. Flight et al. (2003) reported that children from urban areas and higher socioeconomic

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backgrounds exhibited lower levels of food neophobia, likely due to greater exposure to a diverse range of foods. These children were more familiar with various cuisines and more open to trying new foods. In contrast, children with limited exposure, often from rural or lower-income households, were more hesitant to accept unfamiliar foods. While correlations between food neophobia and factors such as cultural diversity, familiarity, and socioeconomic status were low to moderate, they still point to the importance of food exposure and environment in shaping children's dietary behaviours.

In Malaysia, food neophobia among preschool-aged children remains unexplored. While some studies have focused on school-aged populations, preschoolers at a critical stage of developing food preferences have received limited attention. For example, Tan et al. (2024) reported varying levels of food neophobia among children aged 9 to 12 years, yet comparable data on younger children are scarce. Most available evidence is derived from Western populations, which may not reflect Malaysia's multicultural food environment. Hence, this study aimed to assess food neophobia, food consumption, and their associations with sociodemographic factors among preschool children in Kuantan, Pahang.

## MATERIALS AND METHODS

### Participants

A cross-sectional study was conducted among caregivers of children aged 4 to 6 years, using universal sampling. Data were collected from February to April 2025 at IIUM Educare, Kuantan branch. A total of 64 caregiver-child pairs were invited to participate. Inclusion criteria were children aged 4 to 6 years, while those with chronic illnesses or allergies were excluded.

### Sociodemographic Questionnaire

Sociodemographic information of the caregivers included age, gender, race, marital status, educational level, occupation, and household income. Additionally, data related to the preschool children were also collected, including gender, age, age at the introduction of complementary feeding, and duration of breastfeeding.

### Anthropometric Measurements

Anthropometric measurements include height, weight, and body mass index (BMI). Height was measured twice using a stadiometer and recorded in centimetres (cm), while weight was measured twice using a digital weighing scale and recorded in kilograms (kg). BMI was calculated using the formula: weight (kg) divided by height in meters squared (m²). Then, nutritional status was classified according to the World Health Organization (WHO) Child Growth Standards (2008), which categorize them into overweight, obese, stunted, wasted, and severely wasted, depending on the z-score range of growth indicators.

### Child Food Neophobia Scale (CFNS) Questionnaire

The Child Food Neophobia Scale (CFNS) questionnaire used in this study was adapted from Luo et al. (2023), (Cronbach's alpha=0.759), which consists of 10 items, probing issues on children's reluctance on unfamiliar food. Each item was rated by caregivers using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), based on their child's typical response to unfamiliar foods. The total score ranges from 10 to 70, with higher scores indicating a higher degree of food neophobia. Then, scores were categorised using percentiles representing the degree of food neophobia: < 25th percentile: low food neophobia, 25th to 75th percentile: moderate, and > 75th percentile: high.

### Food Frequency Questionnaire

The Food Frequency Questionnaire (FFQ) was adapted from Fatihah et al. (2015) and Noor Hafizah et al. (2019) to assess the frequency of children's consumption of 13 food groups. Frequency options included: 1–3 times per month, once per week, 2–4 times per week, 5–6 times per week, once daily, 2–3 times per day, more than 4 times per day, or never. To improve accuracy, participants were provided with images of standard serving sizes. Caregivers completed the questionnaire based on their child's eating frequency and number of servings consumed. Scoring was based on consumption frequency with reference to portion sizes, and the total score reflected the amount of food consumed across food groups.

### Statistical Analysis

Descriptive statistics were used to determine the prevalence of food neophobia, food consumption patterns, nutritional status, and key sociodemographic characteristics (parental education and household income). Independent t-tests and Mann–Whitney U tests were applied to compare nutritional status and food consumption by gender, following normality testing of continuous variables. Associations between food neophobia and parental education, household income, and nutritional status were examined using chi-square tests. All analyses were conducted with SPSS version 20.0,

with statistical significance set at p < 0.05.

**Ethical Approval**

This study received ethical approval from the International Islamic University Malaysia Research Ethics Committee (IREC) (IREC 2025-KAHS/DNS4).

## RESULTS

**Characteristics of Participants**

A total of 64 pairs of caregivers and their preschool children were recruited, with only 44 returned questionnaires, yielding a response rate of 68.8%.

Most caregivers were female (79.5%, n = 35), aged 30–39 years (61.4%, n = 27), had attained higher education (degree/master's/PhD) (72.7%, n = 32), and were employed (93.2%, n = 41). The mean monthly household income was RM 10,519.51 (SD ± 6,768.87), with 29.5% (n = 13) reporting an income of RM 10,000 and above (Table 1).

An equal proportion of boys and girls was recruited. The majority were aged 4 years (52.3%, n = 23), followed by 5 years (27.3%, n = 12) and 6 years (20.5%, n = 9), with a mean age of 4.68 years (SD ± 0.80). Regarding infant feeding practices, most were breastfed for more than 6 months (61.4%, n = 27) and introduced to complementary feeding after 6 months of age (79.5%, n = 35).

**Table 1**: Sociodemographic characteristics and anthropometric measurements of children (N=44)

| Characteristics | n (%) | Mean $\pm$ $SD$ |
|---|---|---|
| **Caregivers** | | |
| **Age** | | 37.25 ± 4.73 |
| 21-29 years | 2 (4.5%) | |
| 30-39 years | 27 (61.4%) | |
| 40-49 years | 14 (31.8%) | |
| 50-59 years | 1 (2.3%) | |
| **Gender** | | |
| Male | 9 (20.5% | |
| Female | 35 (79.5%) | |
| **Race** | | |
| Malay | 44 (100% | |

| Characteristics | n (%) | Mean $\pm$ $SD$ |
|---|---|---|
| **Educational level** | | |
| Degree/ Master/ PHD | 32 (72.7%) | |
| Diploma | 10 (22.7%) | |
| SPM | 2 (4.5%) | |
| **Occupation Status** | | |
| Working | 41 (93.2%) | |
| Self working | 1 (2.3%) | |
| Not working | 2 (4.5%) | |
| **Household Income** | | 10519.51 $\pm$ 6768.87 |
| RM 2501 – RM 5000 | 11 (25.0%) | |
| RM 5001 – RM 7500 | 7 (15.9%) | |
| RM 7501 – RM 10000 | 10 (22.7%) | |
| ≥ RM 10000 | 13(29.5%) | |
| *Missing | 3 (6.8% | |
| **Children** | | |
| **Characteristics** | **n (%)** | **Mean $\pm$ $SD$** |
| **Gender** | | |
| Male | 21 (47.7%) | |
| Female | 23 (52.3%) | |
| **Age of Children** | | |
| 4 years old | 23 (52.3%) | 4.68 ± 0.80 |
| 5 years old | 12 (27.3%) | |
| 6 years old | 9 (20.5%) | |
| **Breastfeeding Period** | | |
| Never | 2 (4.5%) | 3.28 ± 1.10 |
| < 6 months | 15 (34.1%) | |
| > 6 months | 27 (61.4%) | |
| **Child Weaning Age** | | |
| 4-6 months | 9 (20.5%) | 1.80 ± 0.41 |
| >6 months | 35 (79.5%) | |
| **Child's weight (kg)** | | 14.61 ± 3.72 |
| **Child's height (cm)** | | 96.12 ± 22.50 |
| **BMI ($\mathrm{kg}/m^2$)** | | 14.01 ± 4.04 |
| **Nutritional Status** | | |
| **Weight-for-age (WAZ – score)** | | -0.28 ± 0.59 |
| Normal | 40 (90.9%) | |

| | |
|---|---|
| Underweight | 3 (6.8%) |
| **Height-for-age (HAZ – score)** | -0.91 ± 0.97 |
| Normal | 33 (75.0%) |
| Stunting | 10 (22.7%) |
| **BMI-for-age (BAZ – score)** | -0.16 ± 0.87 |
| Normal | 40 (90.9%) |
| Wasting | 3 (6.8%) |

## Nutritional Status of Preschool Children

Table 1 represents the anthropometric measurements and nutritional status of 44 children. Their average height was 96.12cm (SD±22.50), while the average weight was 14.61kg (SD±3.72). The mean z-scores for weight-for-age, height-for-age, and BMI-for-age were -0.28 (SD±0.50), -0.91 (SD ±0.97) and -0.16 (SD± 0.87), respectively. According to the WHO growth chart, 6.8% (n = 3) of the children were underweight, 22.7% were stunted (n = 10), and 6.8 % (n = 3) were wasted.

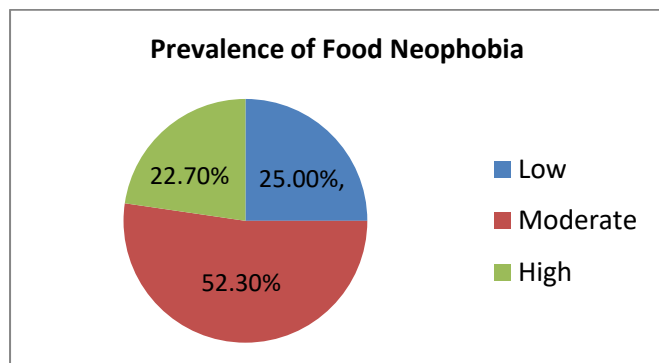## Prevalence of Food Neophobia Among Preschool Children



**Figure 1: Prevalence of Food Neophobia**

The average score for children's food neophobia is 41.09 (SD ±6.24). In this study, 25.0% displayed a low level of food neophobia (n = 11), 52.3% demonstrated a moderate level (n = 23), and 22.7% exhibited a high level of food neophobia (n = 10) (Figure 1).

## Food Consumption of Food Neophobic Children

The normality tests conducted prior to statistical analysis indicate that all types of food are not normally distributed. Therefore, the median and interquartile range were reported. Based on Table 2, intake of beverages was the highest among 13 food groups with median 845.50 gram

(IQR ± 470.55). Next, cereal and cereals product were the second highest intake with median 844.33 gram (IQR±544.08). Lastly, nuts and bread spreads reported for lowest intake with median 0 (IQR±13.30) and 5.32 gram (IQR±13.15) respectively.
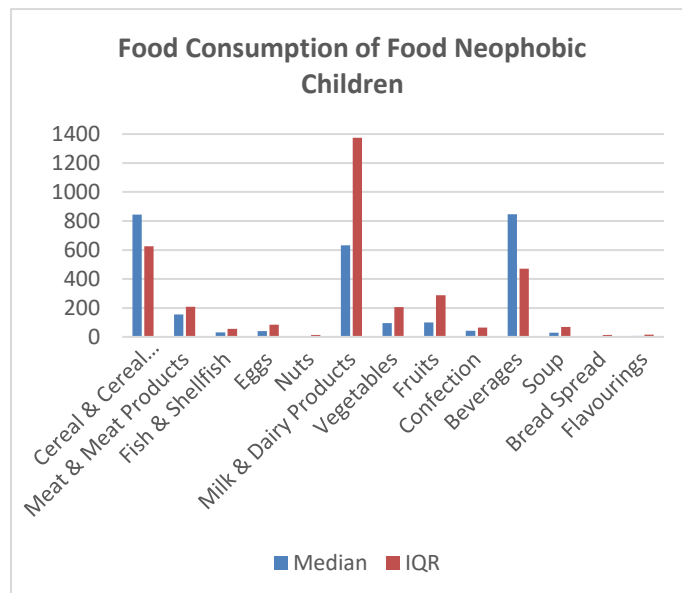


**Figure 2**: Food Consumption of Food Neophobic Children (N=44)

## Factors Influencing Food Neophobia

Tables 3 and 4 present the results using chi-square tests of independence to examine the association between sociodemographic and nutritional factors with food neophobia in preschool children. Table 2 provides the overall associations, while Table 4 offers a detailed distribution of food neophobia levels (low, moderate, high) across categories such as gender, age, parental education, household income, parental occupation, breastfeeding duration, age of complementary feeding, and nutritional status. Although some variations in distribution were observed, for instance, a higher proportion of girls were classified with high food neophobia compared to boys, none of these associations reached statistical significance (all p-values> 0.05). These findings consistently indicate that food neophobia was not significantly associated with sociodemographic or nutritional factors in this sample.

**Table 3**: Factors Influencing Food Neophobia (N=44)

| Factor | P - value |
|---|---|
| Gender | 0.150 |
| Age | 1.000 |
| Parental Education | 0.188 |
| Household Income | 0.468 |
| Occupation Status | 0.535 |
| Period of breastfeeding | 0.292 |
| Introduction to weaning | 0.629 |
| Nutritional Status | 0.631 |

## Association Between Food Neophobia and Sociodemographic Status

No significant association was found between food neophobia and any of the sociodemographic characteristics assessed (Table 4). These included gender ($X^2$(2, n = 44) = 4.010, p = 0.150), age ($X^2$ (4, n = 44) = 0.107, p = 1.000), parental education level ($X^2$ (6, n = 44) = 8.825, p = 0.188), household income ($X^2$(4, n = 44) = 3.842, p = 0.468), parental employment status ($X^2$(4, n = 44) = 4.174, p = 0.535), duration of breastfeeding ($X^2$(8, n = 44) = 9.611, p = 0.292), and weaning age ($X^2$(2, n = 44) = 0.998, p = 0.629). Across all categories, the prevalence of food neophobia did not differ significantly, indicating that neither sociodemographic characteristics nor early feeding practices were associated with the level of food neophobia among the preschool children in this sample.

## Association Between Food Neophobia and Nutritional Status

No significant association was found between food neophobia and the nutritional status of preschool children (Table 4). This included weight-for-age z-score (WAZ) ($X^2$(4, n = 43) = 1.472, p = 0.838), height-for-age z-score (HAZ) ($X^2$(8, n = 43) = 10.326, p = 0.244), and BMI-for-age z-score (BAZ) ($X^2$(6, n = 43) = 4.680, p = 0.631). Across all nutritional indicators, the prevalence of low, moderate, and high food neophobia did not differ significantly, indicating that nutritional status was not related to food neophobia levels in this sample.

## DISCUSSION

This study provides an overview of food neophobia among preschool children aged 4 to 6 years in Kuantan, Pahang, and its relationship with sociodemographic factors, nutritional status, and food consumption. Most children in this study exhibited moderate food neophobia, followed by low and high levels. Stunting was the most prevalent nutritional issue, while cereals and cereal-based products were the most frequently consumed food groups. Despite expectations, no significant associations were found between food neophobia and either sociodemographic characteristics or nutritional status.

Stunting remains a key nutritional concern in this population. The prevalence found in this study mirrors national trends reported in the National Health and Morbidity Survey (NHMS) 2016, which found stunting rates of 22.5% among Malay children under five (Logarajan et al., 2023). Previous studies have linked stunting to male gender, rural residence, poor sanitation, and limited access to play materials, while protective factors include maternal employment in the private sector and higher protein intake (Mohd Nasir et al., 2012). Evidence suggests that stunting affects both physical growth and cognitive outcomes, underscoring the importance of dietary diversity in early childhood. Regionally, Pahang's stunting prevalence is among the highest in Peninsular Malaysia (Muhammad Zulfahmi Haron et al., 2023), reflecting the need for targeted interventions addressing both undernutrition and micronutrient deficiencies, particularly vitamin D (Poh Bee Koon et al., 2023).

**Table 4**: Association Between Food Neophobia and Sociodemographic Status and Nutritional Status

| Sociodemographic | Low Food Neophobia | Moderate Food Neophobia | High Food Neophobia | n | $X^2$-statistic (df) | p-value |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Male | 7 (35.0%) | 11(55.0%) | 2 (10.0%) | 20 | 4.010 | 0.150 |
| Female | 4 (16.7%) | 12(50.0%) | 8 (33.3%) | 24 | (2) | *0.306 |
| **Age** | | | | | | |
| 4 years old | 6 (26.1%) | 12(52.2%) | 5 (21.7%) | 23 | 0.107 | 1.000 |
| 5 years old | 3 (25.0%) | 6 (50.0%) | 3 (25.0%) | 12 | (4) | |
| 6 years old | 2 (22.2%) | 5 (55.6%) | 2 (22.2%) | 9 | | |
| **Parental Education** | | | | | | |
| SPM | 1 (50.0%) | 1 (50.0%) | 0 (0.0%) | 2 | 8.825 | 0.188 |
| Diploma | 2 (20.0%) | 5 (50.0%) | 3 (30.0%) | 10 | (6) | |
| Degree/ Master | 8 (28.6%) | 16(57.1%) | 4 (14.3%) | 28 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PhD | 0 (0.0%) | 1 (25.0%) | 3 (75.0%) | 4 | | |
| **Household Income** | | | | | | |
| B40 | 3 (27.3%) | 6 (54.5%) | 2 (18.2%) | 11 | 3.842 | 0.468 |
| M40 | 4 (21.1%) | 13(68.4%) | 2 (10.5%) | 19 | (4) | |
| T20 | 3 (27.3%) | 4 (36.4%) | 4 (36.4%) | 11 | | |
| **Working Status** | | | | | | |
| Working | 9 (22.0%) | 22(53.7%) | 10(24.4%) | 41 | 4.174 | 0.535 |
| Self-working | 1(100.0%) | 0 (0.0%) | 0 (0.0%) | 1 | (4) | |
| Not Working | 1 (50.0%) | 1 (50.0%) | 0 (0.0%) | 2 | | |
| **Breastfeeding Period** | | | | | | |
| Never | 0 (0.0%) | 2(100.0%) | 0 (0.0%) | 2 | 9.611 | 0.292 |
| < 1 month | 1 (33.3%) | 0 (0.0%) | 2 (66.7%) | 3 | (8) | |
| 1 – 3 month | 0 (0.0%) | 4 (66.7%) | 2 (33.3%) | 6 | | |
| 4 – 6 month | 1 (16.7%) | 4 (66.7%) | 1 (16.7%) | 6 | | |
| > 6 month | 9 (33.3%) | 13(48.15) | 5 (18.5%) | 27 | | |
| **Child Weaning Age** | | | | | | |
| 4 – 6 month | 2 (22.2%) | 6 (66.7%) | 1 (11.1%) | 9 | 0.998 | 0.629 |
| > 6 month | 9 (25.7%) | 17(48.6%) | 9 (25.7%) | 35 | (2) | *0.162 |
| **Nutritional Status** | | | | | | |
| **WAZ Score** | | | | | | |
| Normal | 10(25.0%) | 21(52.5%) | 9 (22.5%) | 40 | 1.472 | 0.838 |
| Underweight | 1 (33.3%) | 1 (33.3%) | 1 (33.3%) | 3 | (4) | |
| **HAZ Score** | | | | | | |
| Normal | 10(30.3%) | 14(42.4%) | 9 (27.3%) | 33 | 10.326 | 0.244 |
| Stunting | 1(10.0%) | 8 (80.0%) | 1(10.0%) | 10 | (8) | |
| **BAZ Score** | | | | | | |
| Normal | 10(25.0%) | 22(55.0%) | 8 (20.0%) | 40 | 4.680 | 0.631 |
| Overweight | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 | (6) | |
| Wasting | 1 (33.3%) | 0 (0.0%) | 2 (66.7%) | 3 | | |

* Chi Square Test of Independence

*Value of Cramer's V

This finding of no significant relationship between food neophobia and nutritional status aligns with some prior research, which suggests that food neophobia may be shaped more by behavioural and psychological factors than by demographic or nutritional variables (Johnson et al., 2015). Factors such as early exposure to diverse foods, parental feeding practices, and children's sensory sensitivity have been shown to influence neophobia more directly than income or education levels. While socioeconomic status did not appear to influence neophobia in this sample, previous work indicates it can still shape overall dietary patterns and food availability.

The dietary patterns in this study indicate that highly food-neophobic children consumed fewer vegetables, fruits, and legumes, while favouring familiar items such as beverages and cereals. This trend is consistent with previous studies, which found that higher food neophobia scores are associated with narrower dietary variety and reduced preference for nutrient-dense foods (Russell & Worsley, 2008; Perry et al., 2015; Cooke et al., 2006). Such selective eating behaviours may reduce dietary quality, even if total energy intake remains unaffected, potentially compromising long-term health.

Gender differences in food consumption were notable, with females reporting higher intakes of vegetables, fruits, soups, and confectionery compared to males. This finding is consistent with research showing that girls often demonstrate greater willingness to consume nutrient-rich foods, possibly due to parental feeding practices or cultural norms (Wardle et al., 2005; Barbosa et al., 2023; Predieri et al., 2020). These differences suggest that interventions to improve dietary diversity may need to be gender-sensitive, encouraging acceptance of healthy foods, particularly among boys.

The strengths of this study include its focus on preschool-aged children, a developmental stage when food neophobia is particularly relevant, and its categorisation of neophobia levels, which improves the applicability of findings for parents and educators. However, the relatively small sample size and cross-sectional design limit the generalisability and causal interpretation of results.

Reliance on caregiver self-reports may have introduced recall or social desirability bias, and incomplete sociodemographic data further constrained analysis. Additionally, the study did not examine cultural practices, parental feeding styles, or exposure frequency, which could provide further insight into the development of food neophobia.

The findings, together with existing literature, point to a need for multifaceted interventions that promote dietary diversity, enhance parental engagement in feeding, and address environmental and socio-cultural factors. Future research should incorporate larger and more diverse samples, longitudinal designs, and a broader range of influencing factors to better understand and address food neophobia in Malaysian preschoolers.

## CONCLUSION

The findings reveal that most preschool children in Kuantan exhibit moderate levels of food neophobia, with no significant association observed between food neophobia and sociodemographic or nutritional status. However, the presence of stunting and wasting among some children highlights ongoing nutritional concerns that require attention. Caregiver factors such as education level and breastfeeding practices showed limited influence on neophobia, suggesting that behavioural and environmental factors may play a greater role. Nutritionists, dietitians, and early childhood educators should prioritize strategies that promote food acceptance, including repeated exposure to unfamiliar foods, caregiver modelling, and positive reinforcement, to encourage a more balanced diet and reduce neophobic tendencies from an early age.

## ACKNOWLEDGEMENT

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