

Prevalence and Associated Factors of Childhood Food Neophobia among Pre-school Children in Selected Pre-schools

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ABSTRACT

Background

Food neophobia is a hidden problem globally, affecting young children's nutrition, as it is a fear of eating new foods and avoiding trying unfamiliar products.

Objective

To identify the prevalence of preschool children towards childhood food neophobia and its associated factors.

Method

A cross-sectional study design was used among 186 preschool children of age 3 to 6 years. The study period was from 5th May 2021 to 2nd November 2022. Pre-schools were selected conveniently and samples were selected by systematic random sampling technique. Data was collected by structured self-administered questionnaire, which was completed by either mother or father of a child. Prevalence of food neophobia was based on the Child Food Neophobia Scale questionnaire adapted by Koziol-Kozakowska et al. Height and weight were taken to determine children's nutritional status by Body Mass index and it was computed based on percentile tables according to age and sex given by World Health Organization. Data analysis was done by STATA version 13. Associations between variables were analyzed by linear regression and multiple linear regression was done for adjusting potential confounders.

Result

The mean age of children was 4.56 years $\pm$ 1.02 years. The prevalence of childhood food neophobia was medium level (74.73%). There was a significant association between the childhood food neophobia score and janajati ethnicity after adjusting the potential confounders (p-value =0.027 at 95% CI 0.15 to 2.47) and pressure to eat of parental strategies of socio-environmental factors after adjusting potential confounders (p-value =0.004 at 95% CI 0.07 to 0.39).

Conclusion

The study showed the medium level of childhood food neophobia, which is significantly associated with Janajati ethnicity and pressure to eat of parental strategies of socio-environmental factors. This study promotes to adopt healthy food behavior and to make the parents understand the importance of child feeding practices to prevent negative attitudes towards food, leading to growth and development of the child as per developmental milestone.

KEY WORDS

Food Neophobia, Parents, Preschool Children, Prevalence

INTRODUCTION

Food neophobia is a fear of eating new foods and avoiding trying unfamiliar products.¹ An unacceptably large proportion of children are suffering as a result of inadequate diets and a failing food system.² Different studies revealed that the prevalence of food neophobia in children were 32.6% to 98.6% with less diversified and low in fruit and vegetable diet, increase saturated fat, modified carbohydrates leading more likely to develop overweight and obesity, malnutrition, anxiety, phobia and chronic diseases.^{3,4}

The study done in Poland and south India showed the prevalence of food neophobia was 87.7% and 37% respectively.^{3,5} Cognitive, environmental, genetic, parental/family food practices, child's health conditions, economical and social practices, sensory characteristics and availability of food, fear of physical and social harm, disgust, pressure to eat and food neophobic mother are the factors associated for food neophobia and lead to restriction of healthy foods.^{6,7} The study revealed that children who were exclusively breastfed for 6 months had a 75% lower probability of developing food neophobia.⁸ According to NDHS (Nepal Demographic Health and Survey) 2022, 56% of babies were exclusively breastfed, which decreased from 66% in 2016. About a third of Nepalese children aged six months to 2 years, were not given any fruits or vegetables. Two-thirds of children refuse to eat non vegetarian and dairy products showing a present of gap between prescribed food and eaten food.^{2,9}

The study aimed to identify the prevalence and associated factors of food neophobia among preschool children of selected pre-schools from parental perception.

METHODS

A quantitative analytical cross-sectional study was conducted at five pre schools of Dhulikhel municipality from May 2021 to November 2022.

Study population was parents and children of 3-6 years of age from selected pre-schools. The sample size was calculated by prevalence from the previous study $\{P(1-P)*(z/e)^3\}$.

Where,

$P =$ prevalence from previous study $= 0.87$

$e =$ margin of error $= 5\% = 0.05$

$Z = 1.96$ (critical value for 95% confidence level)

So sample size $= 174$

Adding 10% non-response, it was 191. With the exclusion of the participant who did not return the questionnaire and refuse to take part in the study, the final sample size was 186.

(1 participant refused to took part in the study and 4 participants did not returned the questionnaire)

Five Pre-schools of Dhulikhel were selected conveniently and a systematic random sampling technique was used for selection of sample. Every Kth (second) child was selected for the study purpose.

The self-administered questionnaire was developed by reviewing the literature and using a standard tool as Childhood Food Neophobia Scale (CFNS). The data collection tool was divided into three parts as demographic information and anthropometric measurements, Childhood Food Neophobia Scale (CFNS), associated factors regarding childhood food neophobia.³ Weight was measured without shoes and with minimal clothing using two weight machines a health mini scale and a selecline (electronic automatic weight scale). Height was measured without shoes using a normal tape measure with participants standing against the wall and recorded to the nearest 0.1 cm. The measurements were taken by the researcher herself, in the respective school of students during school hours. The mean weight was calculated and the Body Mass Index (BMI) was calculated and its values were interpreted according to WHO cut-offs for BMI for age and sex. The CFNS has 10 items. As per the previous research, all items were not applicable in my sample group too, so 4 items were taken off. CFNS score ranges from 6 to 24. A score of 6 to 9 is considered a low level of neophobia, a score of 10 to 18 is considered a medium level of neophobia, and a score of 19 and above is considered as a high level of neophobia or neophobic group.³ Pre-testing was done on 10% of the sample in the same setting which was excluded in the final research. The content validity of the tool was obtained by consulting with the research advisor, evaluating the tool with the help of academic experts, and reviewing the literature. The questionnaire translated into the Nepali version was validated by a Nepali teacher. Reliability was obtained by pretesting the 10% of the sample in a similar setting and its Cronbach alpha was 0.6.

A separate request letter to the parents, prepared by the school, along with an informed consent paper, was attached to the questionnaire and distributed among the parents through the eligible children. The participant's anonymity and confidentiality were maintained. Self-administered questionnaires were distributed to children, with instructions about the questionnaire. Then, questionnaires filled by parents were collect at the school, when children brought them back. The collected, questionnaires were checked for accuracy and completeness. If they were incomplete, the questionnaires were sent back to students for completion. Confidentiality was maintained by providing code numbers (1, 2, 3...) for each questionnaire. At last, the obtained information was restored systematically to prevent loss and damage.

The written consent was taken from the Institute Review Committee (IRC) of Kathmandu University School of

medical Sciences (KUSMS) (100/2021) and permission was taken from the nursing director of KUSMS. Furthermore, formal or written consent was taken from the Principals of the selected pre-schools. Informed consent from parents was obtained.

Children between 3 to 6 years, who had no allergy to food (if aware), parents who were willing to take part in the study, and parents who were literate by formal school education were included in the study. Children with chronic illness /severe illness were excluded from the study.

STATA program was used for data analysis. Categorical data were present using frequency and percentage and numerical data with means and standard deviation as descriptive statistics. Associations were analyzed by linear regression. Multiple linear regression analysis was done for adjusting potential confounders. A p-value of < 0.05 was used to establish the statistical significance at 5% level of significance.

RESULTS

A total of 186 preschool children and their parents participated in the study. The mean ages of the children were 4.56 ± 1.02 whereas the mean ages of the parents were 30.79 ± 5.24 . The majority of the participants (53.76%) were male children. Among 186 respondents, 57.53% of the participants belong to the Janajati ethnicity. The majority of the participants lived in a joint family. Less than half (40.32%) of the parents were educated to higher secondary. Among the total participants, 37.10% of the parents were homemakers. The majority (93.01%) of the children were breastfed for more than 6 months and more than half (58.60%) of the children started weaning after 6 months. The mean monthly family incomes of the families were NRs. 35731.18 ± 21405.8 (Table 1). The mean BMI of the participants was 15.03 ± 1.40 with 95.16% in a normal range of nutritional status (Table 2).

The majority of the preschool children had a moderate level of food neophobia (74.73%), whereas 23.12% of the preschool children had a high level of food neophobia. The mean score of CFNS was 16.09 ± 3.42 (Table 3).

There was only an association between Janajati ethnicity with childhood food neophobia score ($\beta=1.31$ at 95% CI, 0.15 to 2.47, $p=0.027$) after adjusting the confounders (Table 4). There was no significant association between childhood food neophobia score and BMI and nutritional status (Table 5).

There was a significant association between the "pressure to eat" sub-scale of Parental strategies of socioenvironmental factors and childhood food neophobia in bivariate and multivariate analysis ($\beta=0.20$ at 95% CI 0.06 to 0.34, $p=0.005$) and ($\beta=0.23$ at 95% CI 0.07 to 0.39, $p=0.004$) respectively (Table 6). There was no significant association between food neophobia and cognitive factors. While

Table 1. Socio-Demographic Characteristics of Participants (n=186)

Characteristics	Frequency (%)
Age of child (years), Mean(SD)	4.56 $\pm$ 1.02
Age of parents (years), Mean (SD)	30.79 $\pm$ 5.24
Gender	
Male	100 (53.76)
Female	86 (46.24)
Ethnicity	
Brahmin/Chettri	64 (34.41)
Janajati	107 (57.53)
Madheshi	2 (1.08)
Dalit	5 (2.69)
Others	8 (4.30)
Type of family	
Nuclear family	80 (43.01)
Joint family	103 (55.38)
Extended family	3 (1.61)
Educational status	
Primary level	24 (12.90)
Lower secondary level	13 (6.99)
Secondary level	36 (19.35)
Higher secondary level	75 (40.32)
Undergraduate level	23 (12.37)
Postgraduate level	15 (8.06)
Occupation	
Homemaker	69 (37.10)
Business	41 (22.04)
Service	52(27.96)
Others	24 (12.90)
Breastfeeding duration	
Never breastfeed	4 (2.15)
Breastfeed < 6months	9 (4.84)
Breastfeed > -6months	173 (93.01)
Weaning time	
Before 4 months	9 (4.84)
At 4 months	16 (8.60)
5 to 6 months	52 (27.96)
After 6 months	109 (58.60)
Family monthly income (NRs), Mean (SD)	35731.18 $\pm$ 21405.8

Table 2. Anthropometric Measurements of Participants (n=186)

Characteristics	Frequency (%)
Height (cm), Mean (SD)	102.40 $\pm$ 7.41
Weight (Kg), Mean (SD)	15.87 $\pm$ 2.99
BMI (kg/m ²), Mean (SD)	15.03 $\pm$ 1.40
Nutritional status	
Under weight	7 (3.76)
Normal	177 (95.16)
Obese	2 (1.08)

Table 3. Prevalence of Childhood Food Neophobia (n=186)

Characteristics	Frequency (%)
Low level	4 (2.15)
Medium level	139 (74.73)
High level	43 (23.12)
Child Food neophobia Score Mean (SD)	16.09 ± 3.42
High score	16 (14.52)
Low score	1 (0.54)

performing an unadjusted model for each sub-scale, there was a strong association between food texture ($\beta=0.52$ at 95% CI 0.11 to 0.93, $p=0.013$) and visual presentation of food ($\beta=0.31$ at 95% CI 0.07 to 0.55, $p=0.010$) (Table 7).

DISCUSSIONS

In the present study, childhood food neophobia was found to be moderately prevalent among pre-school children as per parent's perception. Which was supported

Table 4. Association between Food Neophobia and Sociodemographic Variables (n=186)

Characteristics	Univariate			Multivariate		
	Beta-coefficient	95% CI	P-value	Beta-coefficient	95% CI	p-value
Age child	0.04	-0.44 to 0.52	0.865	-0.16	-0.66 to 0.33	0.520
Gender						
Male	(Ref)					
Female	-0.86	-1.85 to 0.12	0.086	-0.87	-1.91 to 0.16	0.099
Age parents	-0.03	-0.13 to 0.05	0.465	-0.09	-0.20 to 0.01	0.081
Parent's Education						
Primary	(Ref)					
Lower secondary	1.13	-1.21 to 3.47	0.342	1.54	-1.37 to 3.29	0.213
Secondary	0.79	-1.00 to 2.58	0.385	0.78	-1.61 to 2.42	0.421
Higher secondary	-0.04	-1.64 to 1.55	0.956	-0.16	-2.24 to 1.11	0.858
Undergraduate	0.03	-1.95 to 2.02	0.973	-0.05	-2.72 to 1.39	0.960
Postgraduate	0.74	-1.49 to 2.98	0.515	1.14	-1.98 to 2.87	0.357
Occupation						
Home maker	(Ref)					
Business	0.75	-0.58 to 2.08	0.269	1.02	-0.46 to 2.25	0.176
Service	0.32	-0.91 to 1.57	0.604	0.80	-0.58 to 2.19	0.255
Others	-0.55	-2.15 to 1.05	0.499	-0.23	-1.96 to 1.50	0.794
Ethnicity						
Brahmin/ Chhetri	(Ref)					
Janajati	0.92	-0.13 to 1.99	0.088	1.31	0.15 to 2.47	0.027
Others	1.22	-0.70 to 3.16	0.211	0.94	-1.06 to 2.95	0.354
Family type						
Nuclear	(Ref)					
Joint	0.24	-0.76 to 1.25	0.628	0.31	-0.71 to 1.34	0.546
Family monthly income	-0.03	-0.18 to 0.10	0.592	0.02	-0.18 to 0.13	0.780
Breastfeeding						
Less than 6 months	(Ref)					
6 or more months	-0.25	-2.20 to 1.69	0.796	0.58	-3.07 to 1.90	0.642
Weaning time						
Before 4 months	(Ref)					
At 4 months	1.47	-1.32 to 4.28	0.299	1.56	-1.35 to 4.49	0.291
5 to 6 months	-0.71	3.14 to 1.71	0.560	-0.59	-3.31 to 1.78	0.556
After 6 months	-0.32	-2.65 to 2.00	0.784	-0.04	-2.54 to 2.42	0.964

*multivariate model adjusted for age of child, age of parents, gender of child, parent's education, occupation, ethnicity, family type, family monthly income, breastfeeding, and weaning time.

Table 5. Association between Food Neophobia and Anthropometric Measurement (n=186)

Characteristics	Univariate			Multivariate		
	Beta-coefficient	95% CI	P-value	Beta-coefficient	95% CI	p-value
BMI	-0.09	-0.44 to 0.26	0.613	-0.20	-0.72 to 0.31	0.431
Nutritional status						
Under weight	(Ref)					
Normal	-0.08	-2.70 to 2.54	0.952	-0.59	-3.74 to 2.55	0.710
Obese	0.35	-5.09 to 5.81	0.897	1.15	-6.77 to 9.08	0.775

*multivariate model adjusted for BMI, nutritional status, age of child, age of parents, gender of child, parent's education, occupation, ethnicity, family type, family monthly income, breastfeeding, and weaning time.

Table 6. Association between Food Neophobia and Socio-Environmental Factors (n=186)

Characteristics	Univariate			Multivariate		
	Beta-coefficient	95% CI	P-value	Beta-coefficient	95% CI	p-value
Socioenvironmental factors						
1. Parental strategies						
Pressure to eat	0.20	0.06 to 0.34	0.005	0.23	0.07 to 0.39	0.004
Repeat exposure	0.29	-0.12 to 0.71	0.172	0.18	-0.25 to 0.63	0.392
Encouragement to eat	-0.01	-0.15 to 0.12	0.811	-0.04	-0.20 to 0.12	0.620
2. Peer modeling	-0.11	-0.38 to 0.15	0.414	-0.12	-0.42 to 0.19	0.449

*multivariate model adjusted for repeat exposure, encouragement to eat and peer modeling, age of child, parent's age, gender of child, parent's education, ethnicity, family type, and family monthly income.

Table 7. Association between Food Neophobia and Cognitive Factors (n=186)

Characteristics	Univariate			Multivariate		
	Beta-coefficient	95% CI	P-value	Beta-coefficient	95% CI	p-value
Cognitive factors						
1. Disgust	0.02	-0.23 to 0.29	0.831	-0.15	-0.46 to 0.15	0.314
2. Sensory sensitivity						
a. Food texture	0.52	0.11 to 0.93	0.013	0.40	-0.13 to 0.94	0.137
b. Visual presentation	0.31	0.07 to 0.55	0.010	0.22	-0.09 to 0.54	0.160

*multivariate model adjusted for disgust, food texture, visual presentation, age of child, parent's age, gender of child, parent's education, ethnicity, family type, and family monthly income.

by the previous studies done in Australia (52.2%) and America (60.8%).^{10,11} However, the studies done among Saudi children (98.6%), Polish children (87.7%), by Cooke et al. (47.7%), Maiz and Balluerka (28.7%), Maratos and Staples (27.1%), and Cassells et al. (13%) stated the presence of a high prevalence of food neophobia in children.^{3,12-17} Furthermore, a study done by Perry et al. stated 12.8% of children have food neophobia where as a study conducted in France revealed that the children with food neophobia were 16.86%.^{17,18} However we could not identify the past studies done on the prevalence of food neophobia in Nepal. The hidden reason for the moderate prevalence of childhood food neophobia in the present study could be due to changes in the lifestyle of Nepalese people, modernization, influences in the daily dietary habits by various sources, a busy schedule of parents, easily available food as per the choice of children, and good in taste.

In present study, the mean score of the CFNS was 16.09 ± 3.42, which was similar to the study done in Australia¹⁶ and

France¹⁸, however, the study done in the United States¹⁹ and the UK¹³ stated the lower score as 3.9 ± 1.5 and 1.64 ± 0.73 **14,51** respectively where as a study done in the United states by Kaar JL et al.¹¹ and in Finland by Kahkonen et al.²⁰ revealed higher score of CFNS as 30.4 ± 8.8, 38.3 ± 13.3 respectively.^{16,18,19,13, 14,51, 11, 20,} Two of the studies done in America²¹ and Norway²² stated that the children with increase scoring in the assessment of food neophobia are directly proportional to the increased level of childhood food neophobia, which supports the present study too.^{21,22}

In present study, there was a significant association between food neophobia and Janajati ethnicity ($\beta=1.31$ at 95% CI 0.15 to 2.47, $p=0.027$) of socio-demographic variables after adjusting the confounders, which was in contrast to previous research done in the United Kingdom (UK).¹³ However, the research conducted by Cooke et al. and Johnson et al. supported present study by stating that ethnicity reflects the food practices of people residing at

different places and their way of eating and accepting is different.^{4,23} Since the ethnic people residing in different countries are different, so, in the present study, the association of food neophobia in children and Janajati ethnicity may be due to their own practice of food beliefs and cultural beliefs.

In the present study, pressure to eat was significantly associated with childhood food neophobia ($\beta=0.23$ at 95% CI 0.07 to 0.39, $p = 0.004$) after adjusting the confounders, which may be due to food practice in most of our Nepalese society by giving enough food to children as per their wish or by force, in order to maintain them healthy. This finding was supported by many previous studies conducted in Poland, UK, America, and Australia.^{1,7,11,16,24} Additionally, a study by Tan et al. reported that emotional pressure towards children to eat food and over-restriction on food consumption leads to food neophobia.¹⁹ Similarly, a study concluded as pressure to eat will decrease the happiness to eat.²⁴ In contrast, to the present finding, the study studied in the UK, Saudi Arabia, and America, revealed that childhood food neophobia has no association with pressure to eat, instead, control in food consumption helps to improve healthy eating and will increase liking of the food by children.^{11,12,19,25,26} It clarifies that giving pressure to eat will be beneficial at an early age but later in life, it will create a feeding problem in the context of choosing and intake of food as per body mechanism.²⁴

On the unadjusted regression model, sensory sensitivity (food texture and visual presentation) was a significant association with childhood food neophobia ($p= 0.013$ and $p= 0.010$ respectively), it was supported by past researches, which stated that acceptance of new food, in regular seen color and texture conditions rather than changed one, whereas a study done in Saudi Arabia revealed that sensory sensitivity was found to be positively correlated with food neophobia.^{12,15,27,28} Furthermore, in contrast to the findings of the present study, earlier work conducted by Johnson et al., Mitchell et al. Mustonen et al. depicted that the oral sensory characteristics and sensory education and behavior helps to decrease the food neophobia among children.^{4,24,29} Likewise, a study done in India and Netherlands concluded that acceptance of food with certain textures and colors was more than rejection.^{5,28} A previous study by Kähkönen et al. revealed that mother education is crucial to increase sensory based acceptance of food by the children.²⁰ Additionally Wardle et al. find out that taste exposure is necessary to decrease food neophobia.²⁵

The study used only parent's reports on measures of food neophobia in their children without complementary behavioral assessments. The findings of the study will be significance to some extent to make new programs/guidelines to overcome the nutritional imbalance in

children at an institutional level.

CONCLUSION

The present study assessed the parental response on the prevalence of childhood food neophobia along with associated factors. A medium level of food neophobia was present in a majority of pre-school children. The children with Janajati ethnicity had higher food neophobia. When children were given pressure to eat by their parents then food neophobia increases. In my knowledge, the present study is the only study on the assessment of food neophobia in children in different pre-schools of Dhulikhel municipality. The sample size of the study was small and covers few pre-schools of Dhulikhel municipality, so it cannot be generalized. To promote acceptance of new foods and variety in diets, parents need to encourage adopting healthy dietary behaviors. It is recommended to conduct educational and awareness programs in the family and school about food practices and its importance. A study can be conducted to assess food neophobia in children by food eating behavior and practice of giving food to the children in the home and school setting along with a parental report. Longitudinal and qualitative studies can be conduct to explore the associated factors of food neophobia in young children.

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