Frequency of Picky Eaters among Egyptian Preschool Children and its Association with Iron Profile

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ABSTRACT

Background: Picky eating (PE) behavior is a prevalent feeding issue among preschool children, often characterized by a limited dietary variety, food refusal, and food neophobia. It may contribute to nutritional deficiencies and negatively impact growth, particularly during the critical developmental years of early childhood. Iron deficiency, a common concern in this age group, may be associated with picky eating behavior, yet the relationship has not been extensively explored in the Egyptian pediatric population.

Objective: To determine the frequency of picky eating among Egyptian preschool children aged 1 to 5 years and to assess its association with socio-demographic characteristics, anthropometric measures, dietary habits, and iron profile parameters including serum iron, total iron-binding capacity (TIBC), and ferritin.

Methods: A cross-sectional study was conducted on 100 preschool children attending the pediatric outpatient clinic, Ain Shams University Hospitals selected by simple random method during the period from August 2024 to February 2025. Data collection included detailed history taking, anthropometric measurements, child eating behavior questionnaire (CEBQ), and laboratory analysis of iron profile parameters. Statistical analysis was performed using SPSS, and significance was considered at $p < 0.05$.

Results : Among the studied children, 53% were identified as picky eaters. Significant differences were observed between picky and non-picky groups in terms of age, height, weight, BMI, and several iron-related biomarkers. Picky eaters had significantly lower values in serum iron (median 46 vs. 62 µg/dL, $p = 0.013$), ferritin (median 13 vs. 19 ng/mL, $p = 0.005$).

Conclusions : Picky eating behavior is common among Egyptian preschool children and is significantly associated with poorer growth metrics and lower iron profile. These findings underscore the need for early screening and nutritional intervention strategies in this population to prevent potential long-term developmental consequences.

Keywords : Picky eating, Preschool children, Iron profile, Ferritin, Anthropometry, Feeding behavior, Egypt.

INTRODUCTION

Picky eating (PE), often described as food selectivity or fussy eating, is a prevalent concern among parents of young children, especially in the preschool age group. Characterized by the rejection of both familiar and unfamiliar foods, limited dietary variety, strong food preferences, and reluctance to try new foods, PE represents a behavioral pattern that may lead to unbalanced nutritional intake ***(Samuel et al. 2018).*** The reported prevalence of picky eating among preschoolers varies widely, ranging from 14% to 50%, depending on the definitions and assessment tools used ***(Machado et al. 2016).*** Although it is frequently considered a transient behavior in childhood, evidence suggests that persistent picky eating may extend into adolescence and adulthood, posing risks for nutritional deficiencies, suboptimal growth, and long-term health outcomes ***(Samuel et al. 2018; Yaqob Qazaryan and Kazim Karim 2019; Al-Beltagi et al. 2025).***

While PE is often dismissed as a behavioral phase, emerging literature highlights its potential link with impaired growth and micronutrient deficiencies, particularly involving iron, and other essential elements ***(Taylor et al. 2019).*** In young children, especially those under five years of age, these deficiencies are of significant concern due to their increased metabolic demands and rapid developmental processes ***(Yaqob Qazaryan and Kazim Karim 2019; Theola and Andriastuti 2025).*** Iron is critical for cognitive and psychomotor development, and its deficiency during early childhood can lead to adverse neurodevelopmental and behavioral outcomes ***(Chao et al. 2021; Theola and Andriastuti 2025).*** Yet, the specific relationship between picky eating behaviors and iron profile parameters remains underexplored ***(Chao et al. 2021),*** especially in lower-middle-income countries like Egypt, where both PE and iron deficiency anemia are public health concerns.

The aim of this study was to determine the frequency of picky eating behavior among Egyptian preschool children aged 1 to 5 years, and to evaluate its association with anthropometric measurements and iron profile.

Ethical consideration:

1. Our study was approved by the ethical committee of Faculty of Medicine, Ain Shams University, Cairo, Egypt (FMASU MS 238/2025) and conducted in accordance with Helsinki standards 2013.
2. An informed written consent was obtained from all parents of the participating children.
3. The results and data of the study were confidential, and the patient's caregivers had the right to keep it.
4. The patient's caregivers had the right to refuse or withdraw from the study at any time.
5. The authors received no financial support for the research, authorship, and/or publication of this article.
6. No conflict of interest regarding study or publications.

Sample size calculation:

Based on previous research the prevalence of picky eaters in children was 59% *(Xue et al. 2015)***.**

The sample size was calculated according to the following equation:

$N= Z^2 p(1-p)/d^2$ *(Daniel and Cross 1999)*

N=desired sample size

Z= The statistic corresponding to the level of confidence (1.960)

P= Population proportion (assumed as 50% or 0.5)

d= Precision (d is considered 0.1 to produce good precision and smaller error of estimate).

It is estimated that sample size of 100 children were needed to detect an expected prevalence of PE of 50,4% (Xue et al. 2015).

Inclusion criteria:

1. Preschool children.
2. Aged between 1 and 5 years old.
3. Both sexes were included.
4. Accompanied by a parent or caregiver who could provide detailed feeding and behavioral history.

Exclusion criteria: any child with one or more of the following

1. Chronic medical or mental conditions that could interfere with normal feeding or growth, such as failure to thrive, developmental delays, gastroesophageal reflux disease), esophagitis, and food allergies.
2. Children on long-term medications known to affect appetite or iron metabolism.

Study design:

This was a cross-sectional study conducted on 100 preschool children attending the pediatric outpatient clinic, Ain Shams University Hospitals selected by simple random method during the period from August 2024 to February 2025.

Study procedures:

All participants were subjected to the following:

History:

A structured interview was conducted with caregivers using a predesigned questionnaire to collect:

- Personal data: name, age, sex, address
- Family and socioeconomic status: based on the Fahmi and El-Sherbini scale ***(Fahmy SI 1983).***
- Detailed dietetic history: Type and duration of breastfeeding, weaning method (sudden vs gradual), eating environment (alone/family/mixed), frequency of fast-food consumption, primary caregiver identity.

Examination:

General: including

1. Vital signs including heart rate, respiratory rate, blood pressure and temperature.
2. Signs of undernutrition and anemia e.g.: pallor, nail and hair changes, edema.
3. Anthropometric measurements including weight, height, and body mass index were taken by two trained personnel.

Systemic:

i. Complete chest, heart and abdominal examination were done

Behavioral Assessment Tools:

Child Eating Behavior Questionnaire (CEBQ): validated Arabic version used to evaluate the following dimensions ***(Ali and Ahmed 2022):***

It is a questionnaire administered by parents to assess children's eating behaviors, consisting of eight scales totaling 35 items

1. food responsiveness (4 items)
2. food enjoyment (4 items)
3. emotional overeating (4 items)
4. desire to drink (3 items)
5. satiety responsiveness (5 items)
6. slowness to eat (4 items)

7. emotional trivialization (4 items)
8. fussiness (7 items).

Parents rated their children's behaviors on a 3-point scale (1 = Never, 2 = Sometimes, 3 = Always), where a child with score 2 or 3 in the fussiness scale considered as picky eater.

Laboratory Investigations:

Venous blood samples were withdrawn from all children with the most trained nurses under complete aseptic conditions and collected for measurements of:

1. Serum iron (Colorimetric assay)
2. Total iron binding capacity (TIBC) (Colorimetric assay)
3. Serum ferritin (Electrochemiluminescence immunoassay).

Statistical analysis:

Analysis is to be performed using SPSS for windows v20.0, Data to be presented in terms of range, mean and standard deviation (for numeric parametric variables); range, median and inter-quartile range (for numeric non-parametric variables); or number and percentage (for categorical variables). Difference between two independent groups is to be analyzed using independent student's t-test as well as the mean difference and its 95% CI (for numeric parametric variables); or chi-squared test as well as the risk ratio and its 95% CI (for categorical variables). Binary logistic regression analysis is to be performed for estimating the association between good/poor response and the measured variables ROC curves are to be constructed for estimating the validity of measured variables as predictors of good or poor response validity is to be presented in terms of sensitivity, specificity, positive and negative predictive values and their corresponding 95% Cis significance level is set at 0.05.

RESULTS

1) Demographic Data and Anthropometric Measurements

Table (1): Demographic data and anthropometric measurements of the studied patients:

		Total no. = 100
Sex, N (%)	**Females**	**49 (49%)**
	Males	**51 (51%)**
Age (years)	**Mean ± SD**	**3.1 ± 1.32**
	Range	**1 – 5**
Height (cm)	**Mean ± SD**	**92.85 ± 10.72**
	Range	**71 – 114**
Weight (Kg)	**Mean ± SD**	**13.78 ± 3.71**
	Range	**8 – 24.0**
BMI (Kg/m^2)	**Mean ± SD**	**15.73 ± 1.76**
	Range	**12 – 20.2**
W/H	**Median (IQR)**	**-0.17 (-1.42 – 0.76)**
	Range	**-4.02 – 2.86**

BMI, body mass index; W/H, weight for height

This table shows the demographic data of the studied group.

Table (2): Laboratory results of the studied patients:

		Total no. = 100
Serum Iron (ug/dl)	Median (IQR)	52.5 (37 – 90)
	Range	16 – 150
TIBC (ug/dl)	Mean ± SD	290.84 ± 36.35
	Range	210 – 380
Ferritin (ng/ml)	Median (IQR)	16.15 (9.75 – 23.6)
	Range	5.6 – 88.1

TIBC, transferrin iron binding capacity

This table shows the results of iron profile of the studied group.

Table (3): Descriptive data for details of CEBQ questionnaire of the studied patients:

	Never (1)	Sometimes (2)	Always (3)
Enjoyment of food	57(57.0%)	37(37.0%)	6(6.0%)
Emotional overeating	72(72.0%)	25(25.0%)	3(3.0%)
Satiety responsiveness	62(62.0%)	30(30.0%)	8(8.0%)
Slowness in eating	4(4.0%)	35(35.0%)	61(61.0%)
Desire to drink	19(19.0%)	26(26.0%)	55(55.0%)
Food fussiness	22(22.0%)	29(29.0%)	49(49.0%)
Emotional undereating	14(14.0%)	26(26.0%)	60(60.0%)
Food responsiveness	58(58.6%)	40(40.4%)	1(1.0%)

This table shows the results of the CEBQ questionnaire of the studied patients.

Table (4): Percentage of picky and non-picky among the studied patients

Groups	No. = 100
Non picky	47 (47%)
Picky	53 (53%)

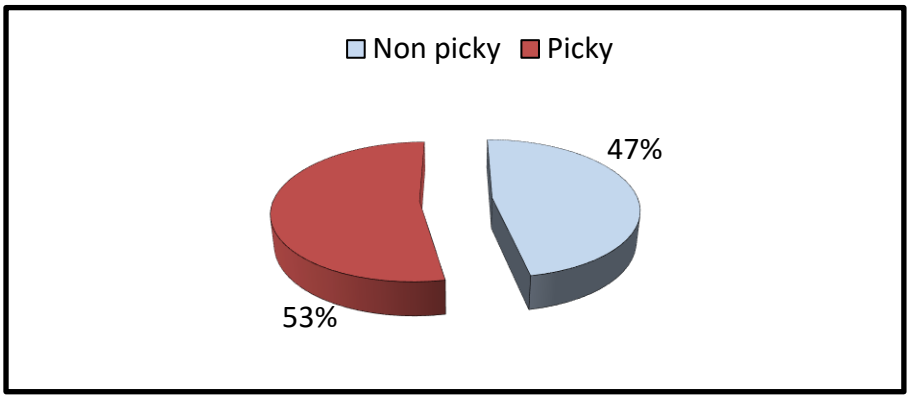

Figure (1): Percentage of picky and non-picky among the studied patients

Out of 100 participants, 53 (53%) were identified as picky eaters based on CEBQ scores, showing that picky eating is a highly prevalent behavior in this population as shown in table (5) and figure (1).

Table (5): Comparison between picky and non-picky patients regarding demographic data and anthropometric measurements:

		Non picky	Picky	Test value	P-value	Sig.
		No. = 47	No. = 53			
Sex	Females	23 (48.9%)	26 (49.1%)	0.000*	0.990	NS
	Males	24 (51.1%)	27 (50.9%)			
Age (years)	Mean ± SD	3.52 ± 1.42	2.74 ± 1.11	3.083•	0.003	HS
	Range	1 – 5	1 – 5			
Height (cm)	Mean ± SD	96.03 ± 11.46	90.02 ± 9.22	2.902•	0.005	HS
	Range	72.5 – 114	71 – 112			
Weight (KG)	Mean ± SD	15.30 ± 4.11	12.43 ± 2.72	4.158•	0.000	HS
	Range	8.3 – 24	8 – 21.5			
BMI (KG/M)	Mean ± SD	16.3 ± 1.73	15.22 ± 1.64	3.223•	0.002	HS
	Range	12.4 – 20.2	12 – 19.7			
	Range	-3.36 – 2.86	-4.02 – 2.16			

***: Chi-square test; •: Independent t-test; ≠: Mann-Whitney test**

This table shows a highly significant difference between picky and non-picky eaters regarding age, height, weight, and BMI.

Table (6): Comparison between picky and non-picky patients regarding laboratory investigations of the studied patients

		Non picky	Picky	Test value	P-value	Sig.
		No. = 47	No. = 53			
Serum Iron (ug/dI)	Median (IQR)	62 (45 – 101)	46 (35 – 73)	-2.497≠	0.013	S
	Range	20 – 150	16 – 131			
TIBC (ug/dI)	Mean ± SD	299.73 ± 34.78	282.94 ± 36.19	2.358•	0.020	S
	Range	230 – 380	210 – 366			
Ferritin (ng/ml)	Median (IQR)	19 (13 – 26.1)	13 (8.6 – 20.8)	-2.829≠	0.005	HS
	Range	7.5 – 88.1	5.6 – 59.1			

•: Independent t-test; ≠: Mann-Whitney test

Picky eaters had significantly lower serum iron (p = 0.013), ferritin (p = 0.005), compared to non-picky peers. TIBC was also significantly lower (p = 0.02) as seen in table (6), and figure (2,3) respectively.

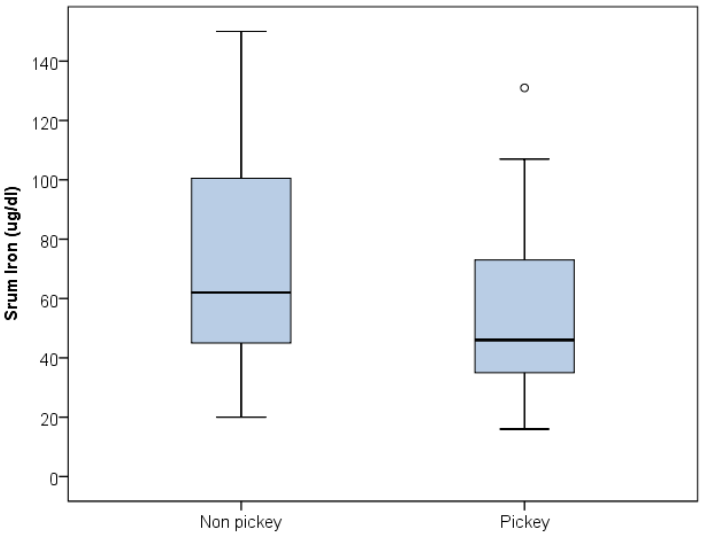

Figure 2

Comparison between picky and non-picky patients regarding serum iron of the studied patients.

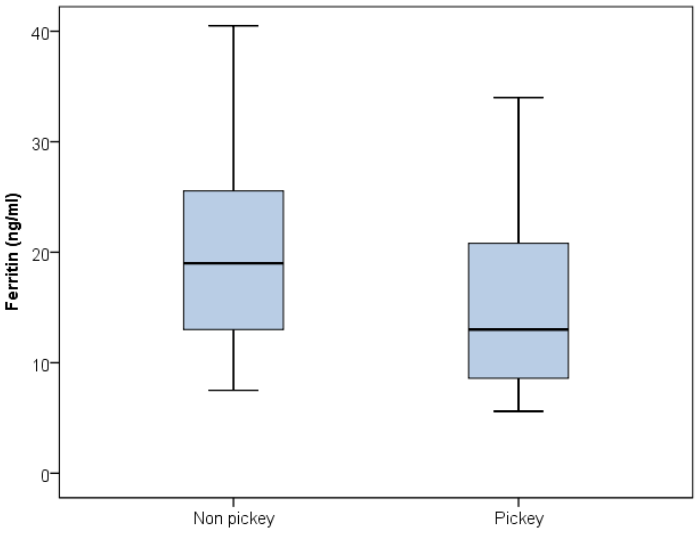

Figure 3

Comparison between picky and non-picky patients regarding serum ferritin level of the studied patients.

Table (7): Receiver operating characteristic curve (ROC) for the studied laboratory parameters as predictors to differentiate between picky and non-picky children

		pecificity	PPV	NPV
Serum Iron (ug/dI)		).57	65.5	62.2
TIBC (ug/dI)		7.23	77.8	56.2
Ferritin (ng/ml)		2.34	69.8	59.6

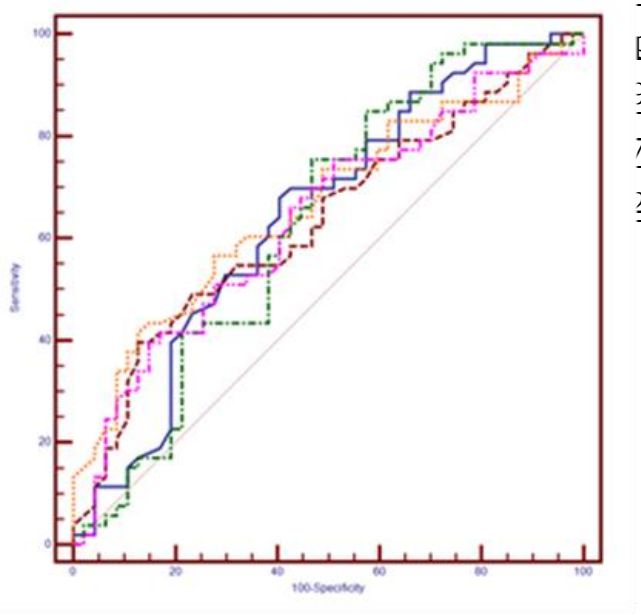

Figure (4): Receiver operating characteristic curve (ROC) for the studied laboratory parameters as predictors to differentiate between picky and non-picky children.

Cut-off values for serum iron (≤ 55 µg/dL), TIBC (≤ 263 µg/dL), ferritin (≤ 14 ng/mL), showed moderate sensitivity and specificity for identifying picky eaters as shown in table (7), and figure (4).

DISCUSSION

Picky eating has been associated with a range of adverse outcomes, including but not limited to poor growth and inadequate nutrient intake. It is imperative to acknowledge the significance of these concerns, particularly during the preschool years. This period is characterized as a sensitive phase for both physical growth and cognitive development, with optimal nutrition playing a pivotal role ***(Theola and Andriastuti 2025).***

Globally, studies on picky eating have predominantly focused on western and high-income Asian countries. However, there is a notable paucity of region-specific data from Middle Eastern and North African countries, including Egypt. In these settings, where micronutrient deficiencies especially iron remain prevalent among young children, the impact of picky eating may be even more pronounced. Moreover, the interaction between, child eating behaviors, and nutritional status in this population remains poorly understood ***(Chao et al. 2021).***

Our study revealed mild to moderate iron deficiency among the study population. In accordance Alkazemi et al discussed nutrient intake insufficiency due to persistent food refusal but did not measure biomarkers directly

(Alkazemi et al. 2025). Our biomarker-based approach gives more biochemical depth, indicating physiological consequences of picky eating not always captured through dietary recall methods alone.

The present study documented that 53% of the subjects were classified as picky eaters., whereas 47% were non-picky. Picky eaters had significantly poorer anthropometric profiles compared to non-picky children. This aligns with a study done in Zagazig, Egypt where 50.4% was reported ***(Ali and Ahmed 2022)*** and is slightly higher than Hanapi and his collegues where 31.8% was reported in Malaysia ***(Hanapi et al. 2022).*** Alkazemi et al. ***(Alkazemi et al. 2025)*** reported a 35.6% prevalence in Kuwait, while Mok et al. ***(Mok et al. 2022)*** observed 38% among older children in Kuala Lumpur. The wide range (31–53%) reflects variation in age groups, assessment tools, and regional feeding cultures. Uwaezuoke et al. ***(Uwaezuoke et al. 2016)*** reported a much lower 17.5% in South-East Nigeria highlighting differences due to diagnostic criteria and sociocultural factors.

Our results showed that picky eaters were younger and significantly more underweight. Hanapi and his collegues ***(Hanapi et al. 2022)*** found similar patterns, with lower weight-for-age, height-for-age, and BMI-for-age z-scores among picky children. Similarly, Alkazemi et al. found reduced height-for-age Z-scores and BMI-for-Age z-scores in picky children from Kuwait, reinforcing the idea that pickiness affects growth ***(Alkazemi et al. 2025)***.

While our study found a significant association between picky eating and lower anthropometric measures particularly weight, height, and BMI some previous studies have reported no such association, including Ali et al. ***(Ali and Ahmed 2022)*** and Mok et al. ***(Mok et al. 2022)***. This discrepancy could stem from differences in age groups, as older children may compensate for selective eating through increased calorie intake from energy-dense but nutrient-poor foods. Additionally, socioeconomic context and cultural feeding practices may play a role; urban Egyptian children, for instance, may have limited access to nutrient-rich alternatives compared to children in more affluent or food-secure environments.

Another explanation may relate to variability in assessment tools studies using less sensitive or non-validated measures may underestimate the behavioral or nutritional impact of pickiness. Similarly, the definition of "picky eating" varies across studies, leading to inconsistent classification and outcome reporting. Moreover, caregiver perception bias and differing sample sizes or clinical settings (e.g., hospital-based vs. community-based) may further explain divergent results. These factors underscore the importance of using standardized definitions, comprehensive methodologies, and context-specific analysis in future research

In the current study when comparing picky and non-picky eaters, significant differences were observed in iron-related parameters. Indicating a notable micronutrient deficiency in this group. This is consistent with previous study that reported low serum iron (76.59 µg/dl) among picky eaters ***(Saati and Adly 2023)***.

The current study results revealed that ROC analysis indicated that serum ferritin (cut-off ≤14 ng/mL, AUC = 0.664), serum iron (≤55 µg/dL, AUC = 0.645), had moderate predictive value for distinguishing picky eaters, with sensitivities ranging from 39.6% to 75.5% and specificities from 53.1% to 87.2%.

Limitations of the Study

Despite its valuable findings, this study is not without limitations. Firstly, the sample size of 100 children, though manageable and focused, may limit the generalizability of the findings to broader populations. Secondly, the study relied in part on parent-reported questionnaires, which are subject to recall bias and social desirability bias, particularly when assessing feeding behavior and food preferences. The cross-sectional design limits causal inference. While associations between picky eating and nutritional deficits are evident, the directionality cannot be firmly establisara hamed eleselyd. Additionally, dietary intake was not measured quantitatively, which could have complemented the biochemical assessments and clarified specific nutrient deficits beyond iron. Lastly, the study was conducted in urban clinical settings, which may not reflect the experiences of children in rural or low-resource environments**.**

Recommendations of the study

Children presenting with persistent picky eating behaviors should undergo nutritional screening, including serum ferritin testing. This could facilitate early identification of subclinical deficiencies that may otherwise go unnoticed.

Conclusion

The study reveals a high prevalence of picky eating (53%) among Egyptian preschoolers and provides clear evidence that this behavior is associated with poor growth parameters and significant micronutrient deficiencies, particularly in iron. Picky eaters exhibited notably lower BMI; ferritin levels concentrations compared to non-picky eaters.

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Review And Editing: Yasmin Gamal El Gendy, Bassma Abdelnasser Abdelhaleem, Sara Hamed Elesely

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