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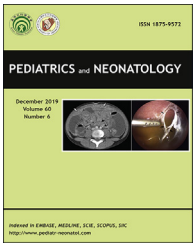

Original Article

Parental concern of feeding difficulty predicts poor growth status in their child

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Key Words
feeding difficulties;
growth faltering;
parental concerns

Background: Parents often express concerns about feeding difficulties in their child. We hypothesized that these parental concerns were associated with adverse growth status in early childhood. We aimed to determine the prevalence of such concerns and whether these concerns were associated with adverse growth status in early childhood.
Methods: We performed a cross-sectional study among healthy children aged 12–36 months attending three well-baby clinics in three urban areas in Malaysia and Singapore between December 2016 and February 2017. Parents were interviewed for concerns about their child's feeding and presence of behavioral and organic red flags for feeding difficulties. We defined growth faltering as weight-for-age < 3rd centile and short stature as height-for-age < 3rd centile according to World Health Organization Growth Standards.
Results: Of the 303 children studied (boys = 160, 52.8%; mean [± SD] chronological age at interview 21.3 [± 4.0] months), 13% (n = 38/292) had growth faltering and 19.5% (n = 50/256) had short stature. Overall, 36.3% (n = 110) of parents expressed concerns about their child's feeding behavior. Sixty-eight percent (n = 206) of parents reported presence of at least one behavioral and 18.5% (n = 56) had at least one organic red flag for feeding difficulties, respectively. 9.9% (n = 30) had both behavioral and organic red flags for feeding difficulties. Growth faltering was significantly associated with parental concern about feeding (odds ratio [OR] 3.049, $p < 0.001$), food refusal (OR 4.047, $p < 0.001$) and presence of at least one organic red flag (OR 2.625, $p = 0.012$).

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Conclusion: We found that parental concerns about their child's feeding to be common. Presence of parental concern, food refusal in the child and presence of organic red flags for feeding difficulties are associated growth faltering in early childhood.

1. Introduction

Parents of young children worldwide often express concern about feeding difficulties in their child.[1] Up to 50% of mothers reported that at least one of their children ate poorly or was a 'picky eater'.[2,3] Although most children labeled as picky eaters eventually improved with time, a subset persists in their picky eating behaviors with some lasting longer than two years.[4]

A major hurdle in estimating the true prevalence of picky eating or feeding difficulty is the lack of an internationally accepted definition.[5] 'Picky eating' has been defined inconsistently in different countries and cultures.[1,5,6] It is generally viewed by medical professionals as a mild form of sensory disturbance and connotes a transient problem requiring attention at primary care level.[1] Feeding difficulty or disorder, on the other hand, indicates a more severe problem which may result in substantial adverse health, nutritional, or emotional consequences.[1,6,7]

Due to the confusing nomenclature, there is at present a wide range of estimates for the prevalence of picky eating.[5] In addition, there is little consensus on an appropriate assessment measure. In general, parents of picky eaters are more likely to report that their children consume a small quantity of food, require food prepared in a specific way, express strong likes and dislikes for food, or throw tantrums when denied food.[4]

Recently, Kerzner et al.[8] proposed a practical approach to assess a child with feeding difficulty. They proposed a list of symptoms and signs suggestive of organic and behavioral feeding difficulty. If present, these symptoms and signs should prompt medical attention and investigation.[1,7] Examples of organic red flags for feeding difficulties include dysphagia, pain when eating, vomiting, recurrent respiratory infections and growth failure.[1] Organic red flags for feeding difficulties may suggest underlying disorders such as esophagitis and food allergy.[1] Behavioral red flags include behavior of both the parent and the child. They include food fixation, abrupt cessation of feeding after a trigger event and anticipatory gagging by the child, and forceful feeding by the parents.[1,8,9] The presence of behavioral red flags suggest that the affected child may need more intensive and prompt support.[1]

The presence of both behavioral and organic red flags for feeding difficulties has been associated with growth failure.[1,9] We hypothesized that parental concerns about their child's feeding would predict the growth status of the child affected. We aimed to ascertain the prevalence of such concerns and whether these concerns were associated with adverse growth status in the affected child in primary care settings in two Southeast Asian countries.

2. Materials and methods

This was a cross-sectional study conducted in three well-baby clinics in Malaysia and Singapore. The participating centers were University Malaya Medical Center (UMMC), Kuala Lumpur; Lam Wah Ee Hospital (LWEH), Penang, Malaysia; and National University Hospital, Singapore (NUHS). All are well-baby clinics providing health and growth monitoring and vaccination. Parents or care-providers were interviewed using a structured questionnaire (Appendix 1). The current study was approved by the institutional ethics committee of the respective centers (UMMC: 2016-815-4141; NUHS: 2015/00306).

2.1. Participants

The participants were healthy children aged 12—36 months attending child health clinics, as well as their parents or guardians. The main reasons for clinic attendance were developmental assessment, health screening, and vaccination. The present study was conducted between December 2016 and February 2017. Trained interviewers approached the parents or guardians, who were asked whether they were the main care-provider or they were aware of the eating habits of the child even though they were not the main or sole care provider. We adopted a universal sampling method where parents of all eligible children were invited to participate.

2.2. Exclusion criteria

Exclusion criteria were known presence of chronic illness which may have potential impact on the child's appetite or eating habits, such as anorexia, gastroesophageal reflux disease, esophagitis, food allergies or intolerance. The parents were asked about presence of any medical issues. Medical records of the infants were screened for confirmation if necessary.

2.3. Data collection

The following data were collected: (a) basic socio-demographic and clinical data, birth history; (b) anthropometric measurements and growth status according to WHO growth standards; (c) presence of parental feeding concerns; and (d) current feeding behavior.

2.4. Anthropometric measurements

Growth parameters were taken at the same setting of the interview. Height was recorded to the nearest 1 mm using a

fixed stadiometer. For children younger than 2 years of age, supine length was recorded with an infantometer. Children were weighed wearing minimum clothing and, in the case of infants, without a diaper. World Health Organization (WHO) Growth Standards charts for boys and girls were used for the present study.

2.5. Definitions

Prematurity was defined as gestational age at birth <37 weeks while term was defined as gestational age at birth of ≥37 weeks. Low birth weight was defined as body weight at birth of <2.50 kg, while appropriate birth weight was defined as birth weight ≥2.50 kg. Growth faltering was defined as current weight-for-age < 3rd percentile while short stature was defined as height-for-age < 3rd percentile.

2.6. Parental concerns and child's feeding behavior

Parents were asked whether they were concerned about their child's feeding/eating, and a series of questions on the eating behavior of their child using a standard questionnaire modified after Kerzner et al. (Appendix 1).[1,10] These questions were divided into the following categories: behavioral red flag, and organic red flags for feeding difficulties.[1] Behavioral red flags were being extremely selective in variety, eating a limited amount of food, refusal to eat, difficulty in progressing to age-appropriate food, abrupt cessation of feeding after a triggering event, and fear and anxiety towards food.[1] Organic red flags for feeding difficulties were vomiting during feeding, respiratory symptoms such as coughing, gagging when feeding, and difficulty in swallowing.[1,10,11]

2.7. Statistics

Statistical analysis was performed using SPSS v21 software. Descriptive analyses were reported using frequency distribution (%) and average ± standard deviation (SD). Chi-square and Fisher Exact test were used for categorical data. Mantel–Haenszel test was used to estimate odds-ratio (OR) and 95% confidence interval (95% CI). A p-value of <0.05 was interpreted as statistical significance.

3. Results

During the study period, the parents of 303 children aged between 12 and 36 months who fulfilled the study criteria were interviewed (Table 1). There were slightly more boys (n = 160, 52.8%) than girls.

3.1. Children's characteristics and growth parameters

The majority of the children were born at term (81.5%; n = 247/298) and had normal birth weight (between 2.50 and 4.00 kg; 76.6%; n = 232/299). Mean (±standard deviation) chronological age at interview was 21.3 (±4.0) months. Most of the children (85.6%; n = 250/292) had a weight-for-age between 3rd and 97th centile. Similarly, 78.9% (n = 202/256) had a height-for-age between 3rd and 97th centile (Table 1). The majority (87.7%; n = 266/303) of children had no medical conditions. All of the remaining 37 children had minor medical conditions (functional constipation [n = 10], mild wheeze [n = 4], minor developmental issues [n = 4], and others [n = 19]).

Table 1 Demographic and clinical features of 303 young children surveyed for symptoms suggestive of feeding difficulties.

Characteristics	N = 303	%
Gender, Males	160	52.8%
Ethnicity: Chinese	121	39.9%
Malays	131	43.2%
Indians	29	9.6%
Other ethnic groups	22	7.3%
Birth weight: <1.00 kg	4	1.3%
1.00–1.49 kg	10	3.3%
1.50–1.99 kg	6	2.0%
2.00–2.49 kg	33	10.9%
2.50–4.00 kg	232	76.6%
>4.00 kg	14	4.6%
Information unavailable	4	–
Gestational age (weeks)		
<28	1	0.3%
28–32	12	4.0%
32–35	12	4.0%
35–37	26	8.6%
37–42	247	81.5%
>42	0	0%
Information unavailable	5	–
Chronological age at interview (months)		
Mean (±S.D.)	21.3 (±4.0)	
12–17	114	37.6%
18–23	72	23.8%
24–29	74	24.4%
30–35	35	11.6%
36	8	2.6%
Weight for-age-percentile at interview[a]		
<3rd centile (growth faltering)	38	13.0%
3rd – 97th centile	250	85.6%
>97th centile	4	1.4%
Information unavailable	11	–
Length/height at interview (in centile)[a]		
<3rd centile (short stature)	50	19.5%
3rd – 97th centile	202	78.9%
>97th centile	4	1.6%
Information unavailable	47	–
Associated medical conditions		
None	266	87.7%
Gastrointestinal & liver	10	
Respiratory	4	
Development	4	
Others	19	

[a] Weight and height centile according to World Health Organization growth charts for children (birth to 5 years).

Table 2 Feeding behavior, behavioral and organic red flags for feeding difficulties of feeding difficulties reported by parents and care-providers.

Symptoms	N = 303	%
Parents reported concern about child's eating behavior		
Yes	110	36.3%
No	193	63.7%
Age at which child's eating behavior first became a concern		
<4 months	16	14.5%
4–6 months	3	2.7%
6–12 months	50	45.5%
13–18 months	29	26.4%
19–24 months	9	8.2%
>24 months	3	2.7%
No parental concern	193	–
Behavioral red flags of feeding difficulty		
No	162	53.4%
Yes	141	46.5%
Nature of behavioral red flags (n = 141)		
Eats an extremely limited variety of food	81	39.3%
Eats a little amount of food	74	35.9%
Refusal to eat	40	19.4%
Difficulty progressing to age-appropriate food	14	6.8%
Fear and anxiety towards food	3	1.5%
Abrupt cessation of feeding after a triggering event	0	0%
Number of behavioral symptoms in the same child (n = 141)		
One	81	47.6%
Two	44	27.6%
Three	13	12.1%
Four	3	9.7%
Five or six	0	0%
Organic red flags for feeding difficulties of feeding difficulty		
No	247	81.5%
Yes	56	18.5%
Nature of organic red flags for feeding difficulties (n = 56)		
Vomiting	26	46.4%
Coughing	25	44.6%
Gagging when feeding	16	28.6%
Difficulty in swallowing	6	10.7%
Number of organic red flags for feeding difficulties (n = 56)		
One	40	71.4%
Two	14	25.0%
Three	1	1.7%
Four	1	1.7%
Both organic and behavioral red flags	30	9.9%
Organic red flags for feeding difficulties only	26	8.6%
Behavioral red flags only	111	36.6%
No organic or behavioral red flags	136	44.9%

3.2. Parental concerns of child's feeding

Approximately one-third (36.3%; n = 110/303) of parents expressed concern about their child's feeding (Table 2). Of these, 45.5% (n = 50/110) reported the symptoms first appeared between six to 12 months of age, followed by between 13 and 18 months (26.4%; n = 29/110).

3.3. Behavioral red flags

A total of 68.0% (n = 206/303) parents reported the presence of at least one symptom of behavioral feeding difficulty (Table 2). The two most common behavioral concerns were related to limited variety of food and quantity. Only a minority were reported to have more severe symptoms such

as difficulty in progressing to age-appropriate food (4.5%; n = 14/206) and fear/anxiety towards food (1.0%; n = 3/206). No children had abrupt cessation of feeding after a triggering event.

3.4. Organic red flags for feeding difficulties

Organic red flags for feeding difficulties were reported in 18.5% (n = 56/303) of children. Most (71.4%, n = 40/56) had only one organic red flag. The two most common organic symptoms were vomiting (n = 26) and coughing upon feeding (n = 25). Gagging when feeding and difficulty in swallowing were uncommon.

3.5. Parental concerns and behavioral and organic red flags for feeding difficulties

36.9% and 57.1% of parents who expressed no concern about feeding behavior in their child reported behavioral and organic symptoms of feeding difficulty, respectively (Table 3).

3.6. Growth status and parental concern

There was a strong association between parental concern of feeding and growth status. Children whose parents expressed concern about feeding difficulty were significantly more likely to have growth faltering (60.5% vs. 33.5%; OR 3.049; 95% CI 1.513–6.144; p < 0.001; Table 4), but not short stature (44.0% vs. 37.4%; OR 1.136; 95% CI 0.704–2.461; p = 0.241).

Of the 38 children who had growth faltering, the parents of 15 children (39.5%) did not express any feeding concerns. On subsequent administering of the feeding questionnaire for these 15 children, three had both organic and behavioral red flags, four had organic red flags for feeding difficulties and one had a behavioral red flag.

3.7. Growth status and behavioral and organic red flags for feeding difficulties

Children who had at least one organic red flag were more likely to have growth faltering as compared to children who had no organic red flags for feeding difficulties (OR 2.685, 95% CI 1.243–5.543; p = 0.011; Table 4). Further analysis of individual behavioral or organic red flags for feeding difficulties shows a strong association between parental report of food refusal and growth faltering. Children who were reported to have food refusal were more likely to have growth faltering as compared to children who ate normally (31.2% vs. 10.2%; OR 4.047, 95% 1.827–8.965; p < 0.001; Table 4). No significant associations between behavioral red flags and child's weight (OR 1.636, 95% CI 0.821–3.260; p = 0.109; Table 4) were noted.

There was no apparent association between presence of organic red flags for feeding difficulties (OR 1.659, 95% CI 0.802–3.433; p = 0.122; Table 4) or behavioral red flags (OR 0.923, 95% CI 0.497–1713; p = 0.462; Table 4) and short stature. Paradoxically, children who had a limited variety of food were less likely to have short stature compared to those did not (OR 0.378, 95% 0.161–0.887; p = 0.014).

4. Discussion

When parents highlight their child's feeding concerns to healthcare professionals, it may be challenging to differentiate children who have true feeding difficulties from those who do not.[1]

The present study, conducted in three well-baby clinics in Malaysia and Singapore, confirmed that parents' concern about their child's feeding is common. More than one in three parents (36.3%) expressed concern about their child's feeding, which is consistent with studies around the world.[1,2] However, there was also a discrepancy between parents' self-reported feeding concern and the presence of behavioral and organic red flags for feeding difficulty. Using a standardized questionnaire, behavioral red flags and organic red flags for feeding difficulties were present in 46.5% and 18.5% of children, respectively. It is likely that parents may not have recognized behavioral/organic red flags for feeding difficulties and therefore did not report these as feeding concerns. This highlights the fact that relying on parental report of feeding concern alone may be insufficient to detect feeding issues.

We observed that there was a strong association between parental concern regarding feeding issues of their child and growth faltering. Parents are twice as likely to be concerned with their child's feeding if there is poor weight than parents whose child is growing well. Among the various feeding symptoms, parental report of food refusal was strongly associated with poor body weight. Growth faltering was four times more common in children who had food refusal than those who did not.

The effect of picky eating on growth status is not consistent. Mascola et al.[12] reported no adverse effects on growth at 11 years among children who were perceived by parents to be picky eaters.[4] However, in a study among Chinese school-aged children, Xue et al.[13] observed that

Table 3 Parental concerns about feeding behavior and presence of red flags of feeding difficulty.

		Parental concern of feeding behavior	
		Yes (n = 110)	No (n = 193)
Presence of at least one behavioral red flag	Yes (n = 141)	89 (63.1%)	52 (36.9%)
	No	21	141
Presence of at least one organic red flag for feeding difficulties	Yes (n = 5 6)	24 (42.9%)	32 (57.1%)
	No	86	161

Table 4 Association of growth faltering and short stature.

Symptoms and risk factors	Growth faltering		Odds ratio	95% CI	P-value
	Yes (n = 38)	No (n = 254)			
Parental expressed concern (n = 108)	23	85	3.049	1.513–6.144	0.001
Behavioral red flags (n = 138)	22	116	1.636	0.821–3.260	0.109
Organic red flags for feeding difficulties (n = 55)	13	42	2.625	1.243–5.543	0.012
Presence of at least one behavioral and one organic red flag for feeding difficulties (n = 29)	7	22	2.381	0.940–6.032	0.064
Behavioral red flags					
Eats limited variety of food (n = 80)	9	71	0.800	0.361–1.774	0.369
Eats limited amount of food (n = 73)	14	59	1.928	0.938–3.963	0.057
Refusal to eat (n = 38)	12	26	4.047	1.827–8.965	0.001
Difficulty in progressing to age-appropriate food (n = 14)	3	11	1.894	0.503–7.123	0.269
Fear and anxiety towards food (n = 3)	1	2	3.405	0.301–38.494	0.343
Organic red flags for feeding difficulties					
Vomiting (n = 26)	4	22	1.241	0.403–3.820	0.447
Coughing (n = 25)	5	20	1.773	0.623–5.043	0.211
Gagging (n = 16)	4	12	2.373	0.724–7.777	0.140
Difficulty in swallowing (n = 5)	1	4	1.689	0.184–15.527	0.505
Symptoms and risk factors	Short Stature		Odds ratio	95% CI	P-value
	Yes (n = 50)	No (n = 206)			
Parent expressed concern (n = 99)	22	77	1.316	0.704–2.461	0.241
Behavioral red flags (n = 127)	24	103	0.923	0.497–1.713	0.462
Organic red flags for feeding difficulties (n = 49)	13	36	1.659	0.802–3.433	0.122
Presence of at least one behavioral and one organic red flag for feeding difficulties (n = 25)	6	19	1.342	0.506–3.558	0.357
Behavioral red flags					
Eats limited variety of food (n = 69)	7	62	0.378	0.161–0.887	0.014
Eats limited amount of food (n = 66)	12	54	0.889	0.433–1.825	0.451
Refusal to eat (n = 31)	7	24	1.234	0.499–3.052	0.401
Difficulty in progressing to age-appropriate food (n = 14)	5	9	2.432	0.778–7.606	0.114
Fear and anxiety towards food (n = 3)	0	3	0.000	–	0.520
Organic red flags for feeding difficulties					
Vomiting (n = 23)	3	20	0.594	0.169–2.082	0.305
Coughing (n = 24)	6	18	1.424	0.534–3.797	0.317
Gagging (n = 13)	4	9	1.903	0.562–6.452	0.234
Difficulty in swallowing (n = 5)	0	5	0.000	–	0.334

Note: Growth faltering was defined weight-for-age < 3rd centile; body weight was available in 292 children; short stature was defined as height-for-age < 3rd centile; height was available in 256 children.

picky eating behavior had a negative effect on physical growth, resulting from a significantly lower dietary intake of energy, protein, minerals and vitamins.[14]

We also observed that children who had at least one organic red flag were 1.6 times more likely to have growth faltering. However, when compared to those with no red flags, children who have at least one behavioral red flag were not more likely to have growth faltering. Paradoxically, having both behavioral and organic red flags for feeding difficulties was not a risk factor of growth faltering or short stature. Wright et al. also observed that children who had eating problems gained less weight over the first two years but eating a limited variety of food alone was not associated with poor growth.[10]

We also observed that the rates of prematurity and low birth weight were unexpectedly high in the present study. One possible explanation is that one of the participating centers was led by a paediatrician/neonatologist. The potential impact of this unexpectedly high rate of prematurity is on the rate of reported feeding difficulty.

However, it is noteworthy that parents of a significant proportion of children (15 of 38 children; 39.5%) who had growth faltering did not express any feeding concerns. The most likely explanation is that causes of growth faltering are complex and multifactorial. Adverse feeding practice is one possible cause. Another possible explanation includes similar family history of small stature among parents or elder siblings. Clinicians using this questionnaire should be aware of this potential pitfall. Serial measurement of growth parameters and comparison with standard growth chart remains the gold standard of diagnosing adverse growth in young children.

There are limitations to the present study. Firstly, energy intake of the children was not estimated. Thus, we were unable to ascertain whether the presence of feeding difficulty adversely affected energy intake, leading to growth faltering. Carruth et al.[2] showed that both picky and non-picky eaters met or exceeded age-appropriate energy recommendations,[3] but Xue et al.[13] showed that picky eating behavior adversely affected the intake of energy and protein.[14] Thus, it is important to assess dietary intake, including the energy intake.

Finally, we did not document parental anxiety and coping mechanisms adopted by parents. Many authors have shown that parents adopt various strategies. Thus, we were unable to determine whether certain coping strategies adopted by parents to enhance the energy and nutrients intake of their child had any effect on growth.

5. Conclusions

In conclusion, there is a complex relationship between picky eating behavior and growth faltering. Although some parents under-reported significant symptoms of feeding difficulty in their child because of misperception, their concern regarding feeding difficulty in their child should be taken seriously as there was a strong association between parental feeding concern and poor growth. The proposed approach by Kerzner et al.[8] is a useful screening tool in identifying children with feeding concerns but will not detect all children with growth faltering. We recommend that as part of routine care and anticipatory guidance for children, parents should be asked about their child's feeding, with specific questions regarding the presence of behavioral and organic red flags for feeding difficulties, regardless of whether parents express feeding concerns or not. Children who are reported to have food refusal or organic red flags for feeding difficulties are at risk of having growth faltering and should be referred for appropriate diagnosis and early intervention. We also recommend regular monitoring of the growth status of every child attending child health clinic at each clinic visit.

Key messages

Parental concern on feeding difficulty in their child is a common phenomenon. However, it is uncertain whether presence of such concerns can reliably predict the growth status of their child. Our findings showed that one in three parents (36.3%) expressed concern about their child's feeding behavior. We found a strong association between parental concern of feeding difficulty and poor growth status of their child. Other predictors of growth faltering were food refusal and presence of organic red flags. We recommend that parental concerns should be taken seriously and growth status of the child concerned be determined.

Conflict of interest statement

None of the authors has any personal or funding interests to be declared.

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Contributor statement

MMA and WSL conceived the idea of this research. MMA, WSL, LCCL designed the questionnaire. TL and HKC gave critical input to the questionnaire. CWT, AGSL, BSS and TL collected data. KSC, SYW and WSL performed initial data analysis. WSL, MMA and LCCL analysed the data. WSL wrote the first draft. All authors agreed to the final draft of the manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pedneo.2019.04.004.