

THE ASSOCIATION OF NUTRITIONAL STATUS AND FUNCTIONAL CONSTIPATION IN THAI CHILDREN

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Abstract

Pediatric functional constipation is a common issue in general clinics, with malnutrition steadily increasing over the past five years. This study investigated the prevalence of pediatric functional constipation and its relationship with nutritional status in Thai children aged 6 months to 5 years. Among 4,359 patients attending the Well Child Clinic at Suranaree University of Technology Hospital between December 1, 2020, and January 31, 2022, 191 (4.4%) were diagnosed with functional constipation. Of these, 52.9% had normal nutritional status, and 47.1% were malnourished, with 64.4% of the malnourished group being overweight and 13.3% obese. While no significant difference in nutritional status was observed between groups, early introduction of complementary foods before six months was associated with a higher risk of malnutrition ($p = 0.02$). Inadequate consumption of complementary foods and vegetables was linked to decreased stool frequency ($p = 0.03$ and 0.029), and insufficient vegetable intake correlated with painful defecation and hard stools ($p = 0.018$). Children with low vegetable and complementary food intake were more likely to experience severe constipation symptoms, emphasizing the importance of dietary factors in managing pediatric functional constipation.

Keywords: Functional Constipation; Malnutrition; Nutritional Status; Obesity

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Introduction

Functional constipation in children is a common condition in medical practice. In Thailand, a survey in 2014 found that the prevalence of constipation in children aged 4 months to 5 years was 18.3% (Osatakul and Puetpaiboon, 2014), while reports in other countries found that the prevalence ranged from 0.5% to 32.2% (van den Berg *et al.*, 2006; Koppen *et al.*, 2016). This difference in data occurred due to different periods of study, data collections and definitions of constipation. The pathophysiology of constipation is caused by many mechanisms and involves many factors such as genetics, family upbringing, eating habits, activities in daily life nutritional status (Peeters *et al.*, 2011; Driessen *et al.*, 2013; Olaru *et al.*, 2016). Studies have also found that constipation in children is related to stressful life events such as being bullied at school and violence in the family (Philips *et al.*, 2015; van den Berg *et al.*, 2006). In addition, it has been reported that constipation causes children to have inferior quality of life when compared with normal children without symptoms (Vriesman *et al.*, 2019). Although they receive continuous treatment, constipation can occur among them as adults as many as 15 to 30 percent (Bongers *et al.*, 2010; Voskuil *et al.*, 2006).

Malnutrition is still a worldwide problem and is likely to increase (Black *et al.*, 2013; Ng *et al.*, 2014). A survey of the situation in Thailand during 2015-2016 by the National Statistical Office found the prevalence of malnutrition among children under 5 years of age, 8.2% were obese, 5.4% were thin, and 10.5% were short (NHISO, 2016). In foreign countries, studies have found that children's nutritional status and growth are related to abdominal pain without physical disease in many forms (Pawlowska *et al.*, 2018). It has been reported that constipation in children is not associated with obesity (Costa *et al.*, 2011; Koppen *et al.*, 2016; Misra, 2016). Meanwhile, studies have found that constipation is more common in children with malnutrition compared to normal children no matter they are obese or thin (Jennings *et al.*, 2010; Pashankar and Loening-Baucke, 2005; Phatak and Pashankar, 2014; Yuwanita *et al.*, 2018). It has also been found that when constipation is treated continuously, it will result in better growth of children (Chao *et al.*, 2008).

Method

The clinical information, including demographic data, weight, height, past medical history, risk factors, complementary feeding, and family history,

were obtained from children aged 6 months to 5 years who visited the well-child clinic and showed signs and symptoms compatible with the diagnostic criteria for functional constipation according to the ROME IV. All children who had their diagnoses confirmed by a pediatrician and continue to receive treatment and follow-up care. The patients were divided into two groups: Group 1, the normal nutrition group, refers to those with a weight for height (W/H) between -2 standard deviations (SD) and +2 SD. Group 2, the malnutrition group, includes those with a W/H less than -2 SD or greater than +2 SD according to the standard Thai growth chart. Subgroups were classified within the group of patients with W/H above +2 SD. Patients with W/H between +2 SD and +3 SD were considered overweight, while those with W/H above +3 SD were classified as obesity. Parents completed a questionnaire regarding their child's eating and drinking history, using picture references from the Child Health Record Book (Pink Book) to assess portions of food, fruit, and milk intake. Data were entered into our Research Electronic Program at Suranaree University of Technology Hospital from December 2020 to January 2022. We obtained institutional review board approval for this study.

Descriptive statistics were used to summarize patients demographics and risk factors, including mean, standard error (SE), and interquartile range for continuous variables. The normal nutrition versus malnutrition group were compared. The Fisher exact test was employed to compare categorical variables between groups and to evaluate their associations. The Wilcoxon rank-sum test was utilized to compare continuous variables between groups. A P value of less than 0.05 was considered statistically significant. The statistical analysis was carried out using SPSS version 21.0.

Results

During the entire data collection period of 1 year and 3 months, a total of 4,359 individual children visited the well-child clinic, excluding repeat visits, were investigated for history and physically examined by medical personnel and pediatricians. It was found that a total of 191 cases met the criteria to be diagnosed with functional constipation according to the ROME IV criteria, accounting for 4.4 percent. Table 1 show that 101 (52.9%) of the children diagnosed with functional constipation were normal nutritional status and 90 (41.2%) were malnourished. The most common malnutrition conditions were overweight and underweight,

Table 1. Shows basic information of subjects diagnosed with functional constipation

Variable	191 volunteers
Male	97 (50.8%)
Age (year)	2.7 (± 1.2)
The length of time symptoms was present before being diagnosed (month)	6 (3, 13.5)
Parents suspect their child has constipation (case)	182 (95%)
Has ever used laxatives (case)	99 (51.8%)
Stunting [#] (case)	6 (3.1%)
Nutritional status [‡] (case)	
- Obesity	12 (6.3%)
- Overweight	58 (30.4%)
- Normal	101 (52.9%)
- Underweight	20 (10.5%)

[#]Stunting evaluated from height according to weight for age

[‡]Evaluated from weight for height

Table 2. Factors affecting nutritional status in children diagnosed with functional constipation

Related Factors	Volunteer (%)	Nutrition Status (% weight for height)		p
		Normal Nutrition (%) (n = 136)	Malnutrition (%) (n = 55)	
Gender				
Male	97 (50.8)	75 (55.1)	22 (40.0)	0.058
Age				
Over 1 year	167 (87.4)	121 (89.0)	46 (83.6)	0.314
Duration of constipation symptoms				
Less than 1 year	101 (52.9)	72 (52.9)	29 (52.7)	0.267
1-2 years	63 (33.0)	48 (35.3)	15 (27.3)	
Longer than 2 years	27 (14.1)	13 (11.8)	11 (20.0)	
Gestational age at birth				
< 37 weeks	25 (13.1)	20 (14.7)	5 (9.1)	0.297
≥37 weeks	166 (86.9)	116 (85.3)	50 (90.9)	
History of milk consumption in infant under six months of age				
Formular fed	15 (7.9)	11 (8.1)	4 (7.3)	0.847
Exclusive breastfed	85 (44.5)	62 (45.6)	23 (41.8)	
Mixed	91 (47.6)	63 (46.3)	28 (50.9)	
Initiating complementary food				
Before 6 months	36 (18.8)	20 (14.7)	16 (29.1)	0.021*
After 6 months	155 (81.2)	116 (85.3)	39 (70.9)	
History of first-degree related constipation				
No	130 (68.1)	94 (69.1)	36 (65.5)	0.623
Yes	61 (31.9)	42 (30.9)	19 (34.5)	
Complementary feeding per day				
Complete 3 meals	64 (36.6)	48 (37.8)	16 (33.3)	0.585
Fewer than 3 meals	111 (63.4)	79 (62.2)	32 (66.7)	
Daily vegetable consumption				
Never	89 (50.9)	63 (49.6)	26 (54.2)	0.590
At least once daily	86 (49.1)	64 (50.4)	22 (45.8)	
Daily fruit consumption				
Never	74 (42.3)	55 (43.3)	19 (39.6)	0.656
At least once daily	101 (57.7)	72 (56.7)	29 (60.4)	
*There is a statistically significant difference (p < 0.05)				

*There is a statistically significant difference ($p < 0.05$)

accounting for 30.4% and 9.9%, respectively. It was also found that 95% of parents correctly understood that their child had chronic constipation before being diagnosed by medical personnel. The volunteers had been constipated for an average of 6 months before being diagnosed and 51.8% had used laxatives before.

From Table 2, it was found that the basic factors such as gender, age which symptoms occurred, and duration of constipation in the two

groups of volunteers were not different. However, it was found that the group of volunteers who started eating food before 6 months of age had significantly less malnutrition than the group who started complementary food after 6 months of age ($p < 0.05$), accounting for 29.1% and 14.7% respectively.

The relationship analysis in Table 3 found that children over 1 year of age who were diagnosed with functional constipation had eating behaviors

Table 3. Eating habits and symptoms of functional constipation in children older than 1 year

Symptoms	Complete three meals of complementary feeding per day		<i>p</i>	Daily vegetable consumption		<i>p</i>	Daily fruit consumption		<i>p</i>
	No (%)	Yes (%)		No (%)	Yes (%)		No (%)	Yes (%)	
2 or fewer defecations per week									
No	21 (35)	55 (51.3)	0.030*	30 (35.3)	44 (53.7)	0.029*	28 (40)	47 (48.6)	0.295
Yes	39 (65)	52 (48.7)		55 (64.7)	38 (46.3)		42 (60)	50 (51.4)	
History of retentive posturing or excessive volitional stool retention									
No	23 (38.3)	53 (49.5)	0.180	35 (41.2)	41 (50.0)	0.263	35 (50)	41 (42.3)	0.330
Yes	37 (61.9)	54 (50.5)		50 (58.8)	41 (50.0)		35 (50)	56 (57.7)	
History of painful or hard bowel movements									
No	4 (6.7)	18 (16.8)	0.055	5 (5.9)	15 (18.3)	0.018*	9 (12.9)	13 (13.4)	0.889
Yes	56 (93.3)	89 (83.2)		80 (94.1)	67 (81.7)		61 (87.1)	84 (86.7)	
Presence of a large fecal mass in the rectum									
No	6 (10.0)	7 (6.5)	0.277	8 (9.4)	6 (7.3)	0.627	5 (7.1)	8 (8.2)	0.604
Yes	54 (90.0)	100 (93.5)		77 (90.6)	76 (92.7)		65 (92.9)	89 (91.8)	
History of large-diameter stools									
No	35 (58.3)	73 (68.2)	0.156	52 (61.2)	56 (68.3)	0.273	44 (62.9)	65 (67)	0.568
Yes	25 (41.7)	33 (31.8)		33 (38.8)	26 (31.7)		26 (37.1)	32 (33)	
History of fecal incontinence									
No	36 (60.0)	61 (57.0)	0.736	48 (56.5)	49 (59.8)	0.878	9 (12.9)	12 (12.4)	0.889
Yes	24 (40.0)	46 (43.0)		37 (43.6)	33 (40.2)		61 (87.1)	85 (87.6)	
*There is a statistically significant difference (<i>p</i> < 0.05)									

*There is a statistically significant difference ($p < 0.05$)

related to constipation according to the ROME IV diagnostic criteria, that is, children who ate less than 3 meals per day and did not eat vegetables each day had significantly fewer defecation 2 times per week than children who ate 3 meals according to their age and ate vegetable at least 1 meal per day ($p = 0.03$ and 0.029 , respectively). It was also found that children who ate at least one serving of vegetables per day had significantly less hard or painful defecation than children who did not eat vegetables. ($p = 0.018$).

Discussion

The results of the study found that the prevalence of functional constipation in children from 6 months to 5 years of age was 4.4%, which is consistent with previous reports (Koppen *et al.*, 2018; Osatakul and Puetpaiboon, 2014; van den Berg *et al.*, 2006) and most children had normal nutritional status when they were diagnosed with constipation, which is in accordance with previous research studies (Costa *et al.*, 2011). Three key factors influencing nutritional status are genetic, environmental, and behavioral. To minimize genetic bias, children with maternal pregnancy complications or significant parental medical history were excluded. Environmental factors are considered less impactful due to the participants' young age and predominantly home-based lifestyle, making dietary behavior the primary focus. From studying factors related to nutritional status by comparing two groups of children with different nutritional status, it was found that in the group of children with

malnutrition, histories of starting of complementary food according to their age before the age of 6 months were found more than those in the group of children with normal nutrition. In general, among healthy infants, starting complementary food according to age appropriately often provides more energy and nutrients than eating milk only. Therefore, it is possible that children in this group receive energy from food according to their age faster than those in another group which could bring about overnutrition. However, previous studies have found that functional constipation in children and adolescents is associated with malnutrition among those underweight and overweight (Chao *et al.*, 2008; Misra, 2016; Yuwanita *et al.*, 2018). However, in this research study, data were collected only for a certain period of time. Thus, if there will be further studies by tracking the weight of children in both groups for a long term, the results of the study may be more obvious.

Analysis of the relationship between symptoms of functional constipation, as defined by the ROME IV criteria, and eating behavior in children aged 1 to 5 years found that children who eat fewer than three meals per day and those who do not consume vegetables exhibit decreased frequency of defecation. Additionally, children who do not eat vegetables are more likely to experience pain during defecation and have hard stools. This suggests that inadequate food intake and insufficient fiber consumption may contribute to functional constipation. Previous research studies and the 2022 clinical practice guidelines for the treatment of functional constipation in Thai children indicate that increasing fiber intake

may not significantly impact the treatment of constipation or may only affect certain types of chronic constipation. However, the results of this study support the notion that consuming an adequate amount of food according to age and including vegetables in meals may serve as a guideline for preventing functional constipation in children.

The limitations of this research study include a limited number of volunteers and a restricted data collection period. Data were only collected at the time of the initial diagnosis of functional constipation. Long-term data collection or follow-up until successful treatment of constipation may reveal more evident changes in the children's growth and provide additional information on various factors that may affect treatment.

Conclusions

Children with low vegetable and complementary food intake were more likely to experience severe constipation symptoms, emphasizing the critical role of dietary factors in managing pediatric functional constipation. This study underscores the potential benefits of adequate food and vegetable consumption in preventing functional constipation in children. Despite certain limitations, these findings suggest that proper nutritional practices should be prioritized in the management and prevention of pediatric functional constipation. Further research with a larger sample size and extended follow-up is recommended to validate these results and investigate additional contributing factors.

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