The effect of mother's and infant nutrition on functional constipation in children between 1-4 months

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ABSTRACT

Objective: Constipation is the infrequent and painful passage of hardened stools, occurring less than three times a week, often accompanied by excessive straining and discomfort. Functional constipation is the most important gastrointestinal complaint of childhood. Limited literature explores the correlation between functional constipation and infant nutrition. Our study aims to investigate the association between maternal and infant nutrition and functional constipation among infants between 1-4 months.

Method: The research is a cross-sectional study. Two groups involved cases from the pediatric clinic, which presented complaints of constipation within the age range of 1 to 4 months, and the control group, which consisted of individuals without any reported constipation issues. Mothers participating in the study completed a questionnaire comprising two sections: one focusing on patient assessment and the mother's diet.

Results: The study encompassed seventy-five cases reporting constipation issues, with the control group comprising thirty cases. Functional constipation was most observed at 78 days of age. Children experiencing functional constipation exhibited lower weight and height values, demonstrating statistical significance. Additionally, 94.7% of infants facing defecation challenges had a history of meconium within the first 24 hours of birth. Factors such as alterations in familial defecation patterns and a history of constipation among first-degree relatives were notably higher in the case group. The incidence of functional constipation was notably elevated by cesarean section and those not receiving breast milk. Furthermore, maternal dietary habits indicated higher consumption of milk, fruit juice, yogurt, vegetables, and legumes among the healthy group, with statistically significant disparities observed.

Conclusion: Functional constipation in infants can associated with cesarean section, a high number of siblings, low parental education levels, familial history of altered defecation patterns, and constipation among first-degree relatives; additionally, formula feeding, maternal consumption of low-fiber foods, and inadequate fluid intake by the mother.

Keywords: functional constipation, infant, mother, nutrition

INTRODUCTION

Functional constipation ranks among childhood's most prevalent gastrointestinal issues, representing a significant portion of cases seen in pediatric gastroenterology outpatient clinics.[1] When characterizing constipation, the consistency and water content of stools are emphasized over the frequency of defecation. It is typically described as infrequent bowel movements, occurring less than three times a week, accompanied by hard and painful stool passage.[1-3] The prevalence of childhood constipation ranges from 0.7% to 29.6%, comprising 3-5% of visits to general pediatric clinics and up to 25% of consultations in pediatric gastroenterology.[3,4]

Constipation poses a significant concern for families, particularly during the initial months of a child's life, when parents closely monitor their offspring's defecation patterns.[5] Although constipation may signal serious organic disorders, especially in newborns, approximately 90% of cases in older children lack an organic explanation, falling under the category of "functional constipation".[6]

Research exploring the link between constipation and nutrition indicates lower constipation rates in breastfed infants compared to those not breastfed, particularly when supplementary feeding is introduced early.[7,8] Additionally, studies reveal that constipated children consume less fiber and macronutrients than their non-constipated counterparts, underscoring the importance of adequate fiber and fluid intake for soft stools.[9]

Furthermore, maternal nutrition significantly influences functional constipation in breastfed infants. However, limited studies suggest a correlation between maternal and infant constipation.[10,11]

Our study aimed to investigate the impact of maternal and infant nutrition on functional constipation among children aged 1-4 months.

MATERIAL AND METHODS

Our research comprises a single-center cross-sectional survey conducted from January 2015 to August 2016. The survey included cases of patients admitted to pediatric outpatient clinics and diagnosed with functional constipation. The study commenced following approval from the local ethics committee (dated and decision number provided). Mothers who consented to participate were required to provide both verbal and written informed consent, after which questionnaires were administered via face-to-face interviews.

Given that the patients fell within the age range of 1 to 4 months, diagnostic criteria for functional constipation were based on the number of defecations and stool hardness criteria outlined in the Rome III criteria. Criteria such as fecal incontinence, excessive fecal continence, and large stools that could obstruct the toilet, more appropriate for older children, were not utilized. Exclusion criteria encompassed infants with sacral dimples, sacral agenesis, perianal fistula, abnormal positioning of the anus, perianal scarring, hypothyroidism, cow's milk protein allergy, as well as alarm symptoms like fever, vomiting, and bloody stools.

Seventy-five cases aged 1-4 months diagnosed with functional constipation, and 30 healthy infants as the control group were enrolled in the study. Both groups underwent a questionnaire comprising two sections: patient evaluation and diet evaluation. The patient assessment segment encompassed inquiries concerning age, gender, weight, height, mode of delivery, birth weight, gestational week, time of first meconium passage, dietary habits, weight gain, defecation frequency, stool characteristics, medication usage, parental education level, family history of constipation, family income, number of siblings, parental age, and employment status. The second part focused on maternal nutrition.

Statistical analyses were conducted using the "SPSS for Windows 20.0" software package. Measurement variables were presented as standard deviation (SD) or median (interquartile range), while categorical variables were expressed as numbers and percentages (%). Comparative analyses of qualitative variables between paired groups utilized the Chi-square and Fisher's Exact test. Student's t-test was employed for normally distributed parameters, whereas the Mann-Whitney U Test was applied for non-normally distributed parameters. When comparing multiple groups, chi-square, one-way ANOVA, and Kruskal-Wallis Analysis were used for different scenarios. A significance level of $p<0.05$ was set for data analysis.

RESULTS

Our study comprised a total of 105 cases, with 75 experiencing functional constipation (Group 1) and 30 healthy individuals (Group 2). No significant difference was observed between the two groups in terms of mean age and gender distribution (Group 1: 78±28 days, Group 2: 82±30 days).

Upon anthropometric evaluation, patients with functional constipation exhibited significantly lower height and weight measurements (p=0.012, p=0.041) than the control group (Table 1). None of the children in the healthy group fell below the 3rd percentile.

Analysis of the mode of delivery revealed a significantly higher prevalence of normal deliveries in the control group, with no notable difference observed in birth weight. Most cases experiencing functional constipation were delivered at term, with no significant difference observed compared to the control group (Table 1).

Regarding meconium passage history, 71 cases (94.7%) with functional constipation had a history of meconium expulsion within the first 24 hours after birth. Only two cases exhibited delayed meconium passage beyond 48 hours without any identifiable organic cause. All control group patients had a

history of meconium passage within the initial 24 hours, with no significant difference observed between the two groups (Table 1).

The proportions of breast milk and/or formula feeding were similar in both groups, with no statistically significant difference noted (Table 1).

Among cases experiencing functional constipation, 33.3% reported hard stool patterns.

In the control group, there were no parents without formal education, and mothers had a higher mean age. The proportion of non-working mothers was comparable between both groups, and there was no disparity in family income levels. However, the mean number of children was notably higher in the group with functional constipation exhibiting a significant difference upon comparison. Instances of hard defecation patterns among

siblings, parents, and relatives were markedly more prevalent in cases with functional constipation (Table 2).

Regarding medication usage for defecation problems among patients with difficulty, it was found that 20 patients (26.7%) received no treatment. In contrast, one patient (1.3%) was prescribed probiotics, 20 patients (26.7%) were administered laxatives and suppositories, 16 patients (21.3%) consumed herbal drinks (with fennel tea being the most common), and 18 patients (24%) received combined treatments (often involving laxatives, suppositories, and herbal drinks).

The maternal nutrition section of the survey noted that mothers in both groups consumed at least one liter of water daily, with significantly higher fruit juice and milk consumption observed in the control group (Table 3). None of the mothers reported alcohol consumption. In addition, the smoking ratio was similar between the groups. Analysis of solid food consumption revealed

Table 1. Anthropometric examination, nutritional status, and defecation history of babies aged 1-4 months			
Parameter	Group 1 (Difficult defecation)	Group 2 (Control)	*P*
Age (days) (mean±SD)	78±28	82±30	0.460
Gender, n (%)			
Male	38 (50.7%)	18 (60%)	0.560
Female	37 (49.3%)	12 (40%)	
Weight (kg)	5.3±1	5.8±1	**0.012***
Height (cm)	56.6±4.7	5.1±4.1	**0.041***
Mode of Delivery, n (%)			
NSVD (%)	22 (29.3%)	20 (66.6%)	**0.001***
C/S (%)	53 (70.7%)	10 (33.4%)	
Birth weight (kg)	2.97±0.6	3.1±0.69	0.540
Birth week (n, %)			
Premature (%)	44 (5.7%)	4 (13.3%)	
Mature (%)	27 (37,3%)	26 (86.7%)	0.812
Postmature (%)	4 (4%)	0	
Time to first passage of meconium (n, %)			
First 24 hours (%)	71 (94.7%)	30 (100%)	0.520
>24 hours (%)	4 (5.3%)	0	
Type of nutrition (n, %)			
Breast milk	45 (60%)	21 (70%)	
Breast milk and Formula	26 (34.7%)	8 (26.7%)	0.140
Formula	4 (5.3%)	1 (3.3%)	

C/S: Cesarean Section, NSVD: Normal Spontaneous Vaginal Delivery

Table 2. Socio-demographic characteristics of parents			
Parameter	Group 1 (Difficult defecation)	Group 2 (Control)	*P*
Educational status			
Mother's level of education (n, %)			
Uneducated	8 (10.7%)	0	**0.002***
Primary school	23 (30.7%)	6(16.6%)	
Middle school	21 (28%)	7(20%)	
High School	12 (17.3%)	14(40%)	
Master's degree	11 (13.3%)	8(23.4%)	
Father's level of education (n, %)			
Uneducated	1(1.3%)	0	**<0.001***
Primary school	35(46.7%)	1(3.3%)	
Middle school	9(12%)	7(20%)	
High school	21(28%)	15(43.4%)	
Master's degree	9(12%)	12(33.3%)	
Maternal employment status (n, %)			
Employed	7(9.3%)	6(16.7%)	0.460
Unemployed	68(90.7%)	29(83.3%)	
Maternal age (years)	27.8±5.3	24.9±3.5	0.380
Number of children in the family (average)	1.8±0.83	1.3±0.55	**0.008***
Income Level (n, %)			
Below minimum wage	(13.3%)	(16.6%)	0.480
Above minimum wage	(86.7%)	(83.4%)	
Presence of Functional Constipation in the Family (n,%)			
In the brothers	(18.7%)	0	**0.001***
In parents	(48%)	(3.3%)	**<0.001***
In relatives	(32%)	(3.3%)	**0.002***

a statistically higher intake of yogurt, vegetables, and legumes in the control group. However, no significant differences were observed in the consumption of cheese, fruit, potatoes, fiber-rich foods such as wholemeal bread, bread and pastry, and convenience foods (Table 4).

DISCUSSION

In our study, cesarean delivery, a high number of siblings in the family, low parental educational attainment, familial history of altered defecation patterns, presence of constipation among first-degree relatives, formula feeding, maternal consumption of low-fiber diets, and inadequate fluid intake by the mother were identified as factors contributing to functional constipation in infants.

Among infants with functional constipation in our study, 50.7% were boys, and 49.3% were girls. Reviewing the literature, studies on constipated children have reported equal gender ratios.[12-15] Similarly, our study revealed no significant difference between genders, which is consistent with existing literature findings.

The cases experiencing functional constipation in our study exhibited lower height and weight measurements. Although the literature suggests an association between constipation

Table 3. Fluid consumption of mothers			
Liquid consumption (day)	**Group**	**Average**	***p***
Tea (cup)	Group 1	6.86 ± .93	0.380
	Group 2	7.0 ± .00	
Milk (cup)	Group 1	1.87 ± 2.72	**0.001***
	Group 2	5.27 ± 1.91	
Fruit juice (glass)	Group 1	2.08 ± 2.76	**0.016 ***
	Group 2	2.06 ± 2.31	
Cola-carbonated drink (glass)	Group 1	1.08 ± 1.66	0.540
	Group 2	1.60 ± 1.30	
Coffee (cup)	Group 1	2.08 ± 2.75	0.980
	Group 2	1.20 ± 0.45	
Water (liter)	Group 1	7.00	0.160
	Group 2	7.00	

Table 4. Solid food consumption of mothers			
Consumption of solid food	**Group**	**Average**	***p***
Yogurt (portion)	Group 1	5.01 ± 2.50	**0.001***
	Group 2	6.60 ± 0.93	
Cheese (matchbox)	Group 1	6.49 ± 1.69	0.120
	Group 2	7.00 ± .00	
Fruit (portion)	Group 1	4.38 ± 2.64	0,540
	Group 2	4.70 ± 1.70	
Salad (portion)	Group 1	3.96 ± 2.70	0.091
	Group 2	4.83 ± 1.51	
Potato (portion)	Group 1	2.09 ± 1.40	0,082
	Group 2	2.60 ± 1.10	
Vegetables (portion)	Group 1	2.36 ± 1.82	**0.010***
	Group 2	3.60 ± 1.32	
Whole wheat bread (slice)	Group 1	0.50 ± 1.78	0.570
	Group 2	0.73 ± 2.13	
Bread, cake, pastry	Group 1	6.40 ± 1.53	0.460
	Group 2	6.63 ± 1.24	
Legumes (portion)	Group 1	1.24 ± 1.10	**0.015***
	Group 2	1.83 ± 1.14	
Convenience food (portion)	Group 1	0.59 ± 1.35	0.990
	Group 2	0.17 ± .46	

and obesity[16], limitations arose from the young age of our subjects and the predominance of breast milk, hindering a comprehensive comparison.

Our study found a higher rate of cesarean births in the group with functional constipation. While the literature on the influence of birth type on constipation is scarce, we hypothesize that intestinal microbiota may play a role, as vaginally born infants are typically colonized with maternal vaginal and fecal bacteria.

In our study, 28 cases (37.3%) were premature. Previous research indicates a higher prevalence of constipation among low birth-weight babies.[17,18] The delay in meconium excretion in premature infants is attributed to immature motor mechanisms of the digestive system and inadequate stimulation of digestive system hormones due to insufficient enteral nutrition.[19] However, due to the limited number of premature cases in our study, significant insights could not be gleaned.

Among cases diagnosed with functional constipation in our study, only 2 had a history of defecation after 24 hours, with no identifiable organic cause. Contrary to much literature, which suggests a higher incidence of constipation among children passing meconium after the first 24 hours[16,20], our cases with functional constipation exhibited a history of meconium passage within the initial 24 hours.

Most infants experiencing functional constipation in our study were predominantly breastfed. Existing literature underscores the positive impact of breast milk on defecation patterns.[21,22] Research indicates a higher average daily number of stools in babies exclusively fed with breast milk at one, two, and four months old.[20] This may be attributed to factors such as motilin in breast milk, which enhances gastric emptying, the digestibility of lipids, particularly long-chain fatty acids present in breast milk, and the presence of prebiotics. Moreover, studies suggest a higher average number of stools per day in exclusively breastfed infants[15,20], indicative of diverse nutrient contributions to gastrointestinal system development post-birth. Our study observed a notable effect of breast milk on increasing stool frequency, particularly during exclusive breast milk in the initial months. However, three cases of not receiving breast milk hindered clear assessment.

In cases of functional constipation, not only the frequency but also the consistency of stool hold significance. Among our cases experiencing functional constipation, stool patterns were predominantly reported as normal. The Bristol stool scale, typically utilized for assessing stool shapes, was omitted from our study due to the infancy age group. Reviewing the literature, Kocaay et al. found that 58.3% of constipated infants exhibited

Bristol type 1 hardball stools, 37.5% had hard stools, and 4.2% had stool shapes close to normal.[23] Similarly, another study involving 116 constipated cases found that 84% of stools were solid, 34% were cylindrical and thick, and 28% were hard, akin to Bristol type 1.[24] However, in our study, contrary to literature findings, instances of hard and goat dung-like stools were infrequent.

Upon analyzing the influence of parental education levels on constipation, it was noted that parents in the control group tended to have higher education levels. It was speculated that conscious childcare practices and the adoption of healthy dietary habits might have contributed to this observation.

In our study, a history of changes in defecation patterns among siblings, parents, and relatives was notably higher in the group experiencing functional constipation, with a statistically significant difference observed compared to the control group. While the role of genetic factors in functional constipation remains controversial, many studies have indicated a familial history of constipation among individuals with functional constipation.[25-27] Similarly, our study detected instances of functional constipation within families of constipated children, aligning with existing literature. This observation was attributed to shared dietary habits within families.

Among the treatment methods employed for defecation problems in our study, laxative-herbal suppositories and herbal drinks were the most frequently utilized. Reviewing the literature, a study conducted in our country reported olive oil, insertion of soap into the anus, and the use of suppositories and enemas as common traditional remedies for constipation.[28] Similarly, our study employed a laxative-herbal suppository approach, albeit it failed to yield positive outcomes for the prevailing complaint.

In our study, we investigated maternal fluid consumption and found that mothers of infants aged 1-4 months with functional constipation consumed less fluid. Although the literature on the effect of maternal nutrition on infantile functional constipation is limited, low fluid intake remains a significant risk factor for constipation. Increasing fluid intake is crucial for treating constipation as it promotes softer stools.[29] In our study, mothers in the healthy group consumed more fluids, indicating that increased fluid content in breast milk might effectively reduce constipation.

Our study observed higher milk and yogurt consumption among mothers in the control group. However, the number of studies investigating the role of cow's milk in developing functional constipation is limited. Some research suggests that calcium combined with fats from cow's milk in the intestinal lumen may

form soap, which does not stimulate intestinal motility and may contribute to constipation.[30] Nevertheless, contrary to these findings, our study suggests that maternal consumption of cow's milk and dairy products might not affect constipation, as infants in our study were not fed cow's milk.

Our study result should be interpreted regarding some limitations. First, the study's cross-sectional nature did not allow detection of the cause-effect relationship. Second, in the period that we performed the study, the Rome III diagnostic criteria were valid. However, the Rome IV diagnostic criteria for functional constipation became valid during the time the paper was written.

Additionally, our study revealed that dietary fiber and fibrous foods consumption was significantly higher among mothers in the healthy group. Reviewing the literature, it is well-established that increasing water-soluble and insoluble fiber sources in the diet is a fundamental nutritional approach for treating constipation. Numerous scientific studies have demonstrated that a high dietary fiber intake helps prevent constipation.[24,25,27]

CONCLUSION

Cesarean history, low parental education levels, a high number of siblings, familial history of constipation, formula feeding, maternal consumption of low-fiber foods, and inadequate fluid intake are identified as factors contributing to functional constipation in infants.

Ethical approval

This study has been approved by the İzmir Tepecik Training and Research Hospital Local Ethics Committee (approval date 02.05.2016, number 2016/09-23).

Author contribution

Study conception and design: GT, MB; data collection: GT, MB; analysis and interpretation of results: GT, MB; draft manuscript preparation: GT, MB. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

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