



# Factors Related to the Duration of Chronic Functional Constipation in Children Referring to a Pediatric Gastrointestinal Clinic of Shiraz in 2014 - 2016

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## Abstract

**Background:** Constipation is a common problem among children. This study aimed to identify the factors related to the duration of chronic functional constipation.

**Methods:** The study was conducted on 826 children with chronic functional constipation referring to a pediatric gastrointestinal (GI) clinic in Fars province. The inclusion criteria of the study were suffering from constipation not due to anatomical (Hirschsprung's disease and spinal disease) and organic reasons (non-functional constipation), not suffering from other systemic disorders (hypothyroidism and psychomotor retardation), not having the history of prior anal surgery, and not using drugs inducing constipation. The data were analyzed using a linear regression analysis.

**Results:** This study was performed on 826 children with chronic functional constipation with the mean age of  $4.98 \pm 2.74$  years. Among the study children, 418 (50.6%) were boys. Based on the results of multivariate linear regression analysis, the duration of chronic constipation was related to children's age ( $B = 0.695$  [ $P < 0.001$ ]), intervals between defecations ( $B = 0.158$  [ $P = 0.036$ ]), age at the onset of defecation control ( $B = 0.15$  [ $P = 0.050$ ]), intervals of cereals consumption ( $B = 0.345$  [ $P < 0.001$ ]), and mother's education level ( $B = 0.283$  [ $P = 0.001$ ]). Accordingly, every year increase in children's age was accompanied by 8.5 months of constipation. In addition, every unit increase in the consumption of cereals during the week (every day, three days a week, once a week, and rarely) caused a four-month increase in chronic constipation.

**Conclusions:** With increasing age, children need parental care to prevent the occurrence of chronic constipation. Moreover, increasing interest in video games has been accompanied by a decrease in physical activity, which requires more attention from parents.

**Keywords:** Functional Constipation, Children, Regression Analysis

## 1. Background

Constipation is one of the most common GI disorders in children that, if untreated, may lead to various complications (1, 2). Constipation is responsible for 3 - 5% of outpatient referrals to physicians and pediatricians, as well as 25% of referrals to pediatric gastroenterologists (3-5). In most cases, constipation occurs for no specific endocrine or metabolic reasons, which is called idiopathic or functional constipation (6). Functional constipation is diagnosed by history taking, clinical symptoms, and physical examination and it does not require laboratory tests. Constipation may occur at any age during childhood, but it is more often detected at three stages: 1- in infants at the beginning of a supplementary feeding, 2- in children at the

time of toilet training, and 3- in school-age children who avoid using the toilet at school (7). Moreover, the peak of the incidence of constipation occurs during toilet training (between two and four years of age) with a higher prevalence in boys (8, 9).

The multifactorial pathophysiology of constipation has been accepted among researchers. Accordingly, constipation has shown to occur due to various factors, including low consumption of fibers, positive family history, and psychiatric factors (10-12). Based on what was mentioned above, constipation is a complex problem among children. Indeed, no research has been conducted on the factors related to the duration of chronic functional constipation in children in Iran. Thus, the present study aimed to identify

the factors related to the duration of chronic functional constipation so that the results would enhance the quality of life among children.

## 2. Methods

This cross-sectional study was conducted on children with functional constipation referring to the pediatric GI clinic, a tertiary pediatric referral center affiliated to Shiraz University of Medical Sciences, from March 2014 to March 2016. The study population included 826 children with chronic functional constipation selected through a census method. The inclusion criteria of the study were suffering from constipation not due to anatomical (Hirschsprung's disease and spinal disease) and organic causes (non-functional constipation), not suffering from other systemic disorders (hypothyroidism and psychomotor retardation), not having the history of prior anal surgery, and not using drugs inducing constipation. It should be noted that Rome III criteria were used for the definition of functional constipation for ages below (7) and above (8) four years.

After reviewing the literature, it should be noted that the researchers could find no studies on this issue, and all available studies had focused on the factors related to chronic constipation and thus, the factors were identified by referring to the references to prepare the initial questionnaire. The data were collected by interviewing the mothers using a predesigned questionnaire that contained various questions, including demographic data of parents and children, symptoms at the onset of the disease, date of the beginning of the disease, intervals of vegetables and cereals consumed during the week, and information regarding other clinical events.

In this study, parents' education levels were classified into two categories, i.e., below and above diploma. Moreover, the parents were asked about the consumption of vegetables and cereals during the week, which could be answered by the following options: every day, three days a week, once a week, and rarely.

Descriptive statistics of the quantitative variables have been presented through mean and standard deviation. Furthermore, with the assumption of normality of the dependent variable, linear regression analysis was used at the significance level of 0.05. It should be mentioned that in order to normalize the duration of chronic constipation, the square root of this variable was computed.

## 3. Results

This study was conducted on 826 children with chronic functional constipation. The children's age ranged from 6.96 months to 17.75 years, with the mean age of  $4.98 \pm 2.74$  years. In addition, 418 cases (50.6%) were boys. Besides, the

children's mean weight and height were  $18.40 \pm 8.97$  kg (range: 7.2 - 130 kg) and  $105.08 \pm 16.21$  cm (range: 43 - 169 cm), respectively. The mean age of the mothers was  $25.56 \pm 5.12$  years during pregnancy and  $31.54 \pm 5.61$  years at the time of referral. The minimum and the maximum number of children were 1 and 6, respectively, with the highest frequency being related to the families with one child (42.7%) followed by those with two children (40.1%). Moreover, 313 children (37.9%) were born through natural vaginal delivery, while 512 ones (62.1%) were born through cesarean sections. The history of neonatal jaundice was reported in 448 cases (54.2%).

Considering the parents, 561 mothers (67.9%) and 580 fathers (70.2%) had a diploma or higher degrees. Additionally, 137 mothers (16.6%) were employees. The family history of constipation was reported in 401 cases (48.5%), 255 cases (63.8%) of which were in the first-degree relatives (parents, siblings). The children's mean age at the onset of constipation was  $21.36 \pm 24.96$  months and their mean duration of constipation was  $38.29 \pm 28.80$  months.

According to Table 1, the positive history of large diameter stools was the most common clinical finding based on the Rome III criteria. In addition, fecal incontinence equal to or more than once a week was more common in boys ( $n = 94$ , 23.2% in females and  $n = 133$ , 31.9% in males). The children's mean age at toilet training was  $1.92 \pm 0.46$  years (range: 1 to 4 years), with 211 children (23.6%) having been trained at below 2-years-age. Besides, the children's mean age at defecation control was  $2.17 \pm 0.52$  years (range: 1.5 to 5 years). The median frequency of defecation was three times a week. The interval between defecations also varied from 1 to 20 days. Among the 383 children who were at school ages, 78 cases (20.4%) reported defecation at school.

Totally, 616 study cases (74.7%) were breastfed for averagely  $20.5 \pm 6.71$  months. Among these cases, 68.8% were exclusively breastfed up to six months. In addition, 153 cases (18.5%) were fed with powdered milk for averagely  $19.65 \pm 6.18$  months and 145 ones (17.6%) were fed with the combination of breast and powdered milk for averagely  $20.78 \pm 6.81$  months. In addition, eight children (1%) were fed with pasteurized milk for averagely  $11.42 \pm 4.15$  months.

Among the children under investigation, 123 (14.9%), 75 (9.1%), 149 (18.1%), and 476 ones (57.8%) consumed vegetables every day, three times a week, once a week, and rarely, respectively. Additionally, 31 (3.8%), 154 (18.7%), 248 (30.2%), and 389 patients (47.3%) consumed cereals every day, three times a week, once a week, and rarely, respectively. The mean daily physical activity was  $2.1 \pm 3.85$  hours. Based on the results, 545 cases (67.3%) had physical activity for less than an hour, 67 cases (8.3%) for 1 - 2 hours, and 198 ones (24.4%) for more than two hours. Moreover, the mean duration of watching TV and playing computer games was  $6.1 \pm 5.08$  and  $1.55 \pm 3.60$  hours, respectively. Accordingly, 279 children (34.2%) watched TV for less than 2 hours, 79

**Table 1.** The Most Common Clinical Findings According to Rome III Criteria<sup>a</sup>

Findings	Total	Male	Female
Positive history of large diameter stool	622 (75.3)	311 (74.4)	311 (76.2)
Positive history of painful defecation	613 (74.2)	304 (72.7)	309 (75.7)
Fecal mass in the rectum	582 (70.5)	297 (71.1)	285 (69.9)
Defecation twice a week or less	525 (63.7)	255 (61.2)	270 (66.3)
Positive history of excessive self-control	486 (59.1)	246 (59.3)	240 (58.8)
Fecal incontinence once a week or more	227 (27.6)	133 (31.9)	94 (23.2)

<sup>a</sup> Values are expressed as No. (%).

**Table 2.** Relationship of Sex with Physical Activity, Watching TV, and Playing Computer Games<sup>a</sup>

Variables	Male	Female	P Value
<b>Physical activity, hours/day</b>			0.014
< 1	295 (54.1)	250 (45.9)	
1- 2	26 (38.8)	41 (61.2)	
>2	90 (45.5)	108 (54.5)	
<b>Watching TV</b>			0.833
Yes	287 (50.8)	278 (49.2)	
No	128 (50.0)	128 (50.0)	
<b>Playing computer games</b>			0.029
Yes	97 (58.1)	70 (41.9)	
No	318 (48.6)	336 (51.4)	

<sup>a</sup> Values are expressed as No. (%).

ones (9.7%) for 2-3 hours, and 457 ones (56.1%) for more than three hours. Moreover, 16 (9.8%), 35 (21.3%), and 113 cases (68.9%) played video games for less than two hours, 2 - 3 hours, and more than three hours, respectively. Furthermore, there was a significant difference between girls and boys in terms of physical activity ( $P = 0.014$ ) and computer games ( $P = 0.029$ ) (Table 2).

The results of univariate linear regression analysis indicated that the duration of chronic constipation was related to child's age ( $B = 0.153$  [ $P < 0.001$ ]), number of children ( $B = 0.13$  [ $P < 0.001$ ]), father's education level ( $B = -0.152$  [ $P = 0.002$ ]), mother's education level ( $B = -0.175$  [ $P < 0.001$ ]), type of delivery ( $B = 0.165$  [ $P < 0.001$ ]), physical activity ( $B = 0.101$  [ $P = 0.038$ ]), duration of watching TV ( $B = 0.033$  [ $P < 0.001$ ]), cereals consumption during the week ( $B = 0.071$  [ $P = 0.006$ ]), duration of breastfeeding ( $B = 0.04$  [ $P = 0.006$ ]), age at the onset of toilet training ( $B = 0.234$  [ $P < 0.001$ ]), and age at defecation control ( $B = 0.088$  [ $P = 0.022$ ]). Therefore, these variables were entered into a multivariate linear regression model to identify the variables related to the duration of chronic constipation at  $P$  value  $< 0.3$ . After adjustment, the duration of chronic constipation was re-

lated to children's age ( $B = 0.695$  [ $P < 0.001$ ]), intervals between defecations ( $B = 0.158$  [ $P = 0.036$ ]), age at the onset of defecation control ( $B = 0.15$  [ $P = 0.050$ ]), the intervals of cereals consumption ( $B = 0.345$  [ $P < 0.001$ ]), and mother's education level ( $B = 0.283$  [ $P = 0.001$ ]). Accordingly, every year increase in children's age was accompanied by 8.5 months of constipation. In addition, everyday increase in the interval between defecations was accompanied by nearly two months of chronic constipation. The results also revealed a relationship between children's age at the onset of defecation control and duration of chronic constipation. Accordingly, every year increase in age at the onset of defecation control resulted in one and a half months of chronic constipation. Furthermore, every unit increase in the consumption of cereals during the week (every day, three days a week, once a week, and rarely) caused a four-month increase in chronic constipation. Mother's education level was also associated with the duration of chronic constipation. Accordingly, the duration of constipation was nearly four months longer among children with mothers who had a diploma or higher degrees (Table 3).

#### 4. Discussion

This study aimed to identify the factors related to the duration of chronic functional constipation in children referring to a GI clinic from March 2014 to March 2016. The mean age of the children in our study is consistent with the results obtained by Chang et al. (13). However, this measure was higher in the study by Buonavolonta et al. (14) and lower in the one performed by Borowitz et al. (15). The means of the children's weight and height were also similar to those reported by Lee et al. in 2008 (16). The male to female ratio in this study was also in line with those estimated by Loening-Baucke (17), Guimaraes et al. (18), Iacono et al. (19), and Pashankar and Loening-Baucke (20).

The mean age of the mothers at the time of admission in our study corresponds to that reported by Farnam et al. (21). Indeed, the number of parents with a diploma or higher degrees is consistent with the results obtained

**Table 3.** Crude and Adjusted B<sup>a</sup> Estimates of Different Variables Regarding the Duration of Chronic Constipation (Years)

Variables	Crude			Adjusted		
	B	95% CI	P Value	B	95% CI	P Value
<b>Children's age, y</b>	0.153	0.140, 0.166	< 0.001	0.695	0.133, 0.211	< 0.001
<b>Sex</b>						
Female	Reference					
Male	-0.032	-0.121, 0.058	0.49			
<b>Number of children</b>	0.13	0.079, 0.181	< 0.001			
<b>Mother's age at delivery, y</b>	-0.008	-0.016, 0.001	0.088			
<b>Mother's education level</b>						
Lower than diploma	Reference					
Diploma or higher	-0.175	-0.27, -0.079	< 0.001	0.283	0.190, 0.651	0.001
<b>Mother's occupation</b>						
Housekeeper	Reference					
Employee	-0.025	-0.146, 0.095	0.681			
<b>Father's education level</b>						
Lower than diploma	Reference					
Diploma or higher	-0.152	-0.249, -0.054	0.002			
<b>Type of delivery</b>						
Cesarean section	Reference					
NVD <sup>b</sup>	0.165	0.074, 0.257	< 0.001			
<b>The family history of constipation</b>						
No	Reference					
Yes	0.021	-0.069, 0.111	0.646			
<b>Intervals between defecations, days</b>	0.009	-0.012, 0.029	0.319	0.158	0.002, 0.060	0.036
<b>Duration of watching TV, hours/day</b>	0.033	0.025, 0.042	< 0.001			
<b>History of jaundice in neonatal</b>						
No	Reference					
Yes	-0.061	-0.151, 0.028	0.180			
<b>Physical activity</b>						
No	Reference					
Yes	-0.101	-0.196, -0.005	0.038			
<b>Duration of breastfeeding, months</b>	0.04	0.011, 0.068	0.006			
<b>Duration of feeding with powdered milk, months</b>	0.055	-0.01, 0.12	0.096			
<b>Intervals of vegetables consumed per week<sup>c</sup></b>	0.032	-0.009, 0.072	0.126			
<b>Intervals of cereals consumed per week<sup>c</sup></b>	0.071	0.020, 0.122	0.006	0.345	0.135, 0.358	< 0.001
<b>Age at defecation control, y</b>	0.088	0.013, 0.163	0.022	0.15	0.001, 0.363	0.05
<b>Age at toilet training, y</b>	0.234	0.144, 0.325	< 0.001			

<sup>a</sup> B are reported as years.

<sup>b</sup> Normal vaginal delivery.

<sup>c</sup> Intervals of vegetables and cereals consumed during the week, which could be answered by the following options: every day, three days a week, once a week, and rarely and each category is the reference for its next category.

by Buonavolonta et al. (14) and Farnam et al. (21). Moreover, most families in our investigation only had one child, which is in contrast to the research carried out by Buonavolonta et al. (14).

In the current study, the children's mean age at the onset of constipation was lower compared to the study conducted by Chang et al. (13). On the other hand, the mean duration of constipation in this study was higher in comparison with the study performed by Dehghani et al. (22). Additionally, our study children's mean age at toilet training was lower than that reported by Borowitz et al. (15). In

addition, the number of children who had been trained at below 2-years-age was lower compared to the studies performed by Fishman et al. (23) and Kocaay et al. (24). Our study children's mean age at defecation control was also lower in comparison with the study performed by Blum et al. in 2004. Previous studies showed that withholding of defecation was the predictor of delayed toilet training. Thus, effective treatment of constipation can reduce refusal of defecation and delay in toilet training. Of course, social and family factors could play a role, as well (25).

The median frequency of defecation in the current

study was higher than that indicated by Guimaraes et al. (18). Additionally, the number of children who had defecated at school was not consistent with that reported by Kocaay et al. (24).

The frequency of family history of constipation was higher in the present study in comparison with the studies conducted by Benninga et al. (26), Aydogdu et al. (27), but lower compared to those performed by Kocaay et al. (24) and Roma et al. (10). The frequency of positive history of self-control behaviors or extreme self-control was also higher in the current study than in the research by Kocaay et al. (24) and Aydogdu et al. (27), but lower than in a study conducted by Loening-Baucke (17). Moreover, the frequency of fecal incontinence equal to or more than once a week was higher in the current study than in the research by Roma et al. (10), but lower than in a study performed by Aydogdu et al. (27). Indeed, the frequency of fecal incontinence was higher in boys, which is consistent with the results obtained by Pashankar and Loening-Baucke (20). Considering the frequency of difficult or painful defecation, Aydogdu et al. (27) and Roma et al. (10) respectively reported lower and higher values than those obtained in the current study.

The number of breastfed children was higher in our study than in a study by Turco et al. (28), but lower than in the one performed by Kocaay et al. (24). Moreover, a large percentage of our study children rarely consumed vegetables and cereals during the week. In contrast, Dehghani et al. demonstrated that most patients consumed vegetables and cereals three times a week (22). In addition, Kocaay et al. reported the history of lack of fibers in 31.9% of their cases (24). Furthermore, the mean daily physical activity was higher in the present study than in that performed by Jennings et al. (29).

In our study, the results of multivariate linear regression revealed that the duration of chronic constipation was associated with child's age, intervals between defecations, age at defecation control, mother's education level, and the intake of cereals. It should be noted that the researchers could find no studies on this issue, and all available studies had focused on the factors related to chronic constipation in case and control groups.

The strongest points of this study were its population-based design, its relatively large sample size, and its assessment of functional constipation symptoms using Rome III criteria. Besides, it was the first study evaluating the duration of chronic functional constipation in children. On the other hand, one of the weak points of the study was collecting data based on individual reports. Additionally, the effects of other factors, such as socioeconomic status, gestational age, iron supplementation, and amount of water intake during the day, on the duration of chronic functional constipation were not taken into consideration. Therefore, further studies are recommended on this issue.

In summary, the study results revealed that the duration of chronic constipation was associated with children's age, intervals between defecations, age at the onset of defecation control, intervals of consumed cereals, and mother's education level. Yet, future studies with larger sample sizes are required to evaluate the factors related to the duration of chronic functional constipation in children.

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## Footnotes

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