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Normal defecation pattern, frequency of constipation and factors related to constipation in Turkish children 0-6 years old

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Background/aims: *The aim of this study is to figure out defecation features, constipation frequency, reasons and factors effecting on functional constipation in 0-6 years old children.* ***Material and Methods:*** *This descriptive study had been carried out in Gazi University School of Medicine Pediatric polyclinics between February-June 2007 and 1018 children aged 0-6 years were included. The study comprises data about defecation pattern and prevalence of constipation. Children were divided into five groups according to the age. Their parents were asked to complete a structured questionnaire. Physical examinations, stool frequency according to the age, feeding patterns, age and gender distributions, major complaints and associated factors were all investigated.* ***Results:*** *Among 1018 children there were 526 (51.7%) boys and 492 (48.3%) girls. One hundred ninety five (88.2%) infants were exclusively breast-fed, 42 children (17.8%) were getting additional feeding in 0-6 months age group. Forty-eight of 1018 children (4.7%) were diagnosed as constipated. Twenty-eight (58.3%) were male and 20 (41.7%) were female. Parents of the constipated children defined the major complaints with defecation as discomfort (33%), pain (25%), seldom defecation (21%), hard stools (17%) and rectal bleeding (4%). Eighteen parents (37.5%) thought that constipation is related to dietary type. Refraining from school toilet was defined by seven parents (14.6%).* ***Conclusion:*** *Constipation may predict serious organic problems in newborns; however organic problems are not encountered in 95% of bigger children. These cases are described as functional constipation. Dietary factors and refraining from school toilets have to be considered during treatment.*

Key words: Constipation, children, defecation, infant, dietary habits

0-6 yaş Türk çocuklarda normal dışkılama paterni, konstipasyon frekansı ve konstipasyona etkili faktörler

Amaç: *Bu çalışmanın amacı; 6 yaş aralığındaki çocuklarda dışkılama özellikleri, kabızlık sıklığı ve fonksiyonel kabızlığa etki eden faktörleri araştırmaktır.* ***Yöntem:*** *Bu çalışma, Gazi Üniversitesi Tıp Fakültesi Pediatri polikliniğine Şubat-Haziran 2007 tarihleri arasında başvuran 0-6 yaş çocuklar dahil edilerek yapılmıştır. Çalışma, çocukların dışkılama düzeni ve kabızlık prevalansı ile ilgili verileri içermektedir. Çocuklar yaşlarına göre 5 gruba ayrılmışlardır. Çocukların ebeveynlerinden yapısal bir anketi cevaplamaları istenmiştir. Fizik muayeneleri yapılmış, dışkılama sıklıkları, beslenme düzenleri, yaş ve cinsiyet dağılımları, başlıca şikayetleri ve kabızlığa etkili faktörler araştırılmıştır.* ***Bulgular:*** *Çalışmaya katılan 1018 çocuğun 526'sı (%51.7) erkek ve 492'si (%48.3) kız idi. Yüzdoksanbeş infant (%88.2) yalnız anne sütü alırken, 42 infant (%17.8) ek gıda alıyordu. Toplam 48 çocuk (%4.7) kabızlık tanısı aldı. Kabızlık tanısı alan çocukların 28'i (%58.3) erkek ve 20'si (%41.7) kız idi. Kabız çocukların ebeveynleri, ana şikayetleri tanımlarken rahatsızlık hissi (%33), ağrı (%25), seyrek dışkılama (%21), sert dışkı (%17) ve rektal kanama (%4) olarak belirttiler. Onsekiz ebeveyn (%37.5) konstipasyonun diyetle ilişkili olduğunu belirttiler. Okul tuvaletlerinden sakınma 7 ebeveyn (%14.6) tarafından tanımlandı.* ***Sonuç:*** *Kabızlığın, yenidoğanlarda ciddi organik problemlere yol açacağı öngörülmekle birlikte, bu problemlere büyük çocukların %95'inde rastlanmamaktadır. Bu vakalar fonksiyonel kabızlık olarak tanımlanır. Diyetsel faktörler ve okul tuvaletlerinden sakınma konuları tedavide dikkate alınmalıdır.*

Anahtar kelimeler: Kabızlık, çocuk, dışkılama, infant, beslenme alışkanlıkları

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INTRODUCTION

Regular defecation is one of the indicators of good health. The normal defecation pattern of children might change according to age and dietary habits. Changes in defecation pattern may cause some problems and anxiety for both children and parents. Thus, understanding the individual age-related normal and abnormal defecation patterns is considerably important. Constipation is a common problem worldwide in childhood. The admittance rates for constipation to general pediatric polyclinics and pediatric gastroenterology polyclinics are 3% and 25%, respectively (1,2). The aim of this study was to assess the defecation pattern, frequency of constipation and factors related to constipation in Turkish children 0-6 years old.

MATERIALS AND METHODS

This descriptive cross-sectional study was carried out in Gazi University School of Medicine pediatric polyclinics between February-June 2007, and 1018 children aged 0-6 years were included. These children were divided into five groups according to their age (Table 1). Their parents were asked to complete a structured questionnaire. In this questionnaire, age, sex, gestational age, timing of first meconium, breastfeeding, formula and additional food usage, medical history, urinary tract infections, frequency and consistency of stool, abdominal and anal pain, rectal bleeding, feeding habits, daily cow's milk consumption, toilet training history, school-nursery toilet usage habits, drug history, and family history for constipation were queried. Weight and height of all of the children were measured and percentages were calculated. Systemic examinations were done, but especially abdominal, rectal and neurologic examinations were highly detailed.

According to gestational ages, births at <38 weeks, 38-40 weeks and >40 weeks were grouped as premature, mature and post-mature, respectively. According to the timing of first meconium, children were grouped as before or after 24 hours. Ninety-nine parents failed to remember the meconium time and were excluded from the assessment. To evaluate the daily stool pattern, parents were asked to mention the daily stool count for the last two weeks. The stool counts were scored as: '1 per day', '2 per day', '3 per day', '4+ per day', '1 per 2 days', '1 per 3 days', and 'sparse'. Daily cow's milk consumption was questioned as: none, <250 cc/day, 250-500 cc/day, and >500 cc/day. Additional foods were questioned as: formula, yoghurt, vegetable soup, vegetable meals, fruits, and meat intake. Two groups were formed according to onset of toilet training time. Fourteen parents failed to remember this period and were excluded. Three children were also excluded due to forgotten presence of drug history.

The definition of 'difficult or rare defecation for at least two weeks' was considered for constipation. The parents of the group "constipated" were asked to complete a second questionnaire. The second questionnaire consisted of questions as follows: defecation frequency, anal pain, rectal bleeding, abdominal pain, factors enhancing complaints such as feeding habits, school, drugs and daily physical activity, relationship with toilet training, if any, presence of soiling, refraining from defecation, lack of appetite, nausea, vomiting, weight loss, family history for constipation, growth history, school performance, and behavioral relations with same-age children. Hirschsprung's disease, thyroidal/parathyroidal diseases, cystic fibrosis, and celiac disease were ruled out.

Data analysis was done with SPSS 11.5. Shapiro-Wilk test was used to evaluate normal variation of continuous variable data. Continuous variables not matching normal variation were analyzed with Mann-Whitney U test and Kruskal-Wallis variant analysis method. In order to reach the va-

Table 1. Constipation frequency according to age groups

	No Constipation n (%)	Constipation n (%)	Sum n
Group-1, 0-6 months	233 (98.3%)	4 (1.7%)	237
Group-2, 7-12 months	133 (97.1%)	4 (2.9%)	137
Group-3, 13-24 months	202 (98.5%)	3 (1.5%)	205
Group-4, 25-36 months *	125 (89.3%)	15 (10.7%)	140
Group-5, 37-72 months *	277 (92.6%)	22 (7.4%)	299
Total	970 (95.3%)	48 (4.7%)	1018

(p<0.001) * groups creating the variation

riation groups after Kruskal-Wallis variant analysis method, multiple comparison tests were performed. Chi-square test was used for categorical comparisons. A value of $p<0.05$ was accepted to be statistically significant.

RESULTS

A total of 1018 children were studied. There were 526 (51.7%) boys and 492 (48.3%) girls. The distribution of children according to age and gender is shown in Table 1 and Table 2. The gender variation was also calculated for each age group, and no statistically significant result was obtained ($p>0.05$).

Stool Frequency According to Age

The median number of stools per day and ranges in each age group are given in Table 3.

Daily stool counts of children were evaluated individually for each group. One defecation per day was found highest in the 37-72 months group, 2 defecations per day in the 13-24 months group, and 3-4 defecations per day in the 0-6 months group. Defecation of more than 4 per day was noticed only in the 0-6 months group. Defecation count of 1 in 2 days was highest in the 37-72 months group and 1 in 3 days was highest in the 25-36 months group. All of the age groups showed variation according to stool counts. The most frequent defecation was detected in the first 6 months, and the frequency of defecation was found to diminish with aging ($p<0.001$).

Feeding Pattern and Stool Frequency

In the 0-6 months group, 195 (88.2%) infants were exclusively breastfed, and 42 children (17.8%) were receiving additional feeding. In the 7-12 months group, 3 children (2.2%) were only breastfed and 134 children (97.8%) were receiving additional feeding. Defecation counts per day were found to be statistically high in the exclusively breastfed infants in the 0-6 months group. Daily frequency of stool was not affected by feeding pattern after the weaning period.

Frequency and Age Distribution of Constipation

Forty-eight of 1018 children (4.7%) were diagnosed as constipated; 28 (58.3%) were male and 20 (41.7%) were female. Gender variation was found to be statistically insignificant ($p>0.05$). One anterior-positioned anus and 1 Hirschsprung disease were diagnosed among constipated children, resulting in a rate of 4.2% for constipation with an organic origin. According to the stool counts survey, 9 children (18.8%) defecated once a day, 25 children (52.1%) once in two days, and 14 children (29.2%) once in three days or more. Questions about consistency of the stool were answered as: goat feces (58.3%), hard (37.5%) and close to normal (4.2%). The distribution of constipation frequency according to the age groups is shown in Table 1. The mean age at diagnosis of constipation was found to be 17.7±11.7 months. An increased frequency of constipation was found in the 25-36 months (31.3%) and in the 37-72 months (45.8%) age groups. These groups demonstrated a significant difference compared with the other groups ($p<0.001$).

Major Complaints

Parents of the constipated children defined the major complaints with defecation as discomfort (33%), pain (25%), infrequent defecation (21%), hard stools (17%), and rectal bleeding (4%). The parents were questioned regarding each constipated child and details were as follows: anal pain during defecation (95.8%), abdominal pain during defecation (47.9%), and rectal bleeding during defecation (25%). Soiling was present in 8 of the constipated children (16.7%). Withholding behavior was present in 21 cases (43.8%). Loss of appetite was seen in 17 cases (35.4%). Weight loss was

Table 2. Distribution of children according to age and gender

	Girls n (%)	Boys n (%)	p
Group-1, 0-6 months	123 (51.9%)	114 (48.1%)	>0.05
Group-2, 7-12 months	70 (51.1%)	67 (48.9%)	>0.05
Group-3, 13-24 months	98 (47.8%)	107 (52.2%)	>0.05
Group-4, 25-36 months	68 (48.6%)	72 (51.4%)	>0.05
Group-5, 37-72 months	133 (44.5%)	166 (55.5%)	>0.05
Total	492 (48.3%)	526 (51.7%)	>0.05

Table 3. Stool frequency according to age

Age	Distribution	Median
0-6 months (n:237)	0.33-6	>0.05
7-12 months (n:137)	0.33-4	>0.05
13-24 months (n:205)	0.5-4	>0.05
25-36 months (n:140)	0.33-3	>0.05
37-72 months (n:299)	0.33-3	>0.05

detected in 5 children (10.4%). Nausea and vomiting was present in 1 child (2.1%), who was diagnosed as Hirschsprung's disease.

Associated Factors

The type of diet, school and nursery, drugs and physical activity were investigated as factors affecting constipation. Eighteen parents (37.5%) thought that constipation was related to type of diet. Refraining from going to the school toilet was defined by 7 parents (14.6%). Four families (8.3%) thought that constipation was due to inactivity and 1 family defined iron supplements as leading to hard stools. One family (2.1%) described acute tonsillitis before the beginning of constipation. Hospitalization due to bronchiolitis was the reason for constipation according to 1 family (2.1%). Overall, 16 parents (37.5%) had no idea about possible causative factors for constipation. Peer relations of the constipated children were identified as poor in 9 children (18.8%). Thirteen constipated children (17.1%) were defined as having quarrelsome behavior. Constipation rate was higher in prematures than mature and postmature infants. Eleven of 865 children (1.3%) with timing of first meconium in the first 24 hours and 6 of 37 children (14%) with timing after 24 hours were found to be constipated (p<0.001). Positive family history in constipated and non-constipated children was found as 54% and 13.5%, respectively (p<0.001). Six hundred and nine (59.8%) children were not toilet trained, and 409 (40.2%) children were toilet trained. Thirteen constipated children (34.2%) and 28 (7.9%) non-constipated children were toilet trained before 2 years of age (p<0.001). The constipation ratio was found to be highest in the group consuming cow's milk of >500 cc per day. The constipation rate was increased with the consumption of cow's milk of >250 cc per day. Breastfeeding was found to be effective on the constipation rate. The constipation rates were found to be 4.3% in 945 children who were breastfed and 19% in 35 children who were never breastfed (p<0.05). The additional food profile was analyzed. Fibers were not given in the diet of 31.9% of constipated children; however, this ratio was 9% in the non-constipated children. Constipation was more frequent in children whose diet was lacking in fiber content (p<0.05).

Refraining from going to school toilets and withholding behavior in the non-constipated group (n: 161) was reported in 1 child (0.6%). Nine of the constipated children (47.4%) had no problem with using school toilets; however, 10 children (52.6%) had problems in this regard. Withholding behavior and refraining from using school toilets were found to be significantly high in constipated children (p<0.001). No relationship was found between constipation and usage of iron supplementary drugs (p>0.05). Recurrent urinary tract infections were identified in 4 of 48 constipated children (8.3%), while 5 of the 970 children without constipation (0.5%) had urinary problems. Recurrent urinary tract infections were found to be significantly high in the constipated group (p<0.001) (Table 4).

Table 4. Factors affecting functional constipation in children aged 0-6 years

Effective Factors	Constipated children	*p*
Gender	Female (41.7%) Male (58.3%)	p>0.05
Age	0-6 months (8.3%) 7-12 months (8.3%) 13-24 months (6.3%) 25-36 months* (31.3%) 37-72 months* (45.8%)	p<0.001
Gestational age	Premature (14.5%)# Mature (85.5%)	p<0.001
Meconium time	First 24 hours (86%) After 24 hours (14%)#	p<0.001
Family history	Positive (54.2%)# Negative (45.8%)	p<0.001
Iron supplement usage	Positive (25%) Negative (75%)	p>0.05
Cow's milk consumption	None (25%) <250 cc/day (16.7%) 250-500 cc/day (29.2%)* >500 cc/day © (29.2%)*	p<0.001
Breastfeeding	Never breastfed (12.5%)# Breastfed (87.5%)	p<0.001
Toilet training age	<2 years (34%)# >2 years (66%)	p<0.001
Diet with fibers	Not given (31.9%)# Given (68.1%)	p<0.05
School related problems	Positive (47.4%) Negative (52.6%)	p<0.001

* : Groups creating the variation
©: Group with highest constipation rate
: seen more frequently in constipated children compared to unconstipated children

Physical Examination

Height and weight of the constipated children were normal in 95.8%. Three children had abdominal distention (6.3%) and stool mass was palpated in 16 children (33.3%). One anterior-positioned anus was found (2.1%). Anal fissures were noted in 17 children (35.4%). Perianal examination was normal in all constipated cases. Hard stools were palpated in the rectal examination in 14 cases (29.2%). One case had loose anal tonus. None of the cases had dimple or ectopic hair, and neurologic examination was found to be normal in all constipated cases.

DISCUSSION

The normal defecation patterns of infants and children are thought to be similar in different geographic locations; however, it is suggested that varied feeding habits may change the defecation characteristics (3-7). Knowledge about defecation patterns of normal infants and children is important for eliminating any parental anxiety and helping them to discriminate the normal from abnormal. Our data showing that stool frequency reduces with aging is similar with other studies on this point (4-6). Fontana et al. (8) studied a group of 188 infants under 3 months and found that daily stool count in breastfed, breastfed plus formula and formula only were 3.2, 2.4 and 2.0, respectively. Tunc et al. (9) reported that stool frequency was higher in exclusively breastfed infants in 0-24 month-old children. Similarly, our study results supported the fact that breastfeeding enhances daily stool count especially in the first six months. Average stool counts per day in 0-6 month-old children who are only breastfed or were breastfed plus formula were 2.7 and 2.0, respectively. This point was noted, as the formula addition to breastfeeding showed a decrease in daily stool count in earlier months. This is partially explained by the enteral maturation and nutrition type. Breastfed babies were fed more frequently, thus gastrocolic reflex stimulation led to increased frequency of defecation. In addition, breast-milk is rich in non-digestive oligosaccharides and proteins, which lead to increase in volume and osmolarity of the stool. On the other hand, minerals and lipids levels were higher in the stool of formula-fed infants than in breastfed infants. It is hypothesized that calcium fatty acid soaps might be related to stool consistency (10-12).

Constipation is the most common digestive complaint in childhood. The most important problem in this issue is the lack of a generally accepted definition for pediatric constipation. Considering age-related defecation features of children, definition of constipation and well- identified etiologic factors will facilitate efficient diagnosis and treatment. This study comprises data about defecation pattern and prevalence of constipation of more than 1000 Turkish children aged 0-6 years.

It has been reported that 3% of children presenting at a pediatric clinic and 10-25% of patients in pediatric gastroenterology clinics had constipation (1). The prevalence of functional constipation varies widely in the literature. Different results may be obtained from studies about constipation possibly due to the size of the study, different methods of gathering information and social and environmental diversity. The overall constipation rate of our study was 4.7%, and 4.2% of constipated children had organic disease. The peak age for the onset of childhood constipation is not well known. Organic disease must be ruled out in the neonatal-onset constipation. Functional constipation generally begins within the first year of life. The weaning period was considered as a cause of constipation in this age group. The study data suggest that the highest prevalence is within the preschool age (13-15). Toilet training might be a causative factor in this age group. A high prevalence rate was shown in the 25-36 months group in our study. Stool patterns of children were identified as goat feces (58.3%), hard (37.5%) and close to normal (4.2%). With the suggestions of this data, not only the stool frequency but also the pattern, any distresses experienced by the child during defecation and accompanying complaints need to be evaluated.

Borowitz et al. (15) reported that febrile diseases, trips, surgical interventions, diet type, sibling birth, usage of drugs, and toilet training were factors having an impact on constipation. In our study, factors enhancing constipation were questioned. The parents declared that constipation was related to diet in 37.5%, school toilets in 14.6%, inactivity in 8.3%, and iron supplements in 2.1% of constipated children. A majority of the families (37.5%) had no idea in this regard. A recent history of an illness was present in 4.2% and a period of hospitalization in 2.1% of patients. Factors affecting constipation were found to be: positive family history for constipation, prematurity, passing of first meconium after 24 hours, toilet trai-

ning before 2 years of age, consumption of cow's milk of >250 cc/day, refraining from using school toilets, not being breastfed, and a low-fiber diet. The possible association between fiber intake and constipation was reported by Roma et al. (16). A positive family history for constipation was also reported by Roma. Preterm infants have a physiological immaturity leading to delay in the timing of meconium passage and constipation. Delayed passage of first meconium might be related to slow transit constipation, which leads to severe constipation in childhood (17,18). The timing of first meconium passage and gestational age were found as significant factors for constipation in this study. Soiling is a common symptom of constipation in childhood. Difficulties with toilet training are reported as an important factor in chronically constipated children. The timing of toilet training might be an important factor in these children. The critical age was found to be 2 years for toilet training in our study group. Hard stools may cause painful defecation. Postponed defecation and withholding behavior related to using the school toilet result in dry and hard stool. Our result supports this observation. We found a significantly lower percentage of breastfed infants in the constipated group. This data was supported before by Iacono et al. (19,20). Calcium-fatty acid soaps might be related to constipation in children with >250 cc daily cow's milk intake.

The prevalence of soiling in children older than 4 years is reported as between 1-4% (2). Morais et al. (21) reported a soiling ratio of 45.5%, and we found this ratio as 16%. This disparity may be explained by the different grades of constipation in groups. Lack of appetite was found in 35.4% of children in our study. Evoked gastrocolic reflex and abdominal pain after feeding may also influence the lack of appetite. Basak et al. (22) reported a ratio of psychological problems of 60% in constipated cases. In our study, psychological problems were noted in 18.8% as quarrelsome and 27.1% as vicious. It would be difficult to comment with certainty as to whether these psychological problems are the cause or result of constipation.

Recurrent urinary tract infections were found to be higher in constipated children according to the normal population in our study, and this result is compatible with the literature (23,24). Avoiding constipation may help to diminish urinary tract infections.

Based on the results of our study and a review of the literature, constipation is a markedly serious problem for both children and parents and has to be evaluated and treated meticulously in pediatric clinics. All these data show that dietary factors and refraining from using school toilets have to be considered during the treatment of constipation.

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