

Risk Factors for Functional Constipation in Young Children Attending Daycare Centers

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Our objective was to determine the risk factors associated with the development of functional constipation (FC) in young children attending daycare centers. A cross-sectional survey using a questionnaire based on the Rome III criteria was conducted in children aged 25 to 84 months from 3 randomly selected daycare centers in January 2016. The items in a questionnaire were statistically compared in the constipated and non-constipated groups. A total of 212 children were included and FC was found in 8.5%. Multivariate logistic regression analyses revealed that maternal history of constipation (odds ratio [OR] = 4.1, 95% Confidence Interval [CI] 1.2-13.9), history of painful defecation before age 1 (OR = 10.4, 95% CI 1.1-101.3), history of painful defecation during toilet training (OR = 28.9, 95% CI 1.9-423.8), no or difficult defecation at a daycare center (OR = 5,804.6, 95% CI 134.4-250,718.4), no meat consumption (OR = 10.1, 95% CI 1.2-88.1), and 500 mL or less of water intake per day (OR = 9.9, 95% CI 0.9-99.5) were powerful predictors of FC in young children ($P < 0.05$). Additionally, the constipated group was significantly associated with 2 hours or less of outdoor play activities per day, entry into daycare centers before 24 months age, 6 hours or more of attendance at a daycare center per day, breastfeeding for less than 6 months, 3 meals or less per day, and 3 or fewer servings of fruits and vegetables per day ($P < 0.05$). The findings of this study can guide parents, daycare teachers, and clinicians in prevention, early recognition and early intervention for the risk factors associated with FC in young children.

Keywords: Constipation; Child; Daycare Centers; Questionnaire

INTRODUCTION

Functional constipation (FC) is common in children with an estimated prevalence of 3% worldwide (1). The most common pathogenesis of FC is a vicious cycle that begins with painful defecation and leads to stool-withholding behavior as a result (2). Identifying the factors that lead to painful defecation in early childhood is important in the prevention of FC.

Over 2 million children attend daycare centers in the Republic of Korea, for an average 5-9 hours per day (3). However, no studies have reported the precipitating factors of FC related to daycare centers. Previous reports on FC during early childhood involved children who visited a pediatric clinic with a complaint of constipation or other disorder (4). This is the first report of FC in healthy young children attending daycare centers.

Our objective was to determine the risk factors associated with the development of FC in young childhood attending daycare centers.

MATERIALS AND METHODS

A cross-sectional survey using a questionnaire was conducted

in children aged 25 to 84 months from 3 randomly selected daycare centers in January 2016. The questionnaire developed by our institute contained 40 items about demographic characteristics, bowel habits, lifestyles and eating habits associated with FC at home and in daycare centers. FC was diagnosed according to the Rome III criteria (5,6).

Data were analyzed with SPSS, version 17.0 (SPSS, Chicago, IL, USA). The items in a questionnaire were compared in the constipated and non-constipated groups using a χ^2 analysis and Student's *t*-test. Multivariate logistic regression analyses were performed between groups. Statistical significance was assigned to *P* values < 0.05 .

Ethics statement

This study was approved by the institutional review board (HIRB-2015-11) and informed consent was obtained from the caregivers of children in the study.

RESULTS

Data were collected from a questionnaire completed by caregivers, who were mostly mothers (91.2%). A total of 217 chil-

Table 1. Clinical characteristics of constipated and non-constipated children

Variables	Constipated (n = 18)	Non-constipated (n = 194)	P value
Age, mon	53.0 ± 17.8	54 ± 14.9	0.656
Male (%)	9/18 (50)	102/191 (53.4)	0.782
Weight, kg	17.0 ± 5.1	18.2 ± 4.3	0.307
Height, cm	104.3 ± 11.5	105.1 ± 13.1	0.820
Body mass index, kg/m ²	15.9 ± 2.2	17.4 ± 8.2	0.526
Gestational week, wk	39 ± 1.6	39.1 ± 8.6	0.964
Mother with a university degree	13/18 (72)	152/193 (79)	0.521
Siblings	16/18 (88.9)	161/194 (83)	0.519
Parental recognition of a child's constipation*	9/18 (50)	13/190 (6.8)	0.000
Family history of constipation (%)			
Father	0/18 (0)	11/155 (7.1)	0.243
Mother*	7/18 (38.9)	23/154 (14.9)	0.011
Siblings	1/16 (6.3)	9/166 (5.4)	0.890
History of painful defecation before age 1*	9/18 (50)	18/190 (9.5)	0.000
Acquisition of toilet skills	16/18 (88.9)	176/193 (91.2)	0.744
Age of toilet training, mon	25.5 ± 5.6	25.2 ± 6.7	0.896
History of difficult toilet training	5/18 (27.8)	43/193 (22.3)	0.595
History of painful defecation during toilet training*	9/18 (50)	15/191 (7.9)	0.000

Values are mean ± SD or No./total No. (%).

* $P < 0.05$.

dren were enrolled; 2 were excluded because of the underlying disease (1 had an anorectal malformation and 1 had cerebral palsy), and 3 submitted an incomplete questionnaire. A total of 212 children (boys: 111 [53.11%], mean age: 54.5 months, standard deviation [SD] 15.1 months) were included (Table 1). Of these, 18 children (8.5%) fulfilled the Rome III criteria for FC (Table 1).

In the analysis of clinical characteristics, the 2 groups did not show significant differences in age ($P = 0.656$), gender ($P = 0.782$), weight ($P = 0.307$), height ($P = 0.820$), birth week ($P = 0.964$), and the number of mothers with a university degree ($P = 0.521$) (Table 1). Maternal history of constipation ($P = 0.011$) and parental recognition of a child's constipation ($P = 0.000$) were significantly associated with FC (Table 1). Seventeen (77.3%) of 22 parents who recognized the child's FC refused to treat the child at clinic, because modification of eating habits might be adequate to treat the FC, and previous short-term treatment of FC at a clinic was not satisfactory.

The two groups showed no significant differences in age of toilet training ($P = 0.744$) or history of difficult toilet training ($P = 0.595$) (Table 1). However, the constipated group reported a significantly higher rate of painful defecation before age 1 ($P = 0.000$) and during toilet training ($P = 0.000$) than the non-constipated group (Table 1).

In the analysis using the Rome III criteria, the constipated group was significantly associated with all items ($P = 0.000$), and the most common complaint was pain during defecation (55.6%) (Table 2). A history of rectal bleeding ($P = 0.008$), withholding ($P = 0.021$) and hard stools ($P = 0.003$) were also significantly associated with FC (Table 2).

The constipated group was significantly associated with 2

Table 2. Bowel habits of constipated and non-constipated children for at least 2 months

Variables*	Constipated (n = 18)	Non-constipated (n = 194)	P value
Rectal bleeding/wk	4/17 (23.5)	11/185 (5.9)	0.008
Withholding /wk	12/17 (70.6)	77/185 (41.6)	0.021
Hard stools/wk	10/18 (55.6)	46/194 (23.7)	0.003
Rome III criteria			
Two or fewer defecations/wk	8/18 (44.4)	6/193 (3.1)	0.000
Stained underclothes once or more/wk	5/18 (27.8)	0/190 (0)	0.000
Retentive posturing/wk	9/18 (50)	3/194 (1.5)	0.000
Pain during defecation/wk	10/18 (55.6)	6/193 (3.1)	0.000
Presence of a large fecal mass in the rectum/wk	8/18 (44.4)	3/194 (1.5)	0.000
Obstructing toilet by large stool/wk	7/18 (38.9)	5/194 (2.6)	0.000

Values are No./total No. (%).

* $P < 0.05$.

hours or less of outdoor play activities per day ($P = 0.044$), entry into daycare centers before 24 months age ($P = 0.02$), 6 hours or more of attendance at daycare centers per day ($P = 0.049$), and no or difficult defecation at daycare center ($P = 0.000$) (Table 3). When analyzed for feeding history, the constipated group was significantly associated with breastfeeding for less than 6 months ($P = 0.033$), 3 meals or less a day ($P = 0.021$), 500 mL or less of water intake per day ($P = 0.002$), no meat consumption ($P = 0.000$), and 3 or fewer servings of fruits and vegetables per day ($P = 0.046$) (Table 3).

Multivariate logistic regression analyses revealed that maternal history of constipation ($P = 0.026$), history of painful defecation before age 1 ($P = 0.045$), history of painful defecation during toilet training ($P = 0.014$), no or difficult defecation at the daycare center ($P = 0.000$), no meat consumption ($P = 0.036$), and 500 mL or less of water intake per day ($P = 0.049$) were statistically significant predictors of FC in young children (Table 4).

Table 3. Lifestyle and eating habits of constipated and non-constipated children for at least 2 months

Variables	Constipated (n = 18)	Non-constipated (n = 194)	P value
Lifestyle			
Main caregiver:mother	10/18 (50)	117/193 (60.6)	0.675
2 hours or less of outdoor play activities/day*	18/18 (100)	156/192 (81.3)	0.044
2 hours or more of sedentary activities/day [†]	4/18 (22.2)	26 (13.5)	0.314
5 hours or less at home/day	8/18 (44.4)	71 (37.8)	0.581
Entry into daycare centers before 24 months age*	15/18 (83.3)	106/193 (54.9)	0.020
6 hours or more of attendance at a daycare center/day*	16/18 (88.9)	128/193 (66.3)	0.049
No or difficult defecation at a daycare center*	16/17 (94.1)	83 (43.2)	0.000
Eating habits			
Picky eater before 1 year old	2/18 (11.1)	26/193 (13.5)	0.778
*Breastfeeding for less than 6 months	12/13 (92.3)	74/118 (62.7)	0.033
3 meals or less /day*	4/18 (22.2)	13/193 (6.7)	0.021
No breakfast	2/18 (11.1)	21/193 (10.9)	0.976
500 mL or less of †water intake/day*	12/17 (70.6)	60/180 (33.3)	0.002
200 mL or less of water intake at the daycare center/day [‡]	2/12 (16.7)	35/112 (31.3)	0.294
500 mL or more of milk intake/day	1/18 (5.6)	7/191 (3.7)	0.689
200 mL or more liquid intake/day	5/18 (27.8)	37/187 (19.8)	0.422
No meat consumption*	6/18 (33.3)	9/188 (4.8)	0.000
3 or fewer servings of fruits and vegetables/day*	17/18 (94.4)	139/190(73.2)	0.046

Values are No./total No. (%).

* $P < 0.05$; †Sedentary activities included watching TV or playing with cell phone; ‡Water intake excluded milk and liquids.

Table 4. Comparison between constipated and non-constipated children by multivariate logistic regression analysis

Variables	OR	95% CI	P value
Maternal history of constipation*	4.1	1.2-13.9	0.026
History of painful defecation before age 1*	10.4	1.1-101.3	0.045
History of painful defecation during toilet training*	28.9	1.9-423.8	0.014
2 hours or more of sedentary activities per day [†]	10.0	0.9-103.0	0.052
No or difficult defecation at the daycare center*	5,804.6	134.4-250,718.4	0.000
No meat consumption*	10.1	1.2-88.1	0.036
500 mL or less of water intake/day* [‡]	9.9	0.9-99.5	0.049

* $P < 0.05$; †Sedentary activities included watching TV or playing with cell phone; ‡Water intake excluded milk and liquids.

DISCUSSION

This study showed that maternal history of constipation, early experience of painful defecation, no or difficult defecation at the daycare center, drinking 500 mL or less of water per day, and no meat consumption were risk factors for FC in early childhood, opposed to external factors such as the age of toilet training, the birth of siblings or environmental change (7). In agreement with previous studies, our data showed that breastfeeding for less than 6 months, entry into daycare before 24 months age and eating fewer meals with fruits and vegetables were important factors associated with FC in young children (8,9).

To our knowledge, this is the first study to assess factors of FC related to daycare centers in early childhood. There have been no reports that children who spent 6 or more hours per day at a daycare center were more likely to present with FC. Early recognition and modification of these risk factors are important, because FC associated with daycare centers will continue through middle-school years (11). Some studies have reported that the earlier a child entered daycare, the more pronounced the socio-behavioral problems (12). Those who entered into daycare be-

fore 24 months age were more likely to present with FC, rather than before 6 months and 12 months age in this study. This result might be related with bowel habit change associated with toilet training. In this study, no and difficult defecation at the daycare center were the predictors of FC with high odds ratio in logistic regression analysis. However, a small number of subjects in this study could lead to an overestimation of odds ratio, because no and difficult defecation at the daycare can be the result and the risk for FC (10). To calculate the accurate odds ratio, the study with a larger number of subjects will be needed.

Drinking 500 mL or less of water per day was also a predictor of FC, whereas the amount of water intake at the daycare center was not significantly associated with FC in this study. The results for this item in the questionnaire might be incorrect, because 88 caregivers (42%) reported they did not know. Although there is no evidence that extra water intake is useful to treat FC, caregivers need to be concerned about a child's water intake (13).

This study is meaningful because we assessed the factors predisposing to FC in daycare centers, where most children spend much of the day. These results could be used in behavioral ther-

apy to prevent FC and to modify precipitating factors in early childhood. Notably, this study assessed healthy children in a public environment, while previous studies reported the clinical characteristics of FC in children who visited the hospital with the complaint of constipation or other disorders (14). Among the items in the questionnaire, the refusal to seek treatment despite recognition of a child's constipation is meaningful to pediatricians. Public education about managing and treating FC is needed and parents must be advised that medication, if needed, could be helpful in an individualized regimen that can vary from months to years. A limitation of the study was the lack of accurate data on the amount of water, meat, and fiber intake provided by 24-hour dietary recall. The item of 'afraid to use the toilet at daycare center' can be added in the questionnaire for analyzing the bowel habits at daycare centers. To clarify the precipitating factors for FC at daycare centers, multicenter studies with a larger number of children and additional surveys of daycare teachers will be needed.

Our study determined the predisposing factors for FC in early childhood among the lifestyle and eating habits in the home and in daycare centers. The findings of this study can guide parents, daycare teachers, and clinicians in prevention, early recognition and early intervention for the risk factors associated with FC in young children.

DISCLOSURE

The authors have no potential conflicts of interest to disclose.

AUTHOR CONTRIBUTION

Conception and design: Park M, Bang YG, Cho KY. Acquisition of data: Park M, Bang YG. Analysis and interpretation of data: Park M. Review the literature: Park M, Bang YG. Drafting and revising the manuscript: Cho KY. Manuscript approval: all authors.

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