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Attention-deficit/hyperactivity disorder in children with constipation and fecal incontinence

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ABSTRACT

Background and Objective: There is some evidence of a relationship between attention-deficit/hyperactivity disorder (ADHD) and functional defecation disorders (FDDs), both of which are common in childhood. The aim of the study was to investigate the frequency of ADHD in children with fecal incontinence (FI) and functional constipation (FC).

Methods: This cross-sectional study was conducted on 99 children aged 4-14 years who met the Rome IV criteria to diagnose pediatric chronic FC with FI from January to May 2020. The ADHD was then assessed by the child and adolescent psychiatrist via clinical visits, DSM-5 and Conners Rating Scale (CRS). Pearson's Chi-Square test and Mann-Whitney's test were used to compare children with and without ADHD. A P value <0.05 was considered statistically significant.

Findings: According to DM-V and clinical visits, about 24 (24.2%) children with FC and FI were diagnosed with ADHD. Moreover, six and one of their relatives had anxiety/depression and schizophrenia, respectively. Children with ADHD were significantly male (83%, p= 0.009), older (p= 0.003), heavier (p= 0.005), first born (79%, P < 0.001) and premature (37%, P=0.01) with older mothers (p=0.01).

Conclusion: This study showed that there was a high prevalence of ADHD in children with FC and FI. Therefore, screening of suspected children is recommended.

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Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neurobehavioral and neurodevelopmental disorder characterized by hyperactivity, inattention and/or impulsivity [1]. ADHD is diagnosed if symptoms are present before the age of 12 years, occurs in two or more settings and causes impairment as well as it is the most common behavioral disorder in children [1]. Studies reported that the elimination disorders were associated with emotional and behavioral disorders such as ADHD [2]. According to a population-based study, 20-30%, 20-40%, and even 30-50% of children with daytime urinary incontinence, nocturnal enuresis and fecal incontinence (FI) showed psychological symptoms, respectively [3]. Swanwick concluded that school disturbances were more likely in 75 boys with the diagnosis of fecal incontinence [4]. ADHD is the most common comorbidity in children with nocturnal enuresis, FI and daytime urinary incontinence [2, 5-7]. Functional defecation disorders (FDDs) comprising FC and FI are common in children so that FC is estimated to occur in 0.7%-29.6% of children <1% suffering from FI worldwide.

Constipation and FI often coexist and their symptoms can be boring and torturous for physicians, families and children [8, 9]. Reports demonstrated the relationship between FI and constipation with a psychiatric problem or emotional disturbance in children. It seems that a changed association between the central nervous system and intestinal nervous system may lead to the impaired understanding of neural messages of rectal distention or delayed bowel movements [1]. A retrospective cohort study in the United States suggested that ADHD children had an increase in prevalence rates of FI (0.9% vs 0.15%) and FC (4.1% vs 1.5%) compared to those without ADHD [1].

Few studies evaluated an association between ADHD and FC or FI, and none of them assessed this association in constipated children who had FI. Therefore, the aim of the current study was to evaluate the frequency of ADHD in children with both FC and FI.

Methods

Study design and participant

This cross-sectional study was conducted on children with chronic constipation referred to the Pediatric Gastroenterology Clinic at Amirkola Children's Hospital in Iran from January to May 2020. Eligible participants were 4-14-year-old children who met the Rome IV criteria to diagnose pediatric chronic FC with FI. Exclusion criteria were a history of anal surgery, taking medications that cause constipation in the past two months, FC and FI due to other disorders such as psychomotor retardation, hypothyroidism, cystic fibrosis, celiac disease and so on.

Data collection

The sampling method was applied through the census. All children (99 children) were examined by a pediatric gastroenterologist at the beginning of the study. Subsequently, the children with constipation were evaluated for ADHD by a child and adolescent psychiatrist using clinical visits and the DSM-V, and Conners Rating Scale (CRS). CRS is developed to assess ADHD and its related behavioral problems in adolescents and children aged from 3 to 17 years, and CRS includes subscales, namely oppositional, hyperactivity cognitive problems or inattention subscales as well as a Conners ADHD Index. The Conners ADHD Index contains items that best distinguish children with ADHD from those without ADHD [10]. Higher CRS scores are associated with greater frequency of problem behaviors. ADHD symptoms were assessed using 18 DSM-5 subscales including nine items related to inattentive behavior and nine items related to hyperactivity/ impulsivity [11, 12].

In addition, demographic and medical data of the patients were collected. Demographic data such as age, gender, gestational age, age of parents, ranking of child and medical data such as duration of constipation, atopic

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diseases in the children, history of mental disorders and family history of constipation in the children and their family. This information was collected by a pediatric gastroenterologist (second author).

Statical analysis

The data were compared in children with and without ADHD. Frequencies and percentages were used to describe categorical variables. Normally distributed continuous variables were described by means and standard deviations. Fisher's Exact Test and Pearson's Chi-square test for categorical variables as well as Student t-test and Mann-Whitney's test for continuous variables were utilized to examine and compare children with and without ADHD.

Results

A total of, 99 children with a mean age and weight of 6±2 years and 24 ± 9 kg participated in this study for 12 months. Male and term-born children accounted for 60 (60.6%) and 81 (81.8%) of the participants, respectively.

According to the DSM-5 and clinical visits, a total of 24 (24.2%) children with FC and FI met the criteria for an ADHD diagnosis. Moreover, six and one of their relatives had anxiety/depression and schizophrenia, respectively. Demographic data by ADHD status are summarized in Table 1. Children with ADHD were significantly older, more often boys, and firstborns in their families. They were also more likely to have higher body weight and older mothers.

A comparison of children with and without ADHD showed that the duration of constipation was 22±16 and 11±13 months, respectively ($p < 0.0001$). Moreover, a family history of constipation ($p<0.0001$) and atopic disease ($p < 0.0001$) was found in 17 (70%) and 7 (29%) children with ADHD, respectively.

Table 1. Demographic characteristics of children with and without ADHD

Variables	Children with ADHD (N=24)	Children without ADHD (N=75)	P.value
Age* (years)	8 [7-9]	5[4-8]	0.003[&]
Sex (Male %)	20 (83 %)	40 (53 %)	0.009
Weight* (Kg)	28[23-30]	19[16-30]	0.005[&]
Preterm Delivery (%)	9(37%)	9(12%)	0.01
Mother age* (years)	34[33-36]	32[29-36]	0.01[&]
Father age *(years)	40[37-45]	39 [33-42]	0.08[&]
Firstborn (%)	19 (79 %)	66(88%)	<0.0001

&. Comparisons made between children with and without ADHD using Mann-Whitney U test, *. Median [IQR]: Interquartile range.

Discussion

The ongoing study assessed the ADHD frequency in children with FC and FI. In this sample, 24% of children presenting with FC and FI had diagnostic criteria for ADHD according to the DSM-5. This figure in the general population was higher than the prevalence of 5% [13].

In a study by Kuizenga et al. [14], ADHD was diagnosed according to DSM-IV criteria in 254 6-16-year-old children who met Rome III criteria for functional non-retentive FI or FC. They reported an ADHD prevalence of 10.3% in children with at least one subtype of incontinence, with ADHD prevalence rates of 12.2% (28 children) and 7.9% (7 children) in 156 children with FC and FI, respectively and 76 FC children without FI.

In a study by Niemczyk et al., among 1676 families of German schoolchildren who completed a questionnaire regarding FI, urinary incontinence (UI), with all DSM-IV items of ADHD, there was an ADHD

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prevalence of 10.3% in children with at least one subtype of incontinence [13]. Moreover, a population-based study reported that 9.2% of children with FI had ADHD [11].

In another population-based study by McKeown et al. [1], 32,773 (4.4%) out of 742,939 children aged 4-12 years had ADHD, and there was an increased prevalence of FC (4.1% vs 1.5%, P< 0.001) and FI (0.9% vs 0.15%, P < 0.0001) in children with ADHD than those without ADHD. Although these studies have described an association between FC, ADHD and FI, our results are comparable to other studies. The differences between the studies can be attributed to methodological factors, particularly differences in the definitions and diagnostic criteria used and in the clinical assessments. However, in the current study, clinical visits were conducted for the diagnosis of both FC and ADHD without using only standardized criteria such as Rome IV and DM-V. In addition, the current study was performed on children with constipation and unlike other studies, it was not a population-based study, which could also lead to higher rates.

Regarding gender differences, boys are at a higher risk for ADHD symptoms and are more affected than girls, which is consistent with other studies [1, 2, 15]. In a study by McKeown et.al, [1] children with ADHD were older and more likely to be firstborns in their families, which is in agreement with our results. There are several studies that point to risk factors for ADHD and an association between ADHD and masculinity [16, 17], prematurity [18], first birth [19, 20], and obesity [21], all of which agree with our findings. Regarding maternal age, teenage birth has been associated with an increased risk of ADHD in the offspring [16, 19], although the current study considered the time of the start of the study rather than the first birth.

The strength of this study was the use of the CRS, which was designed for clinical diagnosis, screening, treatment monitoring, and also for research.

Limitations of the study

Since this was a cross-sectional study, no causal relationship between ADHD and constipation and/or incontinence could be explained in these children. An analytical and longitudinal study is required to elucidate the causal relationship. It would be better to investigate the association between an ADHD diagnosis and constipation and FI in a study including three groups: constipated children with ADHD, ADHD children with constipation and FI, and a control group, which was not done here due to the financial and time constraints.

Conclusion

The present study indicated a high frequency of ADHD in children with FC and FI. Thus, screening and referral to a specialized mental health facility are recommended when ADHD and other disorders are suspected in children with constipation and incontinence.

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Ethical Code

The study protocol was approved (IR.MUBABOL.HRI.REC.1398.357) by the Ethics Committee of Babol University of Medical Sciences. Written informed consent was obtained from all parents.

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Conflict of interest

The authors declare that there is no conflict of interest.

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