



Prevalence of attention deficit hyperactivity disorder (ADHD) in children presenting with foreign body ingestion [☆]



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ABSTRACT

Background: Foreign body ingestion is a common condition in children. We aimed to compare the incidence of attention deficit hyperactivity disorder (ADHD) symptoms in children that ingested foreign bodies with healthy children.

Methods: The study group consisted of 3- to 17-year-old pediatric patients admitted to the emergency department after foreign body ingestion, and the control group was formed with children having similar demographic and cultural characteristics that presented to the same department for non-traumatic causes. After initial intervention and stabilization, we administered the Conners' Parent Rating Scales-Revised (CPRS-R) to both groups.

Results: The study group consisted of 53 patients with a mean age of 7.83 ± 4.36 and the control group comprised 47 children with a mean age of 7.72 ± 3.48 years. There were no statistically significant differences between the study and control groups in terms of age, gender, and parental education levels ($p > 0.05$ for each). The foreign objects most ingested by children were coins (32.1%), followed by needles (15.1%) and beads (9.4%), and all the patients recovered without complications and were discharged. All the CPRS-R subscale scores were significantly higher in the study group than in the control group ($p < 0.001$). The parental education levels of the study group were not significantly correlated with DSM-IV hyperactivity-impulsivity and DSM-IV total.

Conclusion: We found that the incidence of ADHD symptoms may be high in children referred to emergency services after accidentally ingesting foreign bodies.

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1. Introduction

Foreign body ingestion is mostly seen in the early childhood period and is a common reason for emergency admissions [1]. According to the data of the American Association of Poison Control Centers, 75% of a total of 116,000 foreign body ingestion cases in 2000 belonged to children aged below five and were usually accidental [2]. Anything with the potential of passing through the pharynx can be swallowed by children, including coins, toys and their parts, pens, pencil head, pins, chicken bone, and fishbone. In general, there is no life-threatening injury and these objects often leave the gastrointestinal tract without causing any problem

[3]. However, in cases where the foreign body is embedded in the esophagus wall and especially if the ingested body is a battery, it can inflict serious harm on the patient [4]. It has also been reported that when swallowed, pins, hair clips and open safety pins can lead to perforation of the duodenum [5]. However, the rate of complications, such as perforation and obstruction is below 10% [2]. The main reasons for foreign body ingestion can be listed as children's curiosity that leads them to explore objects by mouth, attempts to attract attention, boredom, mental retardation, and hyperactivity-behavior disorders [6].

Childhood accidents occur due to several factors, such as a triggering situation, the physical and social environment, and the psychological, behavioral and emotional state of children [7]. Attention deficit hyperactivity disorder (ADHD) is characterized by lack of attention, hyperactivity, and impulsivity symptoms that start during the early developmental period but are not appropriate for an individual's age and developmental stage [8]. Children experiencing this condition often act without thinking or paying

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attention, and thus they are more likely to be involved in accidents. ADHD is one of the most common neuropsychiatric disorders of childhood, and it has an incidence of 5% in children and 2.5% in adults [9].

In the literature, there are many studies investigating the presence of hyperactivity in children admitted to the otorhinolaryngology clinic after inserting a foreign body into their nose or ears [10–12]. In the current study, we aimed to compare the incidence of ADHD symptoms in children that presented to our emergency service with accidental foreign body ingestion and healthy individuals.

2. Methods

2.1. Study description and design

This was a prospective, case control study conducted in the adult emergency service of a tertiary hospital. Prior to the study, the approval of the clinical research ethics committee of Adiyaman University was obtained. In the routine practice of our hospital, children that present with trauma are evaluated in the adult emergency department and the remaining pediatric patients in the pediatric emergency department. Our adult emergency department serves an average of 25,000 patients a month.

Three- to 17-year-old patients admitted to the adult emergency department due to foreign body ingestion were included in the study group. Then, the control group was formed with pediatric patients of similar age and cultural characteristics that presented to the pediatric emergency department for non-traumatic reasons. First, all patients underwent necessary medical intervention. After the stabilization of the patients' general condition, their parents were informed about the details of the scientific study to be undertaken. The parents that volunteered to take part in the study were administered the Conners' Parent Rating Scales-Revised (CPRS-R). In addition, information on age, gender, parental education levels, and the ingested foreign body was recorded. Children that had previously been diagnosed with ADHD or a behavior disorder were not included in the study. The parents' contact information was noted and they were told that they would be informed about the results of the study and if necessary, their children would be followed up by a child psychiatrist for treatment if they provided consent.

2.2. Conners' Parent Rating Scales

CPRS-R is a parental scale frequently used in the evaluation of ADHD. It consists of 80 items presented under 14 subscales. Taking into account the behavior of their children within the last month, the parents respond to each item on CPRS-R as not true at all (0 point), somewhat true (1 point), certainly true (2 points) or very much true (3 points) [7]. Using this scoring, the total score of each subscale is calculated and the test is terminated. The subscales evaluated in this study were; hyperactivity, opposition, cognitive problems/inattention, anxiety-shyness, perfectionism, social problems, psychosomatic disorders, ADHD index, Conners' global index: discomfort-impulsivity, Conners' global index: emotional lability, Conners' global index: total, DSM-IV symptoms: inattention, DSM-IV symptoms: hyperactivity/impulsivity, and DSM-IV symptoms: total.

2.3. Statistical analysis

The Kolmogorov-Smirnov test was conducted to determine whether variables were normally distributed. In the analysis of

descriptive statistics, the median values (minimum and maximum values) were used for the variables without a normal distribution, whereas the mean \pm standard deviation values were obtained for the normally distributed variables. The distribution of the categorical variables was expressed as number (n) and percentage (%). The chi-square, Student's *t*-test, and Mann-Whitney *U* test were performed for inter-group comparisons. Statistical analyses and calculations were undertaken using SPSS program v. 17. The level of statistical significance was accepted as $p < 0.05$.

3. Results

During one year of the study period, 53 children aged 3–17 years were admitted to the emergency department due to foreign body ingestion. The mean age of the patient group was 7.83 ± 4.36 years (range: 3 to 17), and 26 (49.1%) were female. The control group consisted of 47 children with a mean age of 7.72 ± 3.48 years (range: 3 to 16), and 51.1% of the cases in this group were girls. There were no statistically significant differences between the two groups in terms of age, gender, and parental education level ($p = 0.76, 0.841, 0.611, \text{ and } 0.689$, respectively). The foreign objects ingested by the children in the study group were as follows: coin ($n = 17$), pin ($n = 8$), bead ($n = 5$), battery ($n = 5$), fruit peel or kernel ($n = 4$), magnet ($n = 2$), hair clip ($n = 2$) and ring ($n = 2$). A large proportion of these cases (84.9%) were discharged from the emergency department after outpatient intervention, and the remaining were hospitalized and discharged upon full recovery (Table 1).

The patient and control groups were found to have statistically significant differences for all the subscales of the newly introduced CPRS-R (oppositional, cognitive problems/inattention, hyperactivity, anxiety-shyness, perfectionism, social problems, psychosomatic disorders, ADHD index, Conners' global index: restlessness-impulsivity, Conners' global index: emotional lability, Conners' global index: total, DSM-IV symptoms: inattention, DSM-IV symptoms: hyperactivity/impulsivity, and DSM-IV symptoms: total) ($p < 0.001$) (Table 2). Age and gender did not affect CPRS-R scores in the patient group. In this group, the mother's and father's education levels were not significantly correlated with DSM-IV hyperactivity-impulsivity when evaluated separately (Table 3).

Table 1
Descriptive statistics.

Characteristics	n (%)
Age	
≤ 5	21 (39.6)
$5 < \leq 10$	20 (37.7)
> 10	12 (22.7)
Swallowed objects	
Coin	17 (32.1)
Pin	8 (15.1)
Beads	5 (9.4)
Battery	5 (9.4)
Fruit kernels or peels	4 (7.5)
Magnet	2 (3.8)
Hair clip	2 (3.8)
Ring	2 (3.8)
Others	8 (15.1)
Education level of mothers	
Primary school	35 (66.1)
High school	13 (24.5)
University	5 (9.4)
Outcome	
Admitted	8 (15.1)
Discharged	45 (84.9)

Table 2
Comparison of control and study groups by demographics and CPRS-R subscale scores.

	Control group (n = 47)	Study group (n = 53)	p value
Age	7.72 ± 3.48	7.83 ± 4.36	0.760
Gender			0.841
Female	24 (51.1%)	26 (49.1%)	
Male	23 (48.9%)	27 (50.9%)	
Oppositional	8 (1–23)	19 (4–30)	<0.001
Cognitive problems/ inattention	4 (0–18)	13 (0–35)	<0.001
Hyperactivity	5 (0–14)	17 (3–25)	<0.001
Anxious-shy	37 (1–17)	63 (2–23)	<0.001
Perfectionism	6 (0–15)	9 (4–20)	<0.001
Social problems	2 (0–6)	5 (0–13)	<0.001
Psychosomatic	3 (0–9)	5 (1–16)	<0.001
ADHD-I	7 (1–18)	18 (2–28)	<0.001
Conners' global index	3 (0–13)	12 (0–21)	<0.001
Discomfort			
impulsivity			
Conners' global index	2 (0–7)	6 (0–9)	<0.001
Emotional lability			
Conners' global index	6 (0–17)	17 (0–28)	<0.001
Total			
DSM IV Symptom	5 (1–15)	12 (0–26)	<0.001
Subscales:			
inattention			
DSM IV Symptom	5 (1–14)	17 (4–26)	<0.001
Subscales:			
hyperactivity- impulsivity			
DSM IV Symptom	11 (4–28)	30 (4–48)	<0.001
Subscales: total			

CPRS-R Conners' Parent Rating Scale-Revised; DSM IV Diagnostic and Statistical Manual of Mental Disorders fourth edition; ADHD-I Attention Deficit Hyperactivity Disorder Index.

Table 3
Correlation between educational level of parents and some variables.

Variables	DSM IV hyperactivity-impulsivity r (p value)	DSM IV total r (p value)
Mother educational level	–0.031 (0.826)	0.08 (0.952)
Father educational level	0.009 (0.95)	0.019 (0.893)

DSM IV: Diagnostic and Statistical Manual of Mental Disorders fourth edition; r: Spearman correlation rho.

4. Discussion

In this study, it was determined that hyperactivity, opposition, cognitive problems/inattention, anxiety-shyness, perfectionism, social problems, and psychosomatic disorders were more common in children who presented to the hospital with foreign body ingestion. To the best of our knowledge, this is the first study in the literature that examined the relationship between foreign body ingestion and a psychiatric disorder.

ADHD is a neurobehavioral problem that affects about 5% of school-age children and it is difficult to diagnose. CPRS-R consists of questions directed at parents can be used to evaluate children performing behaviors indicative of ADHD [13]. Children with ADHD and oppositional behavior are more likely to be accidentally injured than normal children. ADHD is more common in the post-three age group, especially when parental control decreases. If this disease is not diagnosed early and treatment is not started immediately, it negatively affects the individual throughout his/her life [7,14]. For example, Nigg et al. [9] reported that people diagnosed with ADHD have higher rates of substance use, smoking, hypertension, diabetes, obesity, and sleep problems, and consequently increased mortality and morbidity.

The relationship between psychiatric disorders and traumas, such as falls, poisoning, injuries and burns in children has been widely investigated and is relatively well known; however, research on foreign body ingestion is limited [15]. Perera et al. [10], Özcan et al. [11], and Celenk et al. [12] evaluated children that placed a foreign body into their mouth, ears or nose, and in their respective studies, all authors reported the presence of high incidence for ADHD. Consistent with this finding, Tavarez et al. [16] suggested that multiple foreign body ingestions could be seen in patients with an ADHD diagnosis. Furthermore, Cakmak et al. [13] found that children that accidentally swallowed caustic chemicals had higher prevalence of ADHD than healthy children.

Concerning the rate of injury among children diagnosed with ADHD, male sex and older age were reported to create a higher risk of trauma [17]. However, other researchers noted that age and gender did not affect children's behavior of placing foreign objects into mouth, nose or ear [10,11]. Similarly, we did not find a significant relationship between the prevalence of ADHD symptoms and age or gender. In a study conducted with children that inserted a foreign body into the nose or ear, Bakhshae et al. [15] found that the parents with lower education levels had higher test scores for psychological problems. In the current study, parental education levels did not affect CPRS-R scores.

Young children are curious to look around and learn about their surrounding and one of the actions they take during their exploration is to place foreign bodies into their mouth, nose or ears. This is mostly seen in boys and under six years of age [3]. The most swallowed object is coin followed by toys and toy parts, and chicken and fish bones [18]. Most of these ingested objects leave the gastrointestinal tract without requiring intervention. However, in the literature, cases related to damage of the gastrointestinal tract have been reported following ingestion of sharp objects, such as magnets and pins [4,5,19]. In the current study, contrary to previous related studies, foreign body ingestion was mostly seen in girls and most cases were aged below eight. Consistent with the literature, we found the most ingested objects to be coins, pins, beads, and batteries. Most of our patients older than 10 years were female and had swallowed pins. This was considered to be due to some Turkish girls starting to wear a headscarf in adolescence, which requires a pin to keep it in place. In most of our cases, the foreign body was spontaneously passed through the gastrointestinal tract and none of the hospitalized patients developed any complication.

5. Conclusion

In this study, it was determined that the prevalence of ADHD symptoms may be higher in children that ingested foreign bodies. Emergency physicians should take this possibility into consideration and immediately refer suspected cases to pediatric psychiatry since a late diagnosis of ADHD can adversely affect a person throughout their life. We believe that the new studies with higher number of patients will give more generalized results which will be referral for all clinicians.

Conflict of interest

None of the authors report any conflicts of interest.

Declarations of interest

None.

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The authors declare that no patient data appear in this article.

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