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Cognitive and behavioral characteristics of children with caustic ingestion

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ABSTRACT

Background/aim: Children with attention-deficit/hyperactivity disorder (AD/HD) have risk taking behavior and are more prone to sustaining injury. It is aimed to evaluate the cognitive and behavioral characteristics of children with caustic ingestion.

Patients and methods: Ninety two children with a history of nonsuicidal caustic ingestion (CI, n = 46) and healthy subjects (HS, n = 46) admitted to pediatric surgery department were enrolled into the study. Patients in groups were evaluated for age, sex, number of siblings and educational status of the parents. Before filling the questionnaires, the children were undergone flexible endoscopy and treated accordingly. Conners Parents Rating Scale-revised long form (CPRS-R:L), validated for Turkish Children, was used to evaluate the cognitive and behavioral characteristics of children. Parents rate their child's behavior with a four-point Likert scale. Subscales of CPRS-R:L including cognitive problems/inattention (CG/I), hyperactivity (H), attention deficit hyperactivity disorder index (AD/HD-I), Conners' Global Index-discomfort-impulsivity (CGI-DI), DSM-IV-symptom subscale-inattention (DSMIV, SS-I), DSM-IV-symptom subscale-hyperactivity-impulsivity (DSM-IV, SS-HI), DSMIV-symptom subscale-total score (DSM-IV SS-T) were used to determine the severity of the AD/HD symptom. Demographic features and cognitive/behavioral characteristics of children with caustic ingestion were compared with healthy subjects.

Results: The median age of the patients was 4 (2–14 years) in both CI and HS groups. Female male ratio was 13:33 in CI and 12:34 in HS. Sixty seven percent of patients were preschool children (younger than 5 years of age) in both CI and HS groups. There was no difference between groups for number of siblings ($p > 0.05$). Parents of HS group had higher educational status than parents in CI ($p < 0.05$). When subscale scores of CPRS-R:L compared between CI and HS groups, CI group had higher CGI-DI scores than HS ($p < 0.05$). Children younger than five years of age had higher scores of H, emotional instability and total CG/I in CI than HS group ($p < 0.05$).

Conclusion: Children with caustic ingestion had impulsiveness behavior when compared to healthy children. In addition to impulsivity, hyperactivity can be also assessed as a risk factor for caustic ingestion in children younger than 5 years of age. We suggest that association between AD/HD behavior and risk of sustaining injuries was also confirmed for caustic ingestion in children.

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Attention-deficit/hyperactivity disorder (AD/HD) is a common behavior disorder in children with a prevalence of 5% in general population [1]. The characteristic features of AD/HD include hyperactivity, impulsivity and inattentiveness [2]. These behaviors cause inability to judge the safety of situation and make the children with AD/HD more prone to sustained injury. The association between AD/HD and risk of burn injuries, head injuries and fractures was well documented [3–6]. Also, it has been recognized that prevalence of self inserted foreign bodies was higher in children with AD/HD [1,2,7].

Caustic ingestions are common cause of esophageal injury in children with high morbidity and mortality. Most of the children ingest caustic agents accidentally. Although many accidental injuries were attributed to possible relation between AD/HD in children, no controlled study which evaluate this possibility between caustic ingestion and AD/HD. Therefore, the aim of the present

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study was to investigate the cognitive and behavioral characteristics of children with caustic ingestion.

1. Patients and methods

For the last six months, children with a history of nonsuicidal caustic ingestion (CI, n = 46) were enrolled into the study. Healthy subjects (HS, n = 46) with a presumptive diagnosis of inguinal hernia, constipation and abdominal pain, admitted to two pediatric surgery departments were also assessed as control group. According to the previous study reported by Uslu et al, the minimum number of patients was found 44 in order to obtain a power of $1-\beta = 0.80$ for $\alpha = 0.05$.

Patients in groups were evaluated for age, sex, number of siblings, family type and educational status of parents. Before filling the questionnaires, the children undergone flexible endoscopy and were treated accordingly. All endoscopic evaluations were performed with flexible endoscope in the first 24 hours of caustic ingestion.

Conners' Parents Rating Scales-revised long form (CPRS-R:L) are common rating scales in AD/HD evaluation [8]. The scale was translated to Turkish and validated for use of research and clinical purposes by Kaner et al [9]. In this scale parents rate their child's behavior with a four-point Likert scale. In the scale; 0, never; 1, rarely; 2, often; 3, always. Subscales of CPRS-R:L including cognitive problems/inattention (CG/I), hyperactivity (H), attention deficit hyperactivity disorder index (AD/HD-I), Conners' Global Index-discomfort-impulsivity (CGI-DI), DSM-IV-symptom subscale-inattention (DSM-IV, SS-I), DSM-IV-symptom subscale-hyperactivity-impulsivity (DSM-IV, SS-HI), DSM-IV-symptom subscale-total score (DSM-IV SS-T) were used to determine the severity of the AD/HD symptom [3]. Demographic features and cognitive/behavioral characteristics of children with caustic ingestion were compared with healthy subjects. Also, rating scores were compared in children younger than 5 years of age with school aged children (>5 years of age).

1.1. Ethics and statistics

The study was approved by local ethic committee (12.11.2012-11/02). Data obtained from the study were analyzed with SPSS 15.0. Nonparametric test and chi-square were used to compare the rating scales in CI and HS groups. The p values less than 0.05 was considered to be significant.

2. Results

Each group consists of 46 patients. The median age of the patients was 4 (2–14 years) in both CI group and HS groups. Female male ratio was 13:33 in CI and 12:34 in HS groups. Sixty-seven percent of patients were preschool children (under 5 years of age). The median levels of demographic features including, age, sex, number of siblings and educational status of patients were listed in Table 1. There was no difference between groups for number of siblings ($p > 0.05$). Parents of HS group had higher educational status than parents in CI ($p < 0.05$). The most common ingested substance was sodium carbonate (bleach, n = 16, 34.8%). Other substances were detergents, sodium hydroxide (drain openers) sodium phosphate and ammonium hydroxide. The definition of endoscopic findings and grades of patients were listed in Table 2 [10]. There was correlation between endoscopic findings and CPRS-L scores ($p > 0.05$).

The mean levels of CPRS-R:L subscale scores were listed in Table 3. When parameters of CPRS compared between CI and HS groups, CI group had higher CGI-DI scores than HS group ($p < 0.05$). Other subscales showed no difference between groups ($p > 0.05$).

In Table 4, the mean rating subscales for each CPRS-R:L parameter are listed. When children younger than 5 years of age were compared with school age children, preschool children had higher scores of H, emotional instability and total CG/I in CI than HS group ($p < 0.05$).

Table 1
Demographic features of children with caustic ingestion (CI) and healthy subjects (HS).

Demographic features (median, min-max)	CI (n = 46)	HS (n = 46)	p values
Age (years)	4 (2–14)	4 (2–14)	>0.05
Sex (female/male)	13:33	12:34	>0.05
Number of siblings	1 (0–5)	1 (0–1)	>0.05
ES* of mother			
No higher education	44 (95.6%)	28 (55%)	<0.05
With higher education	2 (4.4%)	18 (45%)	
ES* of father			
No higher education	35 (80%)	29 (56.4%)	<0.05
With higher education	9 (20%)	17 (43.6%)	

* ES: Educational status.

Table 2
Grades of endoscopic findings in children with CI.

Grades	Defination (Dept of mucosal involvement)	Number of cases
Normal	Normal endoscopic findings	24
Grade I	Superficial mucosal hyperemia, edema, and sloughing	9
Grade II	Transmural involvement with exudates, ulceration, and muscle involvement and pseudomembrane formation	8
Grade III	Eschcar formation, obliteration of lumen, and deep ulceration	5
Grade IV	Erosion through the esophagus into the periesophageal tissue, mediastinum, pleural or peritoneal cavities	0

3. Discussion

AD/HD is one of the most common neurobehavioral disorders affecting 5% of school-aged children [1]. Although AD/HD is a well-recognized disorder, no validated test is available to confirm the diagnosis [11]. The CPRS is used to evaluate the behavioral disorders suggesting an AD/HD by a detailed parental interview.

Children with AD/HD exhibit risk taking behavior. Children with behavioral disorders have been reported to have 1.5 times higher risk for injury [12]. It has been showed that AD/HD was found to be associated with two fold increased risk of burns, poisoning, head injury and fractures [12,13]. Parera et al found significantly higher prevalence of inserted aural and nasal foreign bodies in AD/HD children when compared with normal children [1]. Accidental ingestion of caustic agents is a common cause of esophageal injury in children and constitutes an important cause of morbidity and mortality. Although, relationship between AD/HD and other accidental injuries has been evaluated, the cognitive and behavioral characteristics of children with caustic ingestion have not been evaluated. In this study, we hypothesized that children with caustic ingestion had cognitive and behavioral characteristics suggesting an associated AD/HD.

Table 3
CPRS-R:L subscale scores.

Subscales	CI, mean ± SD	HS, mean ± SD	P values
CG/I	11.2 ± 5.6	9.5 ± 5.3	>0.05
H	12.3 ± 6.4	10.0 ± 5.7	>0.05
ADHD-I	12.4 ± 5.3	10.6 ± 6.8	>0.05
CGI-DI	8.7 ± 4.2	6.5 ± 3.7	<**0.05***
DSM-IV-SS-I	8.4 ± 4.3	8.1 ± 5.7	>0.05
DSM-IV-SS-HI	13.1 ± 5.5	10.7 ± 5.8	>0.05
DSM-IV-SS-T	20.5 ± 8.3	18.5 ± 10.3	>0.05

Abbreviations: CG/I: Cognitive problems/inattention, H: Hyperactivity, AD/HD-I: Attention deficit hyperactivity disorder index, CGI-DI: Conners' Global Index-discomfort-impulsivity, DSM-IV, SS-I: DSM-IV-symptom subscale-inattention, DSM-IV, SS-HI: DSM-IV-symptom subscale-hyperactivity-impulsivity, DSM-IV SS-T: DSM-IV-symptom subscale-total score.

Table 4
The mean ratings of CRPS-R:L subscales for children with caustic ingestion under and above 5 years of age.

Subscales	Children <5 years of age (mean ± SD)	Children >5 years of age (mean ± SD)	p values
CG/I	8.2 ± 4.2	6.7 ± 3.8	<0.05*
H	12.3 ± 6.4	9.4 ± 5.5	<0.05*
ADHD-I	11.1 ± 6.9	11.5 ± 5.7	>0.05
CGI-DI	3.3 ± 1.9	2.1 ± 2.2	<0.05*
DSM-IV-SS-I	8.0 ± 4.9	8.4 ± 5.4	>0.05
DSM-IV-SS-HI	12.9 ± 5.8	10.4 ± 5.4	>0.05
DSM-IV-SS-T	20.3 ± 9.6	18.3 ± 9.4	>0.05

For each parameter mean and standard deviation of scores were given. (CI: Caustic ingestion).

The demographic data obtained from the study showed that there was no difference for age, sex and number of siblings in groups. However, educational status of both mothers and fathers was higher in HS when compared to CI group. The review of the literature suggests that socioeconomic level of parents has inverse relation between frequencies of accidental injuries in children [14]. Our data confirm that educational status of parents is significantly lower in children with CI.

The results of our study showed that parents of children with caustic ingestion rated higher impulsivity scores for their children. The data obtained from CPRS-R:L score surveys indicate significant impulsivity behavioral pattern in these children. In previous studies, all of the CPRS scores were significantly higher in children with trauma, burns and self-inserted foreign bodies [1,3]. In our study, we only found significant difference in impulsivity. Therefore, we could not conclude that children with CI had higher prevalence of AD/HD. However, we suggest that impulsivity is an important behavioral phenotype in children with CI and can be considered as one of the risk factors in the etiology.

Some of the previous studies showed that preschool children had lower scores of hyperactivity when compared to older children [1]. On the other hand, Celenk et al reported that children with 3–4 years of age have similar CRPS scores in both patient group and healthy controls [2]. Their study also showed that children who are more vulnerable to accidental injury had abnormal scores between 5 and 9 years [2]. Ozcan et al found higher score of hyperactivity in older children [7]. In contrast to previous studies, our results showed that children younger than 5 years of age had higher scores of hyperactivity, emotional instability and total CGI. Therefore, we suggest that for all ages, children with caustic ingestion may associate with impulsivity as a behavioral marker. However, other behavioral patterns of AD/HD such as hyperactivity and emotional instability are encountered in younger children.

This study has emphasized the increased risk of ADHD in children who ingested caustic substance and provides awareness for early diagnosis. Besides, these children should be protected against accidents and there should be environmental protective precautions including caustic substances. It is not always possible to protect these impulsive children from dangers so they should be kept safe by increasing protective precautions.

Pediatric surgeons and pediatricians can do screenings in children who admitted after an accident or caustic substance ingestion by asking some symptomatic questions and discuss the scores with a psychiatrist to maintain early diagnosis and protect against future accidents. Besides, close follow-ups would help in early treatment [11].

The limits of this study were the unavailability of parent screens for ADHD. Most of the studies have proved that ADHD is a familial disease. These children might be susceptible to accidents because of their parents. Family screenings can also be done and other siblings or parents could be diagnosed and followed-up by this study.

In conclusion, children with caustic ingestion had more impulsive behavior when compared to healthy children. In addition to impulsivity, hyperactivity can be also assessed as a risk factor for caustic ingestion in children younger than 5 years of age. Our findings show that association between AD/HD behavioral characteristics and risk of sustaining injuries was also confirmed for caustic ingestion in children.

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