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Comparing the Frequency of Unrecognized Attention Deficit Hyperactivity Disorder Symptoms in Injured Versus Noninjured Patients Presenting for Care in the Pediatric Emergency Department

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Abstract

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common pediatric mental health problems but often goes unrecognized. Children with ADHD have an increased risk of injuries. Whether injured children presenting to the emergency department (ED) have an increased frequency of unrecognized ADHD symptoms compared to noninjured children is not known.

Purpose: Examine the association of medically unrecognized ADHD symptoms in injured compared to noninjured children presenting to a pediatric ED.

Methods: A prospective age- and sex-matched cross-sectional comparison design of parent reported ADHD symptoms based on the Vanderbilt Assessment Scale in injured and noninjured children ages 5 to 18 years. Families were excluded if ADHD was listed in the medical history by nurses or physicians or if the child was currently taking medications for ADHD. Injured children were matched with noninjured children who presented with medical complaints. Univariate and bivariate analyses were performed. Proportions of children with ADHD symptoms in injured and noninjured children were compared with the χ^2 statistic.

Results: One hundred sixty-four mothers of children were enrolled into the study: 82 in the injured and 82 noninjured group. The frequency of parent reported ADHD symptoms was the same in the 2 groups (9.8%).

Conclusions: Children presenting with injuries are no more likely than a noninjured age- and sex-matched group to have unrecognized ADHD based on parental screen. Targeting injured children for ADHD screening is not supported by this study.

Keywords

ADHD screening; injury

Attention Deficit Hyperactivity Disorder (ADHD) is a common mental health problem in children affecting between 3% and 12% of all school age children.¹ Attention Deficit Hyperactivity Disorder is more common among boys than girls and is most prevalent among whites, followed by African Americans and Hispanics.² Children with specific temperaments and externalizing behavior problems have been shown to be at increased risk for injury.^{3–13} Unintentional injury is a leading cause of emergency department (ED) visits for children and adolescents in the United States.¹⁴ However, there are little data on the association of unrecognized childhood ADHD in children presenting for injury-related ED visits.

Injuries remain today as the leading cause of mortality and morbidity in children less than 19 years and account for more than a third of all ED visits for US children.^{14–16} Children with ADHD have a markedly higher rate of less severe injuries in the preschool setting.¹⁷ Older children with injury-related hospital admissions are more likely to carry a diagnosis of ADHD,¹⁸ however, younger children have a higher rate of injury-related emergency department visits, some of whom may have unrecognized ADHD.¹⁹ Although an association of children with ADHD and injury has been documented,^{20,21} it is not clear whether an injury visit to the emergency department may represent the first medical encounter or sentinel event for a child with previously unrecognized ADHD. The purpose of this study was to examine the association of medically unrecognized ADHD symptoms in children who present to the ED with injuries compared with children presenting for other medical conditions.

METHODS

Design

The study was a prospective age- and sex-matched cross-sectional comparison design that consisted of interviewer-administered questionnaires with parents of children ages 5 to 18 years who presented to a large tertiary pediatric emergency department from June 10, 2004 to August 10, 2004. This study was nested in a larger study examining the prevalence of unrecognized mental health problems in children presenting for care in an emergency department setting.²²

Subject Recruitment

A trained research assistant approached mothers of injured and noninjured children for enrollment. Multiple trauma patients and those patients requiring intravenous pain medications were excluded. Patients were approached after initial triage and nursing assessments early in the emergency department encounter. Patients were also excluded if they were non-English speaking (at the time of the study less than 1% of patients were non-English speaking), did not present with their mother, had a history of ADHD indicated on the chart, or were previously enrolled in the study. Fathers were excluded from the study

because maternal mental illness was a variable of interest in the larger mental health prevalence study. Injured children who consented and enrolled were age- and sex-matched on a one-to-one basis to the next patient who was within 1 year of age of the injured child and who was presenting to the main area of the ED with a medical diagnosis. Chief complaints of the noninjured comparison group included common medical conditions such as respiratory problems and gastroenteritis. Recruitment of participants occurred in 5 to 6 hour shifts approximately every 4 days across a 2-month enrollment period. All eligible injured patients during a shift were approached for participation.

Participants

Of the 189 mother-child dyads that met eligibility criteria during the study hours, 164 agreed to participate. Twenty-five mothers declined to participate, 15 in the noninjured group and 10 in the injured group. The families who declined to participate were similar to the study population with regard to demographic characteristics.

Classification of “Medically Recognized” ADHD History

In an attempt to exclude children, injured or not, who already carried a diagnosis of ADHD, patient records were prescreened for an established history of ADHD before being approached using the pediatric ED computerized charting system. Families were not directly asked about a history of ADHD by the research assistant before enrollment. Attention Deficit Hyperactivity Disorder history was ascertained by nursing triage information, nursing medical histories, or documentation of a current ADHD medication. If any of these were present, the patient was considered to have a “medically recognized ADHD diagnosis” and therefore was not approached for study participation. The Cincinnati Children’s Hospital Medical Center Institutional Review Board approved the study.

ADHD Screening

Mothers were consented and enrolled by a research assistant after nursing triage was completed. Mothers were then asked to answer questions related to their child’s behavior using the NICHQ Vanderbilt Assessment Scale: Parent Informant version.²³ The Vanderbilt ADHD Parent Rating Scale (VADPRS) has been shown to have valid psychometric properties consistent with a *Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV)* diagnosis of ADHD in elementary school populations²⁴ and is widely used as a good practical screen for ADHD.²³ The scale asks the parent to report on the behavior that has occurred over the last 6 months. In addition, the scale includes questions about problems the child has been experiencing in multiple environments including both school and home. A single parent rater has been used successfully to identify children with ADHD in a nationally representative sample.²⁵

To meet the *DSM-IV* criteria for the diagnosis, the parent must report at least 6 positive responses to either the inattentive or hyperactive core symptoms, or 6 positive responses in both sections. The second section of the scale has a set of performance measures; this section determines the level of impairment as reported by the parent. Impairment is considered present if the parent reports that the symptoms are “somewhat of a problem” or “problematic” in various social or academic environments. To meet diagnostic criteria for

ADHD a parent must report impairment (defined as at least 1 item of the performance measure where the symptoms are “somewhat of a problem” or “problematic”) coupled with symptoms to meet diagnostic criteria. In practice, reports from multiple sources are usually compiled to make a diagnosis of ADHD by the Vanderbilt Scale, whereas in the current study only parent ratings were obtained.

In addition to screening for ADHD inattentive, hyperactive, and combined subtypes, the tool also screened for co-morbidities such as oppositional defiant disorder (ODD), conduct disorder, anxiety, and depression. Demographic information gathered included insurance status, maternal age, maternal education, maternal relationship status, and race.

Statistical Analysis

SPSS software (version 13.0 Chicago, IL) was used for univariate and bivariate analysis of descriptive statistics. The χ^2 test and odds ratios (OR) were used to examine the association of ADHD and co-morbidities, injured and un-injured patients and other risk factors. Using an alpha of 0.05 and a power of 0.8 to detect a 15% difference in the positive screening result between the injured and noninjured groups, we estimated that we would need 82 children in each group.

RESULTS

Overall, the mean age of the participating children and their mother's was 9.9 and 35 years respectively. Almost two thirds of enrolled children (64%) were boys, more than one third (35%) were African American, and 65% were white. The injury and noninjury groups were similar with respect to maternal age and maternal education. The noninjury group was more likely to have Medicaid insurance compared to the injury group (Table 1).

Overall, 14% of children had a Vanderbilt response from their mothers consistent with ADHD, ODD, or anxiety/depression. The injury and noninjury groups were similar with respect to ADHD symptoms (9.8% in both injury and noninjury groups) and other co-morbid mental health problems (ODD and anxiety/depression). The inattentive subtype of ADHD, although elevated in the injured group of children, was not statistically different than the noninjured group. (OR, 2.6; (95% confidence interval [CI], 0.43–20.0); Table 2).

DISCUSSION

Many children in our study were found to have ADHD symptoms as reported by their mothers that were previously unrecognized by ED providers. The frequency of ADHD in this sample of children presenting for emergency care is consistent with other studies in our local area and nationally.^{26–28} However, this study only takes into consideration the unrecognized burden of ADHD symptoms because children with a known history of ADHD were excluded. If this is the case, then there may be at least as many children with unrecognized and undiagnosed ADHD as the 2% to 13% prevalence of diagnosed ADHD in our local population and possibly the larger US population. Although not measured, including children with a known history of ADHD would likely have shown an additional burden of symptoms in the ED population.

Despite the overall frequency of unrecognized ADHD symptoms in the ED, there was no difference in ADHD symptoms between injured children and their noninjured comparisons. This lack of association may be related to the level of impairment in this population. The study participants may represent a less severely affected group of children with ADHD symptoms, whereas children with more severe ADHD symptoms may have already been identified and treated. Children treated with stimulants for ADHD or presumed ADHD have been shown to be more frequent users of a wide range of medical services including emergency care and are more likely to be injured than are other children.²⁰ Whether ADHD symptom severity moderates the ADHD and injury association is an important next step in the understanding the role of ADHD screening in children presenting with injuries. In addition, the frequency of the inattentive subtype of ADHD was greater in the injury group although not statistically different. Children who are inattentive may be less alert and aware of their surroundings, thus more likely to be injured. Future studies will need to include larger sample sizes to be adequately powered to examine this association.

The Vanderbilt Scale assessed symptoms of ODD in the 2 groups and found a similar frequency of symptoms in injured and noninjured children. In contrast to previous work, a child presenting with an injury in this study was no more likely than a child with other medical presentations to have symptoms of ODD.¹⁰ Larger numbers of children presenting with ODD would be needed to better examine the injury/ODD association.

The study did not use multiple informants in the assessment of ADHD symptoms limiting our ability to make a firm diagnosis (consistent with *DSM-IV* criteria) and restricting the generalizability of the findings. Although we were interested in the unrecognized burden of ADHD symptoms in the population of injured children presenting to the ED, it may have been useful to include children with a history of ADHD and a measure of global impairment to enhance our understanding of the relationship between ADHD severity and injury.

In summary, there appears to be a large burden of ADHD symptoms that are medically unrecognized in the children presenting for care in the ED; however, ADHD symptom frequency was not significantly different in injured and noninjured patients in this study. Screening for unrecognized ADHD in children presenting specifically for injury is not supported by this study. Future studies examining the severity of ADHD symptoms, the effect of common co-morbid conditions associated with ADHD (ODD and depression) together with a child's global impairment and their possible associations with a visit for an injury may shed light on important mediators between ADHD and injury visits and lead to improved screening criteria. This study did not find an association of a childhood emergency visit and unrecognized ADHD; however, this study suggests there is a large population of children using emergency services who have unrecognized ADHD and who may benefit from behavioral and mental health services.

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TABLE 1.

Demographic Variable

	Injury Group n = 82 (%)	Noninjury Group n = 82 (%)	P
Child's race			0.08
White	57 (69.5%)	44 (53.7%)	
Black	20 (24.4%)	33 (40.2%)	
Other	1 (1.2%)	2 (2.4%)	
Maternal age V mean (SD)	36.2 (7.1)	34.6 (6.9)	0.17
Insurance category			0.004
Medicaid	21 (25.6%)	43 (52.4%)	
Self-pay	11 (13.4%)	4 (4.9%)	
Commercial	49 (59.7%)	34 (41.5%)	
Maternal education			0.24
Some high school or less	9 (12.5%)	15 (18.3%)	
High school	20 (24.4%)	25 (30.5%)	
Technical or trade school	7 (8.5%)	6 (7.3%)	
Some college	24 (29.3%)	25 (30.5%)	
College and above	20 (24.4%)	9 (11.0%)	
Maternal relationship status			0.10
Married or living as married	57 (69.5%)	50 (61.0%)	
Never married	13 (15.9%)	10 (12.2%)	
Divorced or separated	10 (12.2%)	20 (24.4%)	

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TABLE 2.

Mental Illness Screen

	Injury Group n = 82	Noninjury Group n = 82	OR (95% CI)
ADHD inattentive subtype	6.1%	2.4%	2.60 (0.49–13.79)
ADHD hyperactive subtype	2.4%	2.4%	1.00 (0.14–7.27)
ADHD combined subtype	1.2%	4.9%	0.24 (0.03–2.20)
ADHD (any subtype)	9.8%	9.8%	1.00 (0.36–2.81)
ODD	6.1%	8.5%	0.70 (0.21–2.20)
Anxiety/depression	0.0%	4.8%	Cannot be performed