Does severity of attention deficit hyperactivity disorder impact trauma in children?

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Introduction

Attention deficit hyperactivity disorder (ADHD) is a chronic neurodevelopmental disorder with high heritability. It is the most common childhood mental disorder. The key aspects of ADHD may put the affected children at risk for different traumatic experiences. Therefore, this study was conducted to investigate the relationship between the severity of trauma and ADHD symptoms in children.

Methods:

In this descriptive-correlational study, the target population included 90 children aged 6-12 years old, visiting Imam Reza, Children, Sina, and Shohada Hospitals in Tabriz, Iran. The severity of trauma was assessed, using placebo transdermal system (PTS), and the ADHD symptoms were evaluated, using Conners' Parent Rating Scale. To rule out other psychiatric disorders, the Child Symptoms Inventory-4 (CSI-4) was employed.

Results:

Results showed a significant positive correlation between the severity of trauma and ADHD symptoms in children. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV) defines ADHD based on two symptomatic dimensions: attention-deficit and hyperactivity/impulsivity. These symptoms should have been present before age 12 years in more than one setting, and may negatively impact the level of development, (ii) impulsivity and (iii) hyperactivity.

Children with ADHD are usually described as individuals with chronic difficulties, namely attention-deficit, hyperactivity, and/or impulsivity, as the key signs of ADHD. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV) defines ADHD based on two symptomatic dimensions: attention-deficit and hyperactivity/impulsivity. These symptoms should have been present before age 12 years in more than one setting, and may negatively...
ADHD and trauma in children

impact academic, occupational, or social functioning.  
Children with ADHD may experience significant functional and behavioral problems that are maladaptive and inconsistent with their calendar age and expected developmental level. In DSM-IV, there are three ADHD subtypes:

1. Predominantly inattentive type,
2. Hyperactive/impulsive type, and
3. Combined type.

Shooshtary et al. in a systematic study evaluated the prevalence of ADHD in Iran. Results showed that hyperactivity and attention-deficit were more common among boys and girls, respectively. Prevalence of ADHD is 4%-6% in school-aged children across the world and it is more common in boys. It seems that prevalence of ADHD is increasing and a recent systematic study reported it to be 18%. In Iran, its prevalence was reported 9.7% in preschool children, most commonly among boys. It seems that the main features of ADHD (inattention and hyperactivity/impulsivity) put children and adolescents at risk for many traumatic experiences.

There are several studies on children and adolescents with ADHD and traumatic experience. These studies have shown that children and adolescents with this disorder are more prone to injury and trauma as compared to their peers. It is worth noting that the lack of therapeutic interventions can increase the likelihood of trauma, car accidents, and head traumas. According to previous studies, ADHD increases the risk of childhood injuries and pedestrian accidents. Poor attention skills and high impulsivity while crossing the street may increase the risk of injury.

Trauma is amongst the greatest problems of every society, regardless of their health, economic, and social conditions. It is globally a major cause of mortality, hospitalization, and disability among all age groups. Among the risk factors of moderate to severe trauma are individual and environmental factors. Among the individual factors are age, gender, country, place of birth, socioeconomic status, and degree of psychological trauma, such as substance and alcohol abuse. In recent years, researchers have questioned the relationship between ADHD and increased risk of injury and trauma. Based on a systematic review, people with ADHD are more likely to be injured; the risk is reported as two-fold.

Considering that there is no similar study in the region, if this study shows a relationship between the severity of trauma and ADHD symptoms in children, the next step will be conduction of a research on making home and school settings safe for them. Since trauma is related to road accidents, this study can lay the ground for further investigations and enrich the existing knowledge. It can also contribute to conduction of new studies and formation of new ideas in this area. Considering the scant studies in this field and the need for further investigations to understand the role of this disorder in traumatic injuries among children, the present study set out to respond whether or not the ADHD symptoms are correlated with the severity of trauma in children.

Methods
It was a descriptive-correlational study. The statistical population included children with trauma aged 6-12 years, visiting Imam Reza, Children, Sina, and Shohada University Hospitals in Tabriz, Iran, between February 20 and August 23, 2015. Since there was no similar study, a pilot study with 30 samples was conducted to determine the sample size. After the correlation between variables was measured, the final sample size of 90 was obtained at $\alpha = 0.05$, power of 80%, and acceptable difference. The subjects were selected using convenience sampling technique.

The inclusion criteria were:

i. Completing the informed consent form.
ii. Patients aged 6-12 years hospitalized in the surgical wards of the aforementioned hospitals due to trauma caused by falling, cycling, riding motorbike, and pedestrian accidents.
Table 1. Demographic characteristics of hyperactive and normal groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Normal group</th>
<th>Hyperactive group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender [n (%)]</td>
<td>Boy</td>
<td>27 (46.6)</td>
<td>24 (75.0)</td>
</tr>
<tr>
<td></td>
<td>Girl</td>
<td>31 (53.4)</td>
<td>8 (25.0)</td>
</tr>
<tr>
<td>Age (year) (mean ± SD)</td>
<td>8.103 ± 1.69</td>
<td>9.18 ± 1.37</td>
<td>8.48 ± 1.66</td>
</tr>
</tbody>
</table>

SD: Standard deviation

The exclusion criteria were:

i. Unwillingness to participate, major psychiatric disorders (e.g. psychosis).

ii. Comorbid psychiatric illnesses at the time of accident.

iii. Medical conditions leading to clouding of consciousness at the time of accidents (e.g. seizures).

iv. Indirect role of children in occurrence of traumas (e.g. vehicle accidents or fights caused by other people, a child passenger who merely observes the collisions unless he/she is responsible for them).

v. IQ less than 75 (based on Raven’s Colored Progressive Matrices Test).

vi. Consumption of antiepileptic drugs and medications with an impact on the brain.

To conduct the study, ADHD symptoms were assessed, using the standardized Conners’ Parent Rating Scale. To rule out other psychiatric disorders, the Child Symptoms Inventory-4 (CSI-4) was employed. In this study, the short and revised version of the Conners’ Parent Rating Scale was used. This scale includes four subscales (oppositional, cognitive/inattentive problems, hyperactivity, and ADHD index) and it has 27 items to be completed by parents. The internal reliability coefficients for this scale have been reported between 0.75 and 0.90. The validity of Conner’s constructs has been obtained through factor analysis. In addition, their discriminant validity has been strongly confirmed through statistical investigation into its ability to discriminate ADHD individuals from normal and other clinical groups.

Also, we used pediatric trauma scale (PTS-2) for scoring trauma. In this questionnaire, weight and airway are important factors. PTS is valid in fatal traumas of children. Scores more than 8 predicts 9% mortality rate and scores 0 and below predict 100% mortality rate. There is a linear relationship between low scores of PTS and mortality rate. The minimum score is -6 and the maximum score is +12. Scores 7-11 shows mild injury, 1-6 shows moderate injury, 0 to -6 shows severe injury.

Data analysis was performed using the correlation and independent t-tests through SPSS software (version 22, SPSS Inc., Chicago, IL, USA).

Results

Among the selected sample in this study, 25% were girls and 75% were boys. In the normal group, 53.4% were girls and 46.6 were boys. The age range of the subjects varied from six to 12 years with the mean and standard deviation of 7.27 and 8.48, respectively (Tables 1 and 2).

Different values were obtained from both ADHD and normal groups. The main indices are summarized in table 2.

Table 2. Descriptive indices of research variables

<table>
<thead>
<tr>
<th>Groups</th>
<th>Indices</th>
<th>Mean ± SD</th>
<th>Lowest</th>
<th>Highest</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal group</td>
<td>ADHD</td>
<td>45.21 ± 7.51</td>
<td>32</td>
<td>57</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Hyperactivity</td>
<td>48.34 ± 11.59</td>
<td>33</td>
<td>83</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Oppositional/impulsivity</td>
<td>45.81 ± 12.28</td>
<td>3</td>
<td>97</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Attention-deficit</td>
<td>43.20 ± 7.15</td>
<td>27</td>
<td>63</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Severity of trauma</td>
<td>10.01 ± 1.304</td>
<td>6</td>
<td>11</td>
<td>58</td>
</tr>
<tr>
<td>Hyperactive group</td>
<td>ADHD</td>
<td>66.78 ± 5.59</td>
<td>61</td>
<td>80</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Hyperactivity</td>
<td>70.00 ± 8.53</td>
<td>50</td>
<td>83</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Oppositional/impulsivity</td>
<td>65.15 ± 7.59</td>
<td>53</td>
<td>83</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Attention-deficit</td>
<td>59.46 ± 8.87</td>
<td>44</td>
<td>77</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Severity of trauma</td>
<td>8.03 ± 2.02</td>
<td>3</td>
<td>11</td>
<td>32</td>
</tr>
</tbody>
</table>

ADHD: Attention deficit hyperactivity disorder; SD: Standard deviation
In addition, ADHD severity was different according to the subtypes. The most frequent subtype was combined ADHD (50.8%) while almost most of the affected children were suffering from mild ADHD symptoms (Table 3).

According to the results, there is a significant positive correlation between the severity of trauma with ADHD, hyperactivity score, attention-deficit score, and oppositional/impulsivity score. In other words, the severity of trauma increases with improving the scores of these variables.

There was a significant positive relationship between trauma severity and a total score of ADHD on the rating scale, showing the greatest correlate with hyperactivity subscale (Table 4).

To compare the severity of trauma in children with and without ADHD, the independent t-test was used (Table 5).

The severity of trauma was significantly different in ADHD patients compared to non-ADHD children. The independent t-test after doing Levene’s test for assessment of equality of variance between two groups suggested a significant difference between the ADHD and non-ADHD children with respect to the severity of trauma (t = 5.653, df = 88, and P = 0.001).

**Discussion**

ADHD is one of the most common psychiatric disorders of childhood. This study investigated the relationship between the severity of ADHD symptoms and trauma in children.

In this study, from total 90 children, 39 were girls (8 in ADHD and 31 in normal groups) and 51 were boys (24 in ADHD group and 27 among normal individuals). ADHD symptoms were more prevalent in boys than girls in this study which is compatible with the results of Amiri et al., Abolhassanzadeh et al., Bener et al, and Mugnaini et al. This perhaps results from development of more obvious symptoms in boys than affected girls; for example the majority of boys with ADHD are impulsive and most of the girls with ADHD are inattentive.

Out of 32 children with ADHD, 4 (15.9%) individuals were predominantly suffering from hyperactive/impulsive type, and 16 (50.8%) received the diagnosis of combined type. These are in agreement with the studies conducted by Alishahi et al., Shahim et al, while different from the study of Abolhassanzadeh et al. in which hyperactive/impulsive type was the most frequent one. This difference may be due to different sampling methods noticing that combined and predominantly inattentive types are more common in the clinical population than hyperactive/impulsive type.

In our study, there was a positive significant relationship between severity of trauma and ADHD, hyperactivity, inattention, and impulsivity/oppositional (P < 0.010). This finding is in line with Schwebel et al., Kaya et al., Kouchakzadeh et al., who showed a significant relationship between ADHD symptoms and trauma risk. Also, children and adolescents with ADHD were more prone to traffic accidents.

<table>
<thead>
<tr>
<th>Subtype of ADHD</th>
<th>n (%)</th>
<th>Severity of ADHD</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominantly inattentive type</td>
<td>12 (33.3)</td>
<td>Mild</td>
<td>22 (76.2)</td>
</tr>
<tr>
<td>Predominantly hyperactive/impulsive type</td>
<td>4 (15.9)</td>
<td>Moderate</td>
<td>8 (19.0)</td>
</tr>
<tr>
<td>Combined type</td>
<td>16 (50.8)</td>
<td>Severe</td>
<td>2 (8.4)</td>
</tr>
</tbody>
</table>

*ADHD: Attention deficit hyperactivity disorder*

<table>
<thead>
<tr>
<th>Severity of trauma</th>
<th>Attention-deficit</th>
<th>Oppositional/impulsivity</th>
<th>Hyperactivity</th>
<th>ADHD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.44</td>
<td>0.44</td>
<td>0.56</td>
<td>0.51</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.050 level (2-tailed), **Correlation is significant at the 0.010 level (2-tailed)*
We found that trauma severity was different between ADHD and non-ADHD groups, and was more severe in ADHD group. This is compatible with findings of Biederman et al.\textsuperscript{24}

According to some studies, children with ADHD were more involved in risky behaviors.\textsuperscript{25} Some studies have shown that the risk of traffic accidents were more in children with ADHD because of impulsivity and inattention. Fischer et al.\textsuperscript{26} investigated driving-related behaviors and related consequences during adolescence and adulthood in children with ADHD. Results showed a significant difference between this group and control group in terms of traffic accidents.\textsuperscript{26}

**Conclusion**

In conclusion, there was a significant direct linear relationship between the severity of trauma and hyperactivity components. A significant difference was also observed between the children with and without ADHD in terms of the severity of trauma.

With regard to huge impacts of trauma on human and financial resources, an investigation into trauma is a practical need of people. The high rate of accidents among children and adolescents, as the most active and efficient group of society, along with traffic accidents, necessitates serious planning. In addition, making home and school settings safe for these children should be taken into consideration.

**Acknowledgments**

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**Authors’ Contribution**

All authors have participated in study design, data gathering, and analysis as well as preparing the manuscript regarding the International Committee of Medical Journal Editors.

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**Conflict of Interest**

Authors have no conflict of interest.

**Ethic Approval**

This study was approved by the regional committee of ethics under the number of TBZMED.REC.1394.5903.

**References**


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