J Anal Res Clin Med, 2017, 5(1), 9-14.
doi: 10.15171/jarcm.2017.003, *http://journals.tbzmed.ac.ir/JARCM*

Original Article

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

Ali Reza Shafiee-Kandjani[1], Seyed Gholamreza Noorazar[2]*, Saeed Aslanabadi[3], Javad Abdollahi-Rashid[2], Mehrnaz Dadkhah[2]

[1] *Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran*

[2] *Research Center of Psychiatry and Behavioral Sciences, Tabriz University of Medical Sciences, Tabriz, Iran*

[3] *Department of Surgery, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran*

Article info
Article History:
Received: 05 Nov 2016
Accepted: 05 Dec 2016
ePublished: 10 Mar 2017

Keywords:
Attention Deficit Hyperactivity Disorder,
Severity of Trauma,
Impulsivity,
Inattention,
Disobedience

Abstract

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, hyperactivity, oppositional/impulsivity, and attention-deficit scores ($P < 0.01$). In addition, results from the independent t-test suggested a significance difference between the ADHD and non-ADHD children in terms of the severity of trauma.

Conclusion: There was a significant relationship between the symptoms of ADHD and the severity of trauma in children, in a way that the scores of the aforementioned variables improved with increasing the severity of trauma. Regarding the profound effects of trauma on human and financial resources, required measures should be taken for making house and school settings safe for such children.

Citation: Shafiee-Kandjani AR, Noorazar SG, Aslanabadi S, Abdollahi-Rashid J, Dadkhah M. **Does severity of attention deficit hyperactivity disorder impact trauma in children?** J Anal Res Clin Med 2017; 5(1): 9-14. Doi: 10.15171/jarcm.2017.003

Introduction

Attention deficit hyperactivity disorder (ADHD) is a chronic neurodevelopmental disorder with high heritability. It is the most common childhood mental disorder.[1] Recent studies conducted in disease control centers have shown that nearly 9.5% of children and adolescents, aged 4-17 years, suffer from this problem.[2] ADHD is a childhood mental health condition characterized by (i) attention-deficit to a degree inconsistent to the level of development, (ii) impulsivity and (iii) hyperactivity.[3] Children with ADHD are usually described as individuals with chronic difficulties, namely attention-deficit, hyperactivity, and/or impulsivity, as the key signs of ADHD.[4] 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

* **Corresponding Author:** Seyed Gholamreza Noorazar, Email: s.gh.noorazar@gmail.com

impact academic, occupational, or social functioning.[5] Children with ADHD may experience significant functional and behavioral problems that are maladaptive and inconsistent with their calendar age and expected developmental level.[6] In DSM-IV, there are three ADHD subtypes:

1. Predominantly inattentive type, 2. Hyperactive/impulsive type, and 3. Combined type.[5]

Shooshtary et al. in a systematic study evaluated the prevalence of ADHD in Iran.[7] 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.[8] 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.[9] 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.[10] 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.[10]

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.[11] 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.[12]

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

Characteristic		Normal group	Hyperactive group	Total
Gender [n (%)]	Boy	27 (46.6)	24 (75.0)	51 (56.7)
	Girl	31 (53.4)	8 (25.0)	39 (43.3)
Age (year) (mean ± SD)		8.103 ± 1.69	9.18 ± 1.37	8.48 ± 1.66

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.[13]

Also, we used pediatric trauma scale (PTS-2) for scoring trauma. In this questionnaire, weight and air way 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.[14]

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

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

ADHD: Attention deficit hyperactivity disorder; SD: Standard deviation

Table 3. Frequency of subtype and severity of attention deficit hyperactivity disorder (ADHD)

Subtype of ADHD	n (%)	Severity of ADHD	n (%)
Predominantly inattentive type	12 (33.3)	Mild	22 (76.2)
Predominantly hyperactive/impulsive type	4 (15.9)	Moderate	8 (19.0)
Combined type	16 (50.8)	Severe	2 (8.4)

ADHD: Attention deficit hyperactivity disorder

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.,[15] Abolhassanzadeh et al.,[16] Bener et al,[17] and Mugnaini et al.[18] 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.,[19] and Shahim et al,[20] while different from the study of Abolhassanzadeh et al.[16] 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.,[21] Kaya et al.,[22] Kouchakzadeh et al.[23] who showed a significant relationship between ADHD symptoms and trauma risk. Also, children and adolescents with ADHD were more prone to traffic accidents.

Table 4. Correlation matrix between severity of trauma with attention deficit hyperactivity disorder (ADHD), hyperactivity, score, oppositional, and attention-deficit

	Attention-deficit	Oppositional/impulsivity	Hyperactivity	ADHD
Severity of trauma	**0.44	**0.44	*0.56	*0.51

ADHD: Attention deficit hyperactivity disorder
*Correlation is significant at the 0.050 level (2-tailed), **Correlation is significant at the 0.010 level (2-tailed)

Table 5. Independent Samples Test to compare the severity of trauma in children with and without attention deficit hyperactivity disorder (ADHD)

		Levene's test for equality of variances		t-test for equality of means		
		F	P	t	df	P (2-tailed)
Trauma	Equal variances assumed	5.41	332	5.653	88.000	0.0001
	Equal variances not assumed	-	-	5.007	45.538	0.0001

df: Degree of freedom

We found that trauma severity was different between ADHD and non-ADHD groups, and was more sever in ADHD group. This is compatible with findings of Biederman et al.[24]

According to some studies, children with ADHD were more involved in risky behaviors.[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.[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.[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

Hereby, we thank all family members as well as hospital personnel, who helped us in this study.

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.

Funding

The data were elicited from MD thesis of Dr Javad Abdollahi-Rashid from Tabriz University of Medical Sciences and was financially supported by research center of psychiatry and behavioral sciences.

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

1. Abikoff H, Nissley-Tsiopinis J, Gallagher R, Zambenedetti M, Seyffert M, Boorady R, et al. Effects of MPH-OROS on the organizational, time management, and planning behaviors of children with ADHD. J Am Acad Child Adolesc Psychiatry 2009; 48(2): 166-75. DOI: 10.1097/CHI.0b013e3181930626
2. Visser SN, Bitsko RH, Danielson ML, Perou R. Increasing prevalence of parent-reported attention-deficit/hyperactivity disorder among children-United States, 2003 and 2007. Morb Mortal Wkly Rep 2010; 59(44): 1439-43.
3. Beh-Pajooh A, Motevali Poor A, Farzad V, Rostami R, Habibi Askarabad M. The efficacy of stress coping skills training on parenting stress of mothers with children suffering from attention deficit hyperactivity disorder. Journal of Family Research 2010; 6(1): 99-114. [In Persian].
4. Baughman FA, Jr. Diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. Pediatrics 2001; 107(5): 1239. DOI: 10.1542/peds.107.5.1239

5. Tannock R. Rethinking ADHD and LD in DSM-5: proposed changes in diagnostic criteria. J Learn Disabil 2013; 46(1): 5-25. DOI 10.1177/0022219412464341

6. de Boo GM, Prins PJ. Social incompetence in children with ADHD: possible moderators and mediators in social-skills training. Clin Psychol Rev 2007; 27(1): 78-97. DOI: 10.1016/j.cpr.2006.03.006

7. Shooshtary MH, Chimeh N, Najafi M, Mohamadi MR, Yousefi-Nouraie R, Rahimi-Mvaghar A. The prevalence of attention deficit hyperactivity disorder in Iran: A systematic review. Iran J Psychiatry 2010; 5(3): 88-92.

8. Amiri S, Fakhari A, Maheri M, Mohammadpoor AA. Attention deficit/hyperactivity disorder in primary school children of Tabriz, North-West Iran. Paediatr Perinat Epidemiol 2010; 24(6): 597-601. DOI: 10.1111/j.1365-3016.2010.01145.x

9. Farmer JE, Peterson L. Injury risk factors in children with attention deficit hyperactivity disorder. Health Psychol 1995; 14(4): 325-32. DOI: 10.1037/0278-6133.14.4.325

10. DiScala C, Lescohier I, Barthel M, Li G. Injuries to children with attention deficit hyperactivity disorder. Pediatrics 1998; 102(6): 1415-21.

11. Pendleton S, Stavrinos D, Cotney R, Bridgmon K, Schwebel DC. How temperament and ADHD predict child pedestrian injury. Proceedings of the 2009 Society for the Advancement of Violence and Injury Research Conference; 2009 Mar 5-6; Atlanta, GA, USA.

12. Amiri S, Sadeghi-Bazargani H, Nazari S, Ranjbar F, Abdi S. Attention deficit/hyperactivity disorder and risk of injuries: a systematic review and meta-analysis. J Inj Violence Res 2016; 9(2): 1-11. DOI: 10.2147/NDT.S87614

13. Zargari Nejad G, Yekkeh Yazdandoost R. Efficacy of parent's training on problem behaviors in ADHD children. Psychological Studies 2007; 3(2): 29-48. [In Persian].

14. Kaufmann CR, Maier RV, Rivara FP, Carrico CJ. Evaluation of the Pediatric Trauma Score. JAMA 1990; 263(1): 69-72. DOI: 10.1001/jama.1990.03440010067032

15. Amiri S, Shafiee-Kandjani AR, Fakhari A, Abdi S, Golmirzaei J, Akbari RZ, et al. Psychiatric comorbidities in ADHD children: an Iranian study among primary school students. Arch Iran Med 2013; 16(9): 513-7. DOI: 10.1016/j.neurenf.2012.04.732

16. Abolhassanzadeh M, Shafiee-Kandjani AR, Vaziri Z, Molavi P, Sadeghi-Movahhed F, Noorazar G, et al. The prevalence and risk factors of attention deficit hyperactivity disorder among the elementary school students in Ardabil, Iran, in 2011-2012. J Anal Res Clin Med 2016; 4(3): 146-52. DOI: 10.15171/jarcm.2016.024

17. Bener A, Qahtani RA, Abdelaal I. The prevalence of ADHD among primary school children in an Arabian society. J Atten Disord 2006; 10(1): 77-82. DOI: 10.1177/1087054705284500

18. Mugnaini D, Masi G, Brovedani P, Chelazzi C, Matas M, Romagnoli C, et al. Teacher reports of ADHD symptoms in Italian children at the end of first grade. Eur Psychiatry 2006; 21(6): 419-26. DOI: 10.1016/j.eurpsy.2005.04.011

19. Alishahi MJ, Dehbozorgi GR, Dehghan B. Prevalence rate of attention deficit hyperactivity disorder among the students of primary schools. Zahedan J Res Med Sci 2003; 5(1): 61-7. [In Persian].

20. Shahim S, Mehrangiz L, Yousefi F. Prevalence of attention deficit hyperactivity disorder in a group of elementary school children. Iran J Pediatr 2007; 17(Suppl 2): 211-6. DOI: 10.4103/0019-5545.120544

21. Schwebel DC, Roth DL, Elliott MN, Visser SN, Toomey SL, Shipp EM, et al. Association of externalizing behavior disorder symptoms and injury among fifth graders. Acad Pediatr 2011; 11(5): 427-31. DOI: 10.1016/j.acap.2011.03.003

22. Kaya A, Taner Y, Guclu B, Taner E, Kaya Y, Bahcivan HG, et al. Trauma and adult attention deficit hyperactivity disorder. J Int Med Res 2008; 36(1): 9-16. DOI: 10.1177/147323000803600102

23. Kouchakzadeh Talami S, Namazi A, Zarkesh M. Symptoms related to attention deficit hyperactivity disorder among preschool children based on parents report. Holist Nurs Midwifery 2015; 25(1):35-44. [In Persian].

24. Biederman J, Petty CR, Spencer TJ, Woodworth KY, Bhide P, Zhu J, et al. Examining the nature of the comorbidity between pediatric attention deficit/hyperactivity disorder and post-traumatic stress disorder. Acta Psychiatr Scand 2013; 128(1): 78-87. DOI: 10.1111/acps.12011

25. Nichols JQVA. Human factors and driving behaviors differentiating high risk and low risk drivers with attention deficit hyperactivity disorder [Thesis]. Charlottesville, VA: University of Virginia; 2012.

26. Fischer M, Barkley RA, Smallish L, Fletcher K. Hyperactive children as young adults: driving abilities, safe driving behavior, and adverse driving outcomes. Accid Anal Prev 2007; 39(1): 94-105. DOI: 10.1016/j.aap.2006.06.008