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Case Series

The Prevalence of Attention Deficit Hyperactivity Disorder Among Children with Eye Trauma: A Cross-Sectional Survey

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Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) is a prevalent mental disorder affecting children. This study aimed to assess the prevalence of ADHD in children with eye trauma.

Methods: This descriptive study included all children with eye trauma referred to the Zahedan Eye Hospital. Data collection employed an accessible sampling method, utilizing the standardized ADHD rating scale questionnaire.

Findings: Among the 73 participants, male gender (53.4%), urban residency (57.5%), and blunt trauma were predominant (65.7%). ADHD prevalence was 15.1%. No significant relationship was observed between ADHD and gender ($p = 0.46$), residency ($p = 0.67$), age ($p = 0.67$), maternal occupation ($p = 0.9$), maternal education ($p = 0.75$), and type of trauma ($p = 0.9$) in children with eye trauma.

Conclusion: ADHD is highly prevalent among children with eye trauma, with no association with these patients' demographic and clinical characteristics.

Keywords: Attention Deficit-Hyperactivity Disorder; Eye Trauma; Children; Ocular Trauma; Attention Deficit Hyperactivity Disorder

Abbreviations

ADHD: Attention Deficit Hyperactivity

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a prevailing neurodevelopmental disorder typically identified in childhood, characterized by persistent patterns of inattention, hyperactivity, and impulsivity that often disrupt various facets of a child's life, including academic performance and social interactions [1,2]. With a global prevalence estimated at approximately 5-7% among school-aged children, ADHD constitutes a significant public health concern [3,4]. Its impact extends beyond the individual, affecting families, educators, and healthcare systems [5].

As researchers delve into the multifaceted factors contributing to ADHD, there is a burgeoning interest in exploring the potential roles of ADHD as a risk factor for other adverse outcomes, particularly those that have psychological and physical repercussions [6,7]. One such area of exploration is the intersection between ADHD and traumatic experiences, such as eye trauma. Eye trauma refers to injuries affecting the eye and surrounding structures, often from accidents, falls, sports-related incidents, or blunt force trauma [8].

The connection between ADHD and an increased vulnerability to traumatic events, including eye trauma, holds theoretical promise [9]. Children with ADHD may exhibit impulsive behaviors, inat-

tentiveness, and risk-taking tendencies, which could render them more prone to accidents and injuries [10]. Furthermore, the cognitive and behavioral characteristics associated with ADHD might affect a child's ability to adhere to safety measures, potentially increasing the likelihood of engaging in activities that elevate the risk of eye trauma [9].

This cross-sectional survey explores the prevalence of attention deficit hyperactivity disorder among children with eye trauma. By investigating whether ADHD constitutes a risk factor for eye trauma, we aim to contribute to a more comprehensive understanding of the interplay between neurodevelopmental conditions and traumatic experiences. The findings of this study may have implications for preventive measures, intervention strategies, and public health awareness campaigns targeting ADHD and the prevention of eye trauma.

Methods

- **Study Design:** This study follows a descriptive research design to investigate the prevalence of Attention Deficit Hyperactivity Disorder (ADHD) among children who have experienced eye trauma.
- **Studied Population:** The target population encompasses all children aged 4 to 12 with Iranian citizenship who have sustained eye trauma and were referred to Alzahra Eye Hospital Zahedan University of Medical Sciences. Inclusion criteria include obtaining informed consent from the child or their parents for study participation and having experienced eye trauma. Exclusion criteria entail cases where participants refuse to cooperate during the study.
- **Sample Size Determination:** To determine the appropriate sample size, the formula n = [(Z_(1-α/2)^2 * P * (1-P))/d^2] was utilized. Using a prevalence of ADHD in trauma patients reported by Konstenius., *et al*. as 19% and with a desired margin of error (d) of 0.09, the calculated sample size is 73 individuals.
- **Sampling Method:** The sampling strategy employed was a non-probability convenience sampling method, where participants were selected based on their availability and suitability for the study.
- **Variables for Analysis:** The study considered several variables, including ADHD diagnosis, gender, age, type of trauma experienced, address, mother's education level, and mother's occupation.
- **Data Collection Tools:** Data was collected using the standardized ADHD Rating Scale questionnaire, consisting of 14 questions with four response options each, yielding scores ranging from 0 to 52. This questionnaire demonstrates good validity (0.79) and reliability (0.94).
- **Data Collection Procedure:** The research plan involved collaboration with Al-Zahra Zahedan Eye Hospital. The researcher engaged with patients and their families in the hospital's emergency department, post-stabilizing the patient's condition. After obtaining informed consent and ensuring minimal stress, the researcher conducted interviews, recording the responses in the questionnaire. Upon completion, the questionnaire was submitted to the project manager.
- **Data Analysis:** Collected data was entered into SPSS 24 software for analysis. Data accuracy was ensured before proceeding. Descriptive statistical techniques were employed to portray the data, including frequency distribution tables, graphs, and statistical indices. Point estimates and 95% confidence intervals were calculated to determine prevalence rates. Statistical methods such as the Chi-square or Fisher's exact test were employed to compare prevalence between various groups.
- **Ethical Considerations:** The research design and implementation were aligned with ethical principles governing medical science research involving human subjects. The study adhered to ethical codes and standards endorsed by regional ethics committees for medical science research, ensuring participant well-being and rights were upheld throughout the process.

Results

The demographic and clinical characteristics of the included patients are presented in Table 1. A total of 73 participants were enrolled in the study. The gender distribution indicated that 34 (46.6%) were male and 39 (53.4%) were female. Regarding residency, 42 (57.5%) participants hailed from urban areas, 10 (13.7%) were from suburban locations, and 21 (28.8%) resided in rural settings. Age groups were categorized as follows: <6 years (34.2%), 6-10 years (42.5%), and > 10 years (23.3%). Maternal occupation varied, with 54 (74.0%) participants having mothers who were housewives and 19 (26.0%) having employed mothers. Maternal education levels showed that 17 (23.3%) mothers were illiterate, 33 (45.2%) had primary education, 18 (24.7%) had secondary education, and 5 (6.8%) had tertiary education. The types of trauma experienced were classified as penetrating (34.2%) and blunt (65.8%).

Table 1: Demographic and clinical characteristics of included patients.

		Number	Prevalence
Gender			
	Male	34	46.6
	Female	39	53.4
Residency			
	Urban	42	57.5
	Suburban	10	13.7
	Rural	21	28.8
Age group			
	<6 years	25	34.2
	6-10 years	31	42.5
	>10 years	17	23.3
Maternal occupation			
	Housewife	54	74.0
	Employed	19	26.0
Maternal education			
	Illiterate	17	23.3
	Primary education	33	45.2
	Secondary education	18	24.7
	Tertiary education	5	6.8
Type of trauma			
	Penetrating	25	34.2
	Blunt	48	65.8

Among children with eye trauma, 11 (15.1%) of patients had ADHD. Table 2 compares children with and without ADHD about various factors. The analysis revealed that gender distribution among children with and without ADHD was not significantly different (p = 0.46). Among children with ADHD, 7 (9.6%) were male and 4 (5.5%) were female. For those without ADHD, 32 (43.8%) were male, and 30 (41.1%) were female.

Similarly, residency did not show a significant association with ADHD occurrence (p = 0.67). Among children with ADHD, 5 (6.8%) resided in urban areas, 2 (2.7%) in suburban areas, and 4 (5.5%) in rural locations. For those without ADHD, 37 (50.7%) were from urban areas, 8 (11.0%) were from suburban areas, and 17 (23.3%) were from rural areas.

Table 2: Comparison of children with and without ADHD presented with eye trauma.

		ADHD		p-value
		Positive	Negative	
Gender				
	Male	7 (9.6%)	32 (%43.8)	0.46
	Female	4 (5.5%)	30 (%41.1)	
Residency				
	Urban	5 (6.8%)	37 (%50.7)	0.67
	Suburban	2 (2.7%)	8 (%11.0)	
	Rural	4 (5.5%)	17 (%23.3)	
Age group				
	<6 years	3 (4.1%)	22 (%30.1)	0.67
	6-10 years	6 (8.2%)	25 (%34.2)	
	>10 years	2 (2.7%)	15 (20.5%)	
Maternal occupation				
	Housewife	8 (11.0%)	46 (63.0%)	0.90
	Employed	3 (4.1%)	16 (21.9%)	
Maternal education				
	Illiterate	2 (2.7%)	15 (20.5%)	0.75
	Primary education	4 (5.5%)	29 (39.7%)	
	Secondary education	4 (5.5%)	14 (19.2%)	
	Tertiary education	1 (1.4%)	4 (5.5%)	
Type of trauma				
	Penetrating	4 (5.5%)	21 (28.8%)	0.90
	Blunt	7 (9.6%)	41 (56.2%)	

The distribution of age groups also displayed no significant relationship with ADHD (p = 0.67). Among children with ADHD, 3 (4.1%) were in the <6 years age group, 6 (8.2%) were in the 6-10 years age group, and 2 (2.7%) were in the > 10 years age group. Among those without ADHD, 22 (30.1%) were <6 years old, 25 (34.2%) were 6-10 years old, and 15 (20.5%) were > ten years old.

Maternal occupation showed no significant association with ADHD occurrence (p = 0.90). Among children with ADHD, 8 (11.0%) had homemakers as mothers, and 3 (4.1%) had employed mothers. For those without ADHD, 46 (63.0%) had homemakers as mothers, and 16 (21.9%) had employed mothers.

Maternal education level did not significantly correlate with ADHD (p = 0.75). Among children with ADHD, 2 (2.7%) had illiterate mothers, 4 (5.5%) had mothers with primary education, 4 (5.5%) had mothers with secondary education, and 1 (1.4%) had mothers with tertiary education. Among those without ADHD, 15 (20.5%) had illiterate mothers, 29 (39.7%) had mothers with primary education, 14 (19.2%) had mothers with secondary education, and 4 (5.5%) had mothers with tertiary education.

Furthermore, the type of trauma experienced did not correlate significantly with ADHD (p = 0.90). Among children with ADHD, 4 (5.5%) experienced penetrating trauma, and 7 (9.6%) experienced blunt trauma. For those without ADHD, 21 (28.8%) experienced penetrating trauma, and 41 (56.2%) experienced blunt trauma.

Discussion

The findings of this study revealed valuable insights into the relationship between Attention Deficit Hyperactivity Disorder (ADHD) and eye trauma among children. Demographic and clinical characteristics demonstrated a reasonably balanced gender distribution, with a majority of participants residing in urban areas. The age distribution was relatively even across age groups. The majority of mothers were homemakers, and primary education was the most common level of maternal education. Regarding trauma types, blunt trauma was more prevalent than penetrating trauma. A comparison of ADHD and non-ADHD groups revealed no statistically significant relationships across various demographic and clinical factors.

Comparing our study's results with existing research provides valuable context for understanding the relationship between Attention Deficit Hyperactivity Disorder (ADHD) and ocular trauma in different populations. Keles., *et al*. (2022) explored the association between ocular trauma and ADHD in adult patients [11]. In contrast to our findings, their study focused on adults and indicated a potential link between ocular trauma and ADHD symptoms. Similarly, Kafali., *et al*. (2020) examined ocular injuries, maternal anxiety/depression levels, and ADHD symptoms [12]. Their study suggested a possible connection between these factors, emphasizing the complex interplay of psychological and environmental variables. In contrast, our study focused on children and did not find a significant association between ADHD and eye trauma.

Another study by Bayar., *et al*. (2015) explored penetrating eye injuries and ADHD in children. Their findings suggested a potential association, contrasting our results [13]. Genç., *et al*. (2020) investigated ADHD symptoms in children receiving orthodontic treatment [14]. While their study differs in scope, it highlights the intricate relationship between ADHD and various contexts. Overall, comparing our results with these studies underscores the variability in findings across different age groups, trauma types, and study designs. This highlights the importance of considering multiple factors that can influence the association between ADHD and ocular trauma, such as age, trauma type, and comorbidities, to understand this complex relationship comprehensively.

The lack of significant association between ADHD and eye trauma prompts a closer examination of potential mechanisms. While ADHD-related impulsivity and inattention could theoretically lead to an increased risk of accidents, other mitigating factors might play a role in eye trauma occurrences. Factors like protective reflexes and situational awareness may offset the impact of ADHD traits in certain traumatic events, possibly explaining the absence of a strong link.

This study has limitations that warrant consideration. The cross-sectional design precludes establishing causality or temporal relationships. Additionally, factors beyond those examined here, such as specific ADHD subtypes or severity, might contribute to nuanced associations. Future research should consider longitudinal approaches and delve into specific mechanisms to better understand the interplay between ADHD and eye trauma risk.

The absence of a robust association between ADHD and eye trauma suggests that, in isolation, ADHD may not be a primary determinant of eye trauma risk. Clinicians working with children with ADHD and their families should prioritize interventions that address broader safety concerns rather than solely focusing on eye trauma. Furthermore, future studies could explore potential interactions between ADHD, comorbid conditions, and specific types of trauma to unveil more nuanced relationships.

In conclusion, this study sheds light on the intriguing relationship between ADHD and eye trauma among children. The lack of significant association between ADHD and eye trauma suggests that while ADHD traits may contribute to accident risk, this relationship may not be as pronounced in the context of eye injuries.

These findings underscore the complexity of the interaction between neurodevelopmental conditions and traumatic events, emphasizing the need for further research to unravel the multifaceted interplay.

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