The Impact of Environmental Factors on Eye Trauma in Children: A Retrospective Study in Albania

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Abstract

Eye trauma in children can lead to long-term visual impairment and significantly impact their quality of life. Environmental factors play a crucial role in the occurrence of such injuries. This retrospective study aims to investigate the influence of ambiental factors on eye trauma among children in Albania. A retrospective analysis was conducted using data obtained from the Albanian Statistical Center covering the period from January 2017 to December 2023. A total of 317 pediatric patients with eye trauma were included in the study. Data regarding demographics, types of trauma, mechanisms of injury, and environmental factors were collected and analyzed. The study found that environmental factors significantly contributed to eye trauma in children. The most common environmental factors associated with eye injuries included inadequate supervision during outdoor activities, presence of hazardous objects in the environment, and lack of protective eyewear. Seasonal variations were observed, with a higher incidence of eye trauma during the summer months when outdoor activities are more prevalent. This retrospective study highlights the significant impact of environmental factors on eye trauma in children in Albania. Strategies focusing on improving supervision during outdoor activities, implementing safety measures and promoting the use of protective eyewear could help reduce the risk of eye injuries among pediatric populations. Further research and targeted interventions are warranted to address this public health concern effectively.

Keywords: *Eye trauma, children, Albania, environment factors*

1. Introduction

Eye trauma represents a significant public health concern, particularly among pediatric populations, as it can lead to long-term visual impairment and impact the overall well-being of children [1]. Environmental factors play an important role in the occurrence of eye injuries [2]. Understanding these environmental influences is crucial for implementing effective preventive measures and reducing the burden of eye trauma in children.

Albania, like many other countries, faces challenges related to childhood eye injuries, with environmental factors exerting a notable influence on their occurrence [3]. However, there is a lack of comprehensive studies focusing on the specific environmental determinants of eye trauma in Albanian children. Therefore, this retrospective study aims to fill this gap by examining the impact of environmental factors on pediatric eye trauma in Albania over a seven-year period, from January 2017 to December 2023.

By analyzing data obtained from the Albanian Statistical Center, including information on patient demographics, types of trauma, mechanisms of injury, and environmental conditions, this study aims to identify the environmental factors associated with pediatric eye injuries.

Through this research, we aim to raise awareness about the importance of environmental factors in pediatric eye health and suggest eye injury prevention. By addressing the underlying environmental determinants of eye trauma, we can work towards safeguarding the visual health and well-being of Albanian children.

2. Methodology

This study is a retrospective study were data collected from the Albanian Statistical Center from January 2017 to December 2023 were included. A comprehensive dataset of pediatric patients diagnosed with eye trauma during the study period was obtained. This data included information on patient demographics (age, gender), types of trauma (blunt trauma, penetrating trauma, chemical burns, etc.), mechanisms of injury (falls, accidents, assaults, etc.), and environmental factors potentially contributing to the injuries. Pediatric patients (aged 0-18 years) diagnosed with eye trauma during the study period were included in the analysis. Patients with incomplete or missing data were excluded from the study.

Descriptive statistics were used to summarize demographic characteristics, types of trauma, mechanisms of injury, and environmental factors associated with pediatric eye trauma. Chi-square tests were used to assess associations between categorical variables, such as types of trauma and environmental factors. Environmental factors examined in the analysis included but were not limited to: - Presence of hazardous objects in the environment (sharp objects, projectiles, etc.), -Level of supervision during outdoor activities, -Use of protective eyewear (goggles, sunglasses, etc.), - Seasonal variations in injury incidence. Statistical analysis was conducted using appropriate software packages (e.g., SPSS, R), with significance set at $p < 0.05$.

3. Results

Table 1: Demographic Characteristics of Pediatric Patients with Eye Trauma

Demographic Characteristic	Number of Patients (%)
Age Group	
- 0-5 years	145 (45.7%)
- 6-10 years	92 (29.0%)
- 11-18 years	80 (25.3%)
Gender	
- Male	198 (62.5%)
- Female	119 (37.5%)
Total	317

The majority of pediatric patients with eye trauma were in the 0-5 years age group, comprising 45.7% of the total cases. Males accounted for a larger proportion of cases compared to females, with 62.5% of patients being male.

Table 2: Types of Eye Trauma in Pediatric Patients

Type of Trauma	Number of Patients (%)
Blunt trauma	220 (69.4%)
Penetrating trauma	57 (18.0%)
Chemical burns	25 (7.9%)
Other	15 (4.7%)
Total	317

The most common type of eye trauma among pediatric patients was blunt trauma, accounting for 69.4% of cases. Penetrating trauma and chemical burns were also significant contributors to pediatric eye injuries.

Table 3: Mechanisms of Eye Injury in Pediatric Patients

Mechanism of Injury	Number of Patients (%)
Falls	132 (41.6%)
Accidents	95 (30.0%)
Assaults	50 (15.8%)
Sports-related	30 (9.5%)
Other	10 (3.2%)
Total	317

Falls were the leading cause of eye injury among pediatric patients, accounting for 41.6% of cases. Accidents and assaults were also significant mechanisms of injury, contributing to 30.0% and 15.8% of cases, respectively.

Table 4: Environmental Factors Associated with Pediatric Eye Trauma

Environmental Factor	Number of Patients (%)
Presence of hazardous objects	102 (32.2%)
Inadequate supervision	125 (39.4%)
Lack of protective eyewear	145 (45.7%)
Seasonal variation (e.g., summer vs. winter)	70 (22.1%)
Total	317

Inadequate supervision during outdoor activities was the most common environmental factor associated with pediatric eye trauma, accounting for 39.4% of cases. Lack of protective eyewear and the presence of hazardous objects were also significant contributors to eye injuries among children. Additionally, seasonal variation, particularly during summer months, was observed to impact the incidence of pediatric eye trauma.

Table 5: Chi-square Test Results for Association between Environmental Factors and Pediatric Eye Trauma

Environmental Factor	Chi-square Statistic	Degrees of Freedom	p-value	Conclusion
Presence of Hazardous Objects	20.32	1	0.0001	Significant ($p < 0.05$)
Inadequate Supervision	12.45	1	0.0005	Significant ($p < 0.05$)
Lack of Protective Eyewear	5.76	1	0.016	Significant ($p < 0.05$)
Seasonal Variation	2.81	1	0.094	Not Significant ($p \geq 0.05$)

The presence of hazardous objects and inadequate supervision showed a significant association with pediatric eye trauma, with p-values less than 0.05. Lack of protective eyewear also exhibited a significant association, although with a slightly higher p-value of 0.016. Seasonal variation did not show a significant association with pediatric eye trauma, as its p-value (0.094) was greater than 0.05.

Table 6: Odds Ratio Calculation Results for Environmental Factors and Pediatric Eye Trauma

Environmental Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	Interpretation
Presence of Hazardous Objects	3.50	(2.10, 5.85)	Significant association - Children with hazardous objects present are 3.50 times more likely to experience eye trauma compared to those without.
Inadequate Supervision	2.80	(1.75, 4.48)	Significant association - Children with inadequate supervision are 2.80 times more likely to experience eye trauma compared to those with proper supervision.
Lack of Protective Eyewear	1.90	(1.10, 3.28)	Significant association - Children without protective eyewear are 1.90 times more likely to experience eye trauma compared to those with protective eyewear.
Seasonal Variation	1.30	(0.95, 1.80)	No significant association - There is no significant difference in the likelihood of pediatric eye trauma between different seasons.

The odds ratio indicates the strength of the association between each environmental factor and pediatric eye trauma. A value greater than 1 suggests a positive association, while a value less than 1 suggests a negative association. Presence

of hazardous objects and inadequate supervision exhibit higher odds ratios (3.50 and 2.80, respectively), indicating stronger associations with pediatric eye trauma. Lack of protective eyewear also shows a significant association but with a lower odds ratio (1.90) compared to the other factors. Seasonal variation, although not statistically significant, still shows a slight positive association with pediatric eye trauma, albeit with a low odds ratio (1.30) and wide confidence interval.

4. Discussion

Eye trauma in children is a significant public health concern due to its potential to cause long-term visual impairment and impact overall quality of life [4] . Understanding the environmental factors contributing to pediatric eye injuries is crucial for developing effective prevention strategies. In this study, we investigated the association between environmental factors and pediatric eye trauma in Albania. Our findings indicate significant correlations between certain environmental factors and the incidence of eye trauma in children.

The presence of hazardous objects emerged as a significant risk factor for pediatric eye trauma [5]. Children exposed to hazardous objects were 3.50 times more likely to experience eye injuries compared to those without such exposure. This underscores the importance of creating safe environments for children by removing or securing hazardous objects, particularly in play areas and homes. Inadequate supervision during outdoor activities also showed a strong association with pediatric eye trauma [6], with children lacking proper supervision being 2.80 times more likely to sustain eye injuries. This highlights the need for enhanced supervision and caregiver education to prevent accidents and mitigate the risk of eye trauma in children.

The lack of protective eyewear was identified as another significant risk factor for pediatric eye injuries [7]. Children without protective eyewear were 1.90 times more likely to experience eye trauma compared to those wearing protective gear. Promoting the use of appropriate eye protection, such as goggles or sunglasses [8], during recreational activities and sports can help reduce the incidence and severity of eye injuries in children.

Although seasonal variation did not show a statistically significant association with pediatric eye trauma in our study, there was a slight positive correlation, with a low odds ratio. This suggests that environmental factors influenced by seasonal changes, such as increased outdoor activities during summer, may contribute to a higher incidence of eye injuries among children. However, further research is needed to explore the specific environmental factors driving seasonal variations in pediatric eye trauma [9].

It is essential to acknowledge the limitations of our study, including its retrospective design and reliance on secondary data sources. The study's findings may be subject to selection bias inherent in retrospective analyses. Future research could benefit from prospective studies with larger sample sizes and more comprehensive data collection methods to validate our findings and explore environmental factors influencing pediatric eye trauma.

5. Conclusion

In conclusion, our study highlights the significant impact of environmental factors on pediatric eye trauma in Albania. The presence of hazardous objects, inadequate supervision, and the lack of protective eyewear emerged as key risk factors contributing to the incidence and severity of eye injuries in children. These findings underscore the importance of implementing targeted interventions and educational programs aimed at creating safer environments, promoting proper supervision, and encouraging the use of protective eyewear among children. By addressing these environmental determinants, we can effectively reduce the injury of pediatric eye trauma and safeguard the visual health and well-being of Albanian children.

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