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ANALYSIS OF EPIDEMIOLOGICAL AND HEALTH-ECONOMIC INDICATORS IN CASE OF CHILDREN OCULAR TRAUMA

Case
Study

Keywords

Ocular trauma,
Pediatric,
Health-economic indicators,
Hospitalization days,
Epidemiology

Abstract

Analysis of epidemiological and health-economic indicators on ocular trauma involving children is important for developing targeted managerial, medical and educational strategies of health care providers and patients in order to reduce incidence and severity of pediatric ocular trauma. We analysed data collected from 29 children with ocular trauma from Emergency Hospital of Sibiu, between 2008-2016. For this children with closed globe injury it took an average of 7 days of hospitalization (IQR: (5; 9.5)), with a cost per day of hospitalization on average of 127 RON (IQR: (103; 136)), respectively a total hospitalization cost on average 856 RON (IQR: (529; 998)), with no significant gender or area differences. It took a slightly larger number of hospitalization days in the following situations: (1) in the case of mixed trauma compared to lamellar lacerations or contusions; (2) if the affected area was zone III compared to the other two areas (zone I and zone II); (3) where the visual acuity at admission was less than 1/6(0.16) compared to cases with visual acuity greater than 1/6(0.16); (4) in patients with hypertension at admission compared to those with normal tension or hypotension.

RESULTS

INTRODUCTION

Although there are many ways in which eye trauma in children is different by eye trauma in adults, ocular trauma in general and paediatric ocular trauma in particular are causes of eye morbidity, non-congenital blindness, visual impairment (unilateral or bilateral low vision or blindness), socioeconomic loss, pain, psychosocial stress [Niiranen 1981, Coody 1997, Al-Bdour 1998, Négrel AD 1998, Knyazer 2008, Rahman 2006, Soyly 2010, Acar 2011, Al-Mahdi HS 2011, Abbott 2013]. This study aims to analyse epidemiological causes and economic indicators of eye injury in children in order to identify most common mechanisms of occurrences, their economic implications and possible prevention strategies.

MATERIALS AND METHODS

We conducted a retrospective study, considering 29 paediatric patients from County Hospital of Sibiu, Romania, Department of ophthalmology, in the period 2008-2016. We included in the study children under 18 years, with closed eye injury (according to Birmingham Eye Trauma Terminology System (BETTS)). This study was conducted in association with Research and Telemedicine Center in Neurological Diseases in Children, aiming to evaluate a data collection including: (1) demographics variables: age, gender, area (urban/rural); (2) clinical examination data: injury eye, injury type / mechanism (contusion, lamellar laceration (partial thickness), superficial foreign body, mixed), circumstances of injury (while being engaged in work, contact with an object, indeterminate intention, aggression by physical force or the use of a blunt object, road accident, while cutting wood), initial visual acuity (IVA) and final visual acuity (FVA), intraocular pressure (initial and final) and (3) health-economic indicators: numbers of hospitalization days, cost / hospitalization day and total cost of hospitalization.

Overall health-economic indicators were compared with demographics and clinical examination data. For data description we compute frequency, mean, standard deviation, median, IQR (percentile 25; percentile 75). For comparison we first used Kolmogorov-Smirnov test for normality and then the T-Test, Anova or Mann-Whitney, Kruskal-Wallis tests, as appropriate. The considered level of significance was 0.05. Data analysis was performed using SPSS Statistics (v. 20, IBM)

There were 79.31% (N=23) male cases, 51.72% (N=15) from rural area, with 55.17% (N=16) having the right eye injury, 62.07% (N=18) traumas caused by contusion, 51.72% (N=15) in zone II, in 68.97% (N=20) of cases the production circumstance was contact with an object (undetermined intention), 37.93% (N=11) with initial visual acuity ≥ 0.5 and 86.21% (N=25) with final visual acuity ≥ 0.5 .

For the 29 children with ocular trauma it took an average of 7 days of hospitalization (IQR: (5; 9.5)), this value ranging between an average of 4 days (SD=1.41) in 2010 and 10.50 days (SD=6.54) in 2009, with over 70% cases in the period 2011-2015 (figure no. 1).

The cost per day of hospitalization was on average of 127 RON (IQR: (103; 136)), respectively a total hospitalization cost was on average of 856 RON (IQR: (529; 998)). The figure no. 2 represents the distribution of the number of hospitalization days and the cost per day of hospitalization for the five age groups considered.

For male cases the average hospitalization length has been of 7.61 days (SD=4.28, median= 6, IQR (4;11)) being higher than in females cases (M=6.17, SD=1.33, median= 6, IQR (5;7)), without significant differences ($p=0.179>0.05$). The same tendency is preserved in terms of cost per day of hospitalization (male: M=129.13, IQR: (102; 136); female: M=119, IQR: (133; 135)) and total hospitalization cost (male: M=893.22, IQR: (526; 987); female: M=727.41, IQR: (665; 1008)).

There were also no significant differences between rural and urban patients in terms of hospitalization days (urban: M=7.29, IQR: (5;8); rural: M=7.33, IQR: (5;10); $p=0.974$), cost per day of hospitalization (urban: M=126.82, IQR: (82; 135); rural: M=127.55, IQR: (133; 136); $p=0.973$) and total hospitalization cost (urban: M=835.53, IQR: (409; 987); rural: M=880.73, IQR: (537; 1008); $p=0.816$).

In terms of injury mechanism (figure nr. 3), cases of trauma caused by mixed mechanisms have required a longer hospitalization length (M=8.75, SD=3.33, IQR (6;11.5)) and a greater total hospitalization cost (M=869.26, SD=483.04, IQR: (598;998)) but a lower cost per day of hospitalization (M=102.33, SD=41.72, IQR (65;134)) than situation of contusions (hospitalization length: M=869.26, SD=483.04, IQR: (598;998); total hospitalization cost M=862.26, SD=560.01, IQR: (526;976); cost per day of hospitalization: M=138.77, SD=63.86, IQR: (133;136)) or lamellar laceration (hospitalization length: M=6.33, SD=2.08, IQR: (4;8); total hospitalization cost: M=811.19, SD=355.31, IQR: (409;1083); cost per day of hospitalization: M=124.05, SD=18.85, IQR: (102;135)).

In situations where the production circumstance was contact with an object (undetermined intention) it took a larger number of days of hospitalization (M=7.55, SD=4.32, IQR: (4.5;10)), bigger (p=0.781) than in the situation of aggression by physical force or the use of a blunt object (M=6.57, SD=2.88, IQR: (5;8)) but a smaller (p=0.415) cost/day of hospitalization (contact with an object: M=115.53, SD=36.07, IQR: (103;135); aggression: M=157.84, SD=98.09, IQR: (82;195)) and a smaller (p=0.747) total hospitalization cost (contact with an object: M=835.28, SD=585.50, IQR: (472;940); aggression: M=876.78, SD=249.12, IQR: (675;1062)).

Patients with trauma in III area required a higher number of days of hospitalization (M=10, SD=6.28, IQR: (6;14)) and a higher total hospitalization cost (M=1283.37, SD=955.49, IQR: (537;1886)) compared to those who had affected the other areas (days of hospitalization, zone I: M=6.11, SD=2.67, IQR: (5;7), zone II: M=7.13, SD=3.36, IQR: (5;10), p=0.197; total hospitalization cost, zone I: M=738.58, SD=240.34, IQR: (665;941), zone II: M=789.63, SD=378.73, IQR: (526;1008), p=0.116).

Patients with initial visual acuity between 0.16-0.025 (1/6-1/40) have required a higher number of days of hospitalization (M=9, SD=6.78, IQR: (5;13)) being followed by patients with IVA of 0.02 (1/50), counting fingers, hand movement, light perception (M=8, SD=4.32, IQR: (5;14)), patients with IVA ≥ 0.5 (M=6.82, SD=2.71, IQR: (5;9)) and patients with IVA between 0.3-0.2 (1/3-1/5) (M=6.43, SD=3.55, IQR: (4;11)) (p=0.701) (figure nr. 4).

Patients with hypertension have required a higher number of hospitalization days (M=8.13, SD=5.62, IQR: (4.5;11.5)) and a cost per day of hospitalization (M=135.45, SD=93.25, IQR: (119;167)) and a total cost (M=1008.06, SD=695.84, IQR: (604;1019)) higher than patients with normal tension (number of hospitalization days: M=7, SD=3.20, IQR: (5;9); cost per day of hospitalization: M=115.85, SD=32.75, IQR: (94;135); total cost: M=791.76, SD=431.96, IQR: (467;970))

CONCLUSION

In our study the majority of pediatric eye injury are caused by contact with an object, indeterminate intent and aggression by physical force or the use of a blunt object, so is obvious in this research and widely reported in other studies that they are preventable. Implementation of targeted managerial, medical and educational strategies of health care providers and patients would reduce incidence and severity of pediatric ocular trauma. In this direction, there are numerous approaches

undertaken by the World Health Organization, The Royal Society for the Prevention of Accidents, Child Safety Education Coalition and other researchers [Abbott 2013, Hoskin 2016], which can be considered and adapted after a local analysis of the situation.

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Appendices

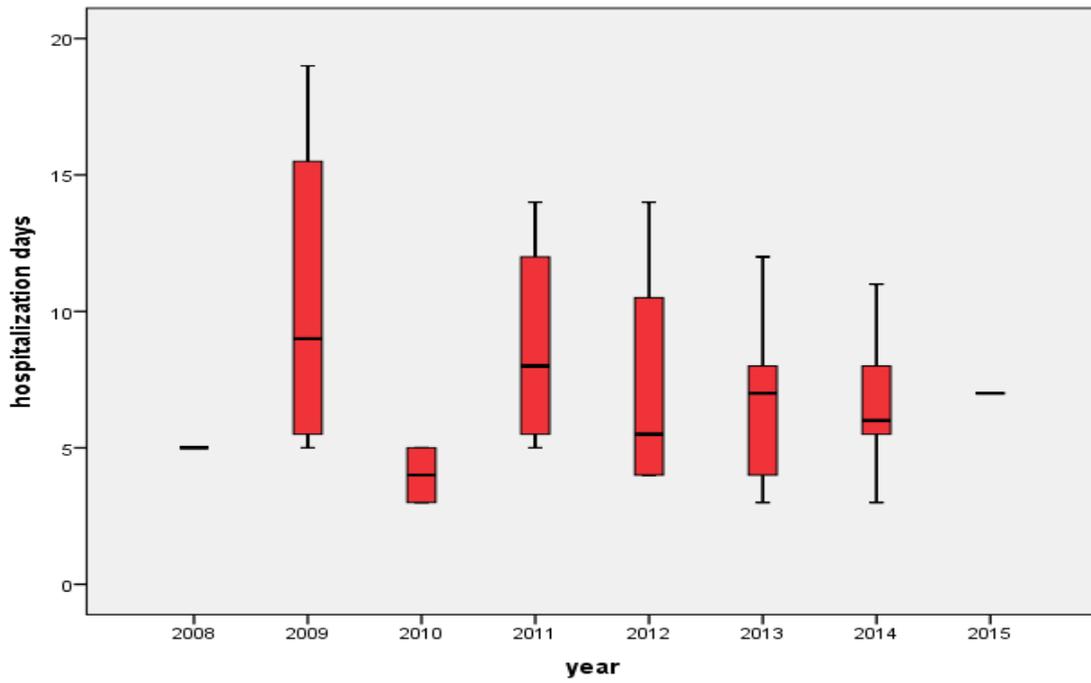


Figure no.1 Distribution of the number of days of hospitalization over time (2008-2015)

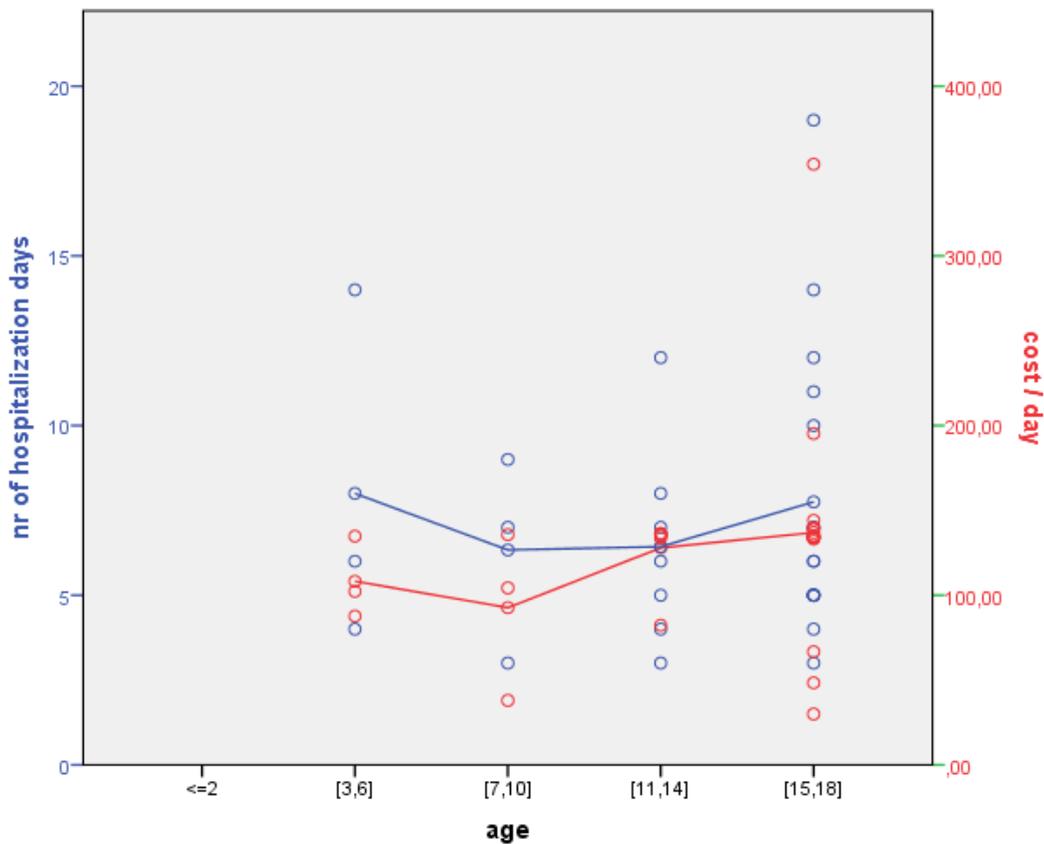


Figure no. 2 Number of hospitalization days and the cost per day of hospitalization for the five age groups

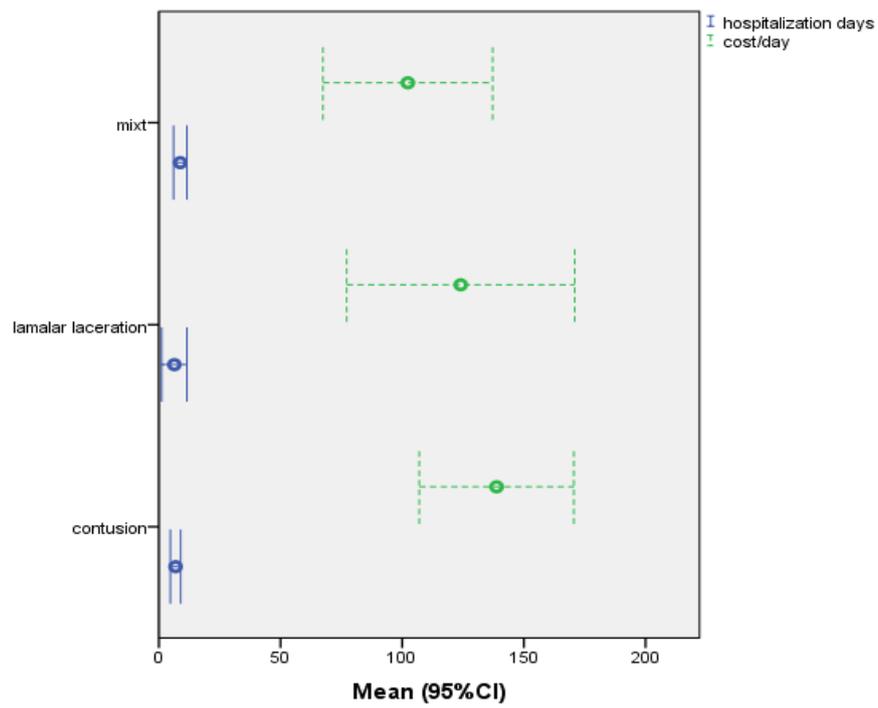


Figure no. 3 Distribution of hospitalization days and cos/day by injury mechanism

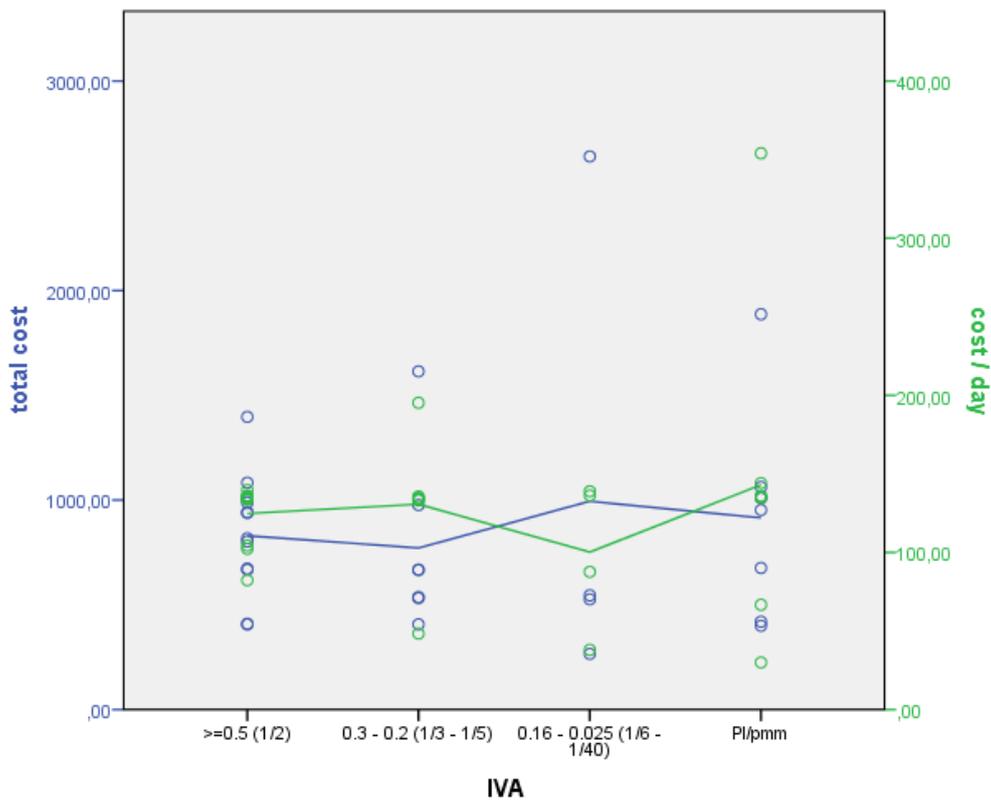


Figure no. 4 Distribution of total hospitalization cost and cos/day by IVA