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# The epidemiology of blunt ocular trauma in a tertiary health care institution in Serbia – a four-year-long retrospective study

Епидемиологија тупе трауме ока у терцијарном здравственом центру у Србији – четворогодишња ретроспективна студија

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# The epidemiology of blunt ocular trauma in a tertiary health care institution in Serbia – a four-year-long retrospective study

## Епидемиологија тупе трауме ока у терцијарном здравственом центру у Србији – четворогодишња ретроспективна студија

**SUMMARY**

**Introduction/Objective** Ocular trauma is a globally important cause of visual impairment.
The aim of our study was to analyses demographic, epidemiological and clinical characteristics of blunt ocular trauma.

**Methods** The retrospective study enrolled patients with blunt ocular trauma, hospitalized at the Eye Clinic, University Clinical Center of Serbia in Belgrade in a four-year period (2018-2022). Demographic characteristics, mechanism of injury, best corrected visual acuity on admission and discharge and injured eye structure were analyzed.

**Results** Out of 283 patients, the majority (n = 233.82%) were men. People aged 61 and over (n = 82.29%) were at greatest risk for blunt ocular trauma. Injuries from splitting wood (n = 78.28%) and various blunt tools and objects (n = 70.25%) were the most common mechanism in the entire study group, both in men and in women. Visual acuity on admission was better than 0.6 in 147 (52%) patients and at discharge in 185 (65%). The most common eye structure affected are pathological findings in anterior chamber (n = 160.56%), which are mainly related to hyphemia.

**Conclusion** Present study showed that blunt ocular trauma affects all age groups, but most often elderly and children. Men are injured more often than women. Splitting wood and manipulating blunt tools and objects are activities with the highest risk of blunt ocular trauma.

**Key words:** blunt trauma; Serbia; epidemiology; injury

**САЖЕТАК**

**Увод/Циљ** Повреде ока представљају важан узрок оштећења вида на глобалном нивоу. Циљ наше студије био је да анализирамо демографске, епидемиолошке и клиничке карактеристике тупих повреда ока.

**Методе** Спроведена је ретроспективна студија која је укључила пацијенте са тупом повредом ока, хоспитализоване на Клиници за очне болести, Универзитетског Клиничког центра Србије у Београду у четворогодишњем периоду (2018–2022). Анализиране су демографске карактеристике, механизам повреде, најбоље коригована видна оштрина на пријему и отпусту као и повређене структуре ока.

**Резултати** Од 283 пацијената, већину (*n* = 233,82%) су чинили мушкарци. Људи старости од 61 године или старији (*n* = 82,29%) су били у највећем ризику од тупе трауме ока. Повреде током цепања дрва (*n* = 78,28%) и различитим тупим алатима и предметима (*n* = 70,25%) представљали су најчешћи механизам повређивања у целој студијској групи, као и међу мушкарцима и женама. Видна оштрина при пријему била је боља од 0,6 код 147 (52%) пацијената, а на отпусту код 185 (65%). Најчешће захваћена структура ока били су патолошки налази у предњој комори (*n* = 160,56%), који су се углавном односили на хифему.

**Закључак** Ова студија показала је да тупа траума ока погађа све старосне доби, али најчешће старију популацију и децу. Мушкарци се чешће повређују у поређењу са женама. Цепање дрва и руковање тупим алатима и предметима представљају активности са највећим ризиком од тупе трауме ока.

**Кључне речи:** тупа траума; Србија; епидемиологија; повреда



## INTRODUCTION

Ocular trauma is a globally important cause of visual impairment. According to estimates, traumatic eye injury is the cause of 1.6 million cases of blindness and 19 million cases of monocular blindness worldwide [1, 2]. According to the reports of the World Health

 

Organization, every year there are about 55 million cases of eye trauma in the world [3], therefore eye trauma is a considerable public health issue. It can seriously limit patient's social and working abilities [4]. When it comes to eye trauma in the pediatric population, it represents a specific problem, in terms of rehabilitation, greater emotional stress for the child and parents, and the possibility of amblyopia [5, 6]. Rates of ocular trauma are higher in young adults, specifically ages 5 to 25, and in people over the age of 70. Additionally, men are at greater risk of ocular injuries [2, 3]. However, it is estimated that around 90% of eye trauma is relatively preventable, especially in children [7].

According to widely accepted Birmingham Eye Trauma Terminology system [8], all eye injuries can be divided into closed and open globe injuries, depending on presence of a full thickness wound. Open globe injuries refer to rupture, laceration, penetrating, intraocular foreign body and perforating injury, while closed globe injuries are lamelar laceration and contusion. In some cases, wounds are of a mixed nature. Blunt ocular trauma can cause either open (rupture) or closed globe injury (contusion and lamelar laceration). Standardized classifying of eye injuries is required for documentation and determination of the extent of injury [9].

The aim of our study was to analyses demographic, epidemiological and clinical characteristics of blunt ocular trauma patients who were hospitalized atthe University Eye Clinic in Belgrade. These researches are useful in recognizing risk factors and prognosis, thereby improving preventiveand management stategies

## METHODS

This retrospective study was conducted at the Eye Clinic, University Clinical Center of Serbia in Belgrade. Analyzed patients were hospitalized at the Department of Eye Traumatology and the Department of Children's Diseases at the Eye Clinic in the period from



 

December 2018 to May 2022. Patients data has been obtained from medical records - medical history and the database of the "Heliant" software. The collected data included sex, age, diagnosis, mechanism of injury, eye structure affected by the injury, as well as the method of treatment and the correlation of all these parameters.

Patients were divided according to gender and into groups according to age (under 18, 18-39, 40-60 and 61 and older). In correlation with these groups, a division was made according to the mechanism of injury as follows: injuries while chopping woods, injury with different blunt tools and objects, fall injury, injury by a projectile, sport injuries, assaults, explosions, traffic injury and injury resulting from an unknown cause. For each cause of injury, the affected structures of the eye (eyelid, conjunctiva, cornea, anterior chamber, iris, lens, vitreous body and retina) were analyzed. The best-corrected visual acuity (BCVA), obtained with Snellen charts, was also analyzed at admission and discharge, and then divided into three groups: below 0.1, 0.1-0.5 and 0.6-1.0. In relation to the applied therapy, all patients were divided into two groups - patients who received conservative therapy, and patients who were treated surgically.

This study was undertaken according to the tenets of Helsinki Declaration and approved by the hospital's Committee.

Statistical analysis

The description of the categorical variables was performed by using an absolute and relative number in the form n (%). Comparisons were made using the Chi-square test and Students T-test. Continuous variables are displayed as mean value and standard deviation and were compared using the Mann-Whitney test (with the assessment of the distribution normality). The result was considered statistically significant for the level of significance from 0.05. Statistical analysis was performed using Microsoft Excel 2010 software.



 

**RESULTS**

Our retrospective study consisted of 283 patients with blunt eye trauma, including contusions, lamelar lacerations and globe ruptures. There were 233 males (82%) and 50 females (18%), with male to female ratio of 4,7:1. In all age study groups, males represented the majority.

The majority of the study population (n=82, 29%) was older than 61 years, while 76 (27%) patients were younger than 18 years. In the group between 18 and 39 years was 75 (26%) patients, and 50 of them (18%) were between 40 and 60 years. The youngest patient was 1 year old, and the oldes was 87, with average age 40.32±23.89. In the female population, injuries occurred most commonly at the age over 61 years (n=23, 46%), followed by females younger than 18 years (n=17, 34%). In each of the remaining groups, there were 5 cases (10%) of women, i.e., in the groups between 18 and 39 years old and between 40 and 60 years old. In the male population, different results were obtained compared to the female population. Seventy cases (30%) of all injured men were in the age group between 18 and 39 years, while 59 cases (25%) were younger than 18 years. In addition, 59 (25%) of all injured men were older than 61 years, while 45 (20%) od men were in the 40 -60 age group.

In our sample, patients were most often injured when splitting wood (n=78, 28%). The second most common cause is injuries with various blunt tools and objects (n=70, 25%), followed by sport injuries (n=42, 15%), assaults (n=26, 9%), projectile injuries (n=21, 7%), fall injuries (n=15, 5%), unknown cause of injury (n=15, 5%), explosions (n=12, 4%) and traffic injuries (n=4, 2%). The first and second most common mechanism of injury in men and women were the same as in the entire examined population. Third in order are sports injuries in men (n=39, 17%), while in women it is projectile injuries (n=8, 16%). The fourth most common cause in both men and women was assault (n=20, 9% and n=6, 12%, respectively). Patients injured in traffic are all males. Detailed analysis regarding the meschanism of injury



 

in males and females are shown in Figure 1. and 2. In the group up to 18 years of age, the most common cause of injuries was sport (n=20, 26%), while injuries caused by various tools and objects were the most common cause in the population between 18 and 39 years (n=24, 32%), as well as in the population aged 40 to 60 (n=15, 30%). Chopping wood was the most common mechanism of injury among people over 61 years old (n=45, 55%). Detailed analysis regarding the mechanism of injury in all age study groups are shown in Table 1.

Visual acuity on admission was better than 0.6 in 147 (52%) patients, while in 106 (37%) of them it was worse than 0.1 while 30 (11%) patients had visual acuity between 0.1 and 0.5. At discharge, BCVA was better than 0.6 in 185 (65%), worse than 0.1 in 63 (22%) and between 0.1 and 0.5 in 35 (12%) patients.

In the vast majority of the study population (n=197, 70%) conservative treatment was the treatment method. Eighty-six cases (30%) required surgery, most of whom were older than 61 years (n=47, 55%).

Regarding the structure of the injured eye, the most prevalent are the pathological findings in the anterior chamber (n=160, 56%). These mostly included hyphaema, however cells, proteins and vitreous were also seen in some patients. The second most common site of injury was the conjunctiva (n=147, 52%) involving hyperemia, suffusion and lacerations, followed by the corneal erosions, edema and lacerations (n=123, 43%). Retinal edema, hemorrhages, tears or detachments were observed in 121 (43%) patients. Eyelids were also often injured (n=113, 40%). Lens injuries, including traumatic cataract, subluxation and luxation were present in 85 (30%) patients. Partial or total vitreal hemorrhages were found in 64 (23%) patients, and the iris was the least injured (n=46, 16%). Nine (3%) globe ruptures were observed.



 

## DISCUSSION

Ocular trauma in general, is one of the leading preventable cause of monocular blindness worldwide [8]. According to many previous studies, blunt ocular trauma accounts for the majority of all ocular traumas [3, 4, 6, 9, 10, 11], so the analysis of this type of trauma by itself could be very useful. To our knowledge, this is one of the first studies that examines the epidemiology of hospitalized blunt eye trauma in the Serbian population. Our study provides insight into the epidemiology of eye trauma in hospitalized patients in Serbia and supports findings that eye trauma is a significant cause of vision loss in our population.

Our study showed that men are at, approximately four times greater risk of blunt ocular trauma compared to women. This is consistent with most others studies [3-13] with the link believed to be due to occupational hazards, more frequent involvement in assaults, alcohol use, and high-risk driving activities [8, 11, 12, 13]. In this study, all patients injured in traffic accidents were male. Our study, as well as previous studies involving only pediatric populations, reported a male predilection for ocular trauma in children. This can be related to more aggressive games in boys than in girls [5, 6]. One study that included only patients older than 70 years, with globe rupture due to a fall, showed a predominance of women [2]. Although our study observed a male predilection in all age groups and across all mechanisms of injury, the mentioned study suggests that women may be at greater risk of ocular trauma in some specific circumstances [2].

Regarding the age distribution, the majority of our study group consisted of patients older than 61 years. These data are in contrast to the results observed in most other studies, where the highest rates of ocular trauma are usually found in children or younger adults [3, 9, 11-14]. This difference may be due to different demographic characteristics of various countries and nations. Additionally, the ranges of age groups were not the same in all studies, so they are more difficult to compare. However, one research conducted in Spain noted the highest



 

incidence of eye trauma in people over 65 years of age, as well as a much stronger association with older age in female group, all of which is consistent with our results [15]. Most of our male patients were in the group between 18 and 39 years, followed by men younger than 18 years, which is consistent with previous studies [12, 16].

In our study, patients were most often injured when chopping woods and with various tools and objects. These two mechanisms of injury together were found in nearly half of the entire study population. Also, in men and women separately, these two were the most common causal mechanisms. In some studies, it was found that wooden objects are the most common cause of eye trauma [3, 16, 17], while in others, blunt object injuries were the most common [9, 13, 14]. This is in agreement with results obtained in this study. Additionally, twelve-year-old research from our country reported wood as the most prevalent causal mechanism in all eye injuries [18]. Therefore, over the years, this tendency remains the same in our nation, according to the present study. We found that sport is the most common cause of injury in pediatric population, which is in agreement with previous studies [19, 20]. Contrary to our results, Shah et al. as well as Choovuthayakorn et al. reported that children are at the highest risk of being injured by wooden objects or stones [5, 17]. Still, our second most common causal mechanisms in children were blunt tools and objects which includes stone objects as well. Wooden objects were the most common cause of eye trauma in people over 60 years old according to a study from Thailand, which is the same as in our research [17]. Assaults are not insignificant, considering that they were the fourth causal mechanism in entire study group, as well as in both men and women. The same, increasing trend in assaults is also found in other studies [4, 9].

Patients with BCVA greater than 0.6 at admission comprised more than half (52%) of our study group. At discharge, an even higher percentage (65%) of patient had a visual acuity greater than 0.6. Severe visual impairment (BCVA less than 0.1) was noted in 37% of our patients at admission, while at discharge that number was 22%. Similar results were obtained



 

in other studies [3, 5]. However, some researchers have found worse visual prognosis after eye trauma, comparing to our findings [21, 22].

Data found in the literature on the structure of the eye affected by trauma are controversial. Pathological findings in the anterior chamber, related mainly to hyphemia, were the most frequently observed in this study. One study that included only closed globe injuries also reported hyphemia as the most common anterior segment presentation [23]. However, another study involving blunt ocular trauma exclusively in pediatric population, gave different results, as hyphemia was not that common [5]. In our patients, the conjunctiva, cornea, retina and eyelids are often damaged. Two studies, one from Oman and the other from Jordan, described similar but not exactly the same results. They also reported frequent wound to the conjunctiva, cornea and lid, but the retina was rarely injured compared to our study [4, 13]. These differences can be explained by the fact that most other studies described total eye injuries and not just blunt eye trauma.

## CONCLUSION

The current study showed that blunt ocular trauma affects all age groups, but most often the elderly and children. Men are injured more often then women. Splitting wood and manipulating blunt tools and objects are activities with the highest risk of blunt ocular trauma. Further studies are desired to better understand the epidemiology and nature of these injuries. Attention should also be focused on educating people about safety measures to prevent blunt ocular trauma.



 

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Ethics: Principles of the Declaration of Helsinki were respected in this study.

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**Conflict of interest:** None declared.



 

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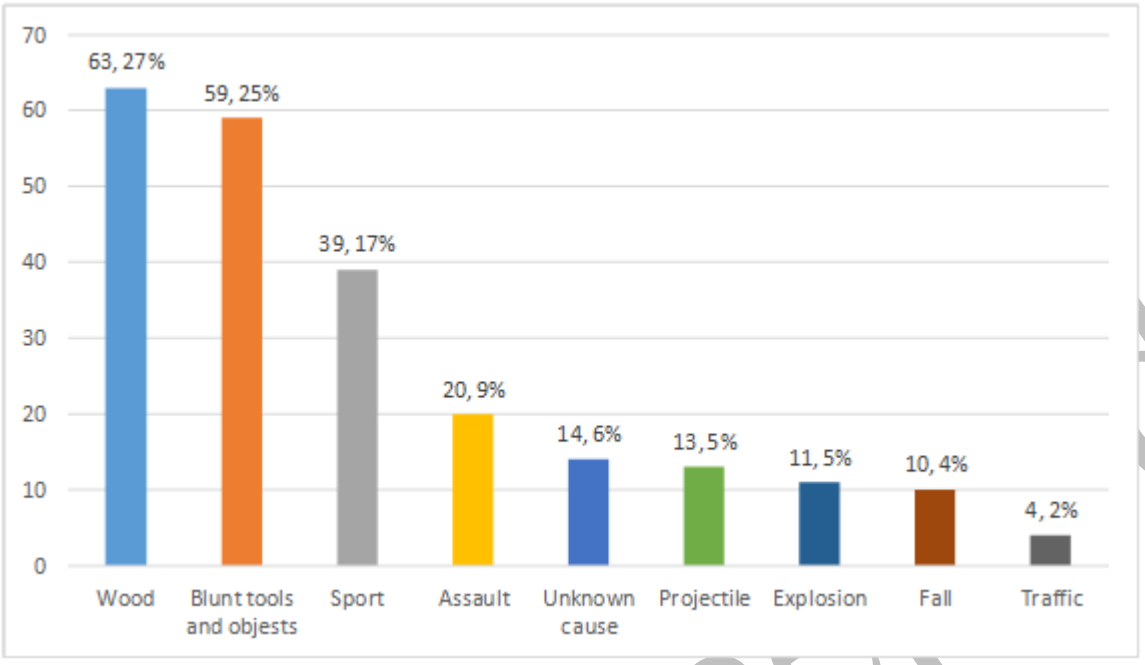


**Figure 1.** Mechanism of injury in males



 

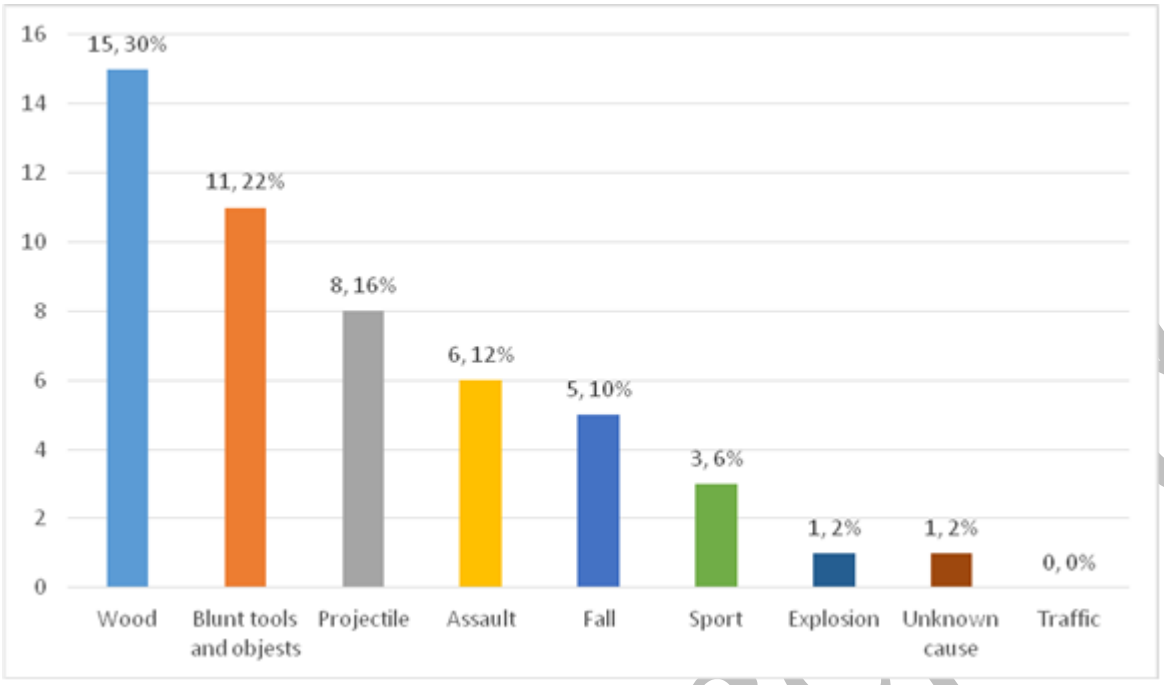


**Figure 2.** Mechanism of injury in females



 

**Table 1.** Mechanism of injury in all age study groups

| **Mechanism of injury** | **Age** | | | |
|---|---|---|---|---|
| | Under 18 | 18–39 | 40–60 | 61 and older |
| Wood | 10 (13%) | 10 (13%) | 13 (26%) | **45 (55%)** |
| Blunt tools and objects | 18 (24%) | **24 (32%)** | **15 (30%)** | 13 (16%) |
| Sport | **20 (26%)** | 16 (21%) | 5 (10%) | 1 (1%) |
| Assaults | 5 (7%) | 11 (15%) | 4 (8%) | 6 (7%) |
| Projectile | 11 (14%) | 4 (5%) | 1 (2%) | 5 (6%) |
| Fall | 4 (5%) | 1 (2%) | 3 (6%) | 7 (9%) |
| Unknown cause | 2 (3%) | 4 (5%) | 6 (12%) | 3 (4%) |
| Explosions | 5 (7%) | 3 (4%) | 2 (4%) | 2 (2%) |
| Traffic | 1 (1%) | 2 (3%) | 1 (2%) | 0 (0%) |
| Total | 76 (100%) | 75 (100%) | 50 (100%) | 82 (100%) |



 