



Ocular injuries sustained at home in five metropolitan cities: a review of 5008 cases

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ABSTRACT

Background: In Iran, ocular injuries sustained at home are a growing public health issue, and few studies have explored their prevalence and the frequencies of different causes of these injuries. We investigated the features of ocular injuries at home among children and adolescents (aged < 18 years), adults (18 – 64 years), and the elderly (≥ 65 years) in five metropolitan cities.

Methods: In this cross-sectional study, we recruited individuals with ocular injuries sustained at home who presented to 12 public/teaching hospitals in five metropolitan cities during a 5-month period. Using clinical records within the emergency department archives, we collected the following data: age, sex, frequency of injuries requiring hospital admission or surgical intervention, and causes of eye injuries, documented as 1) cleaning products, 2) chemical products, 3) kitchen items, 4) cooking activities, 5) toys, 6) falls from height, 7) sports equipment, 8) penetrating or cutting, 9) abrasions, 10) foreign bodies, and 11) direct blows by other individuals.

Results: Of 5008 participants from the five cities, 74% (n=3711) were male and 26% (n=1297) were female. The most frequent causes of injury among children and adolescents, adults, and the elderly were toys, kitchen items, and cooking activities, respectively. In children and adolescents, injuries were caused by kitchen items, toys, foreign bodies, and direct blows by other individuals more frequently than in adults or the elderly, and by cleaning products and abrasions more frequently than in the elderly (all $P < 0.05$). In adults, injuries were caused by cleaning products, cooking activities, falls from height, sports equipment, penetrating or cutting, and abrasions more frequently than in children and adolescents or the elderly (all $P < 0.05$), and by kitchen items, toys, and blows by other individuals more frequently than in the elderly (all $P < 0.05$). In the elderly, injuries were caused by chemical products more frequently than in children and adolescents or adults, and by cooking activities, falls from height, and sports equipment more frequently than in children and adolescents (all $P < 0.05$). In adults, the frequency of ocular injuries was significantly higher in Tehran and lower in Mashhad when comparing each with that of the other four cities (all $P < 0.05$). We found a significantly higher frequency of ocular injuries by cleaning and chemical products in Tehran, by toys in Shiraz, by falls from height in Isfahan, and by direct blows by other individuals in Ahvaz when comparing each to that of the other four cities (all $P < 0.05$). Regarding the prevalence of severe ocular injuries among the children/adolescent and adult age groups, conditions were relatively better in Shiraz and relatively unfavorable in Mashhad.

Conclusions: Ocular trauma was more common in male individuals and the younger age groups. Approximately half of the causes were kitchen items, toys, and foreign bodies, which are avoidable by enhancing public eye health awareness. The prevalence of severe ocular injuries in individuals aged < 18 years was high, highlighting the necessity of nationwide preventive strategies for pediatric ocular injuries.

KEYWORDS

eye injury, home accidents, children, adolescents, adults, elderly, boys, girls


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INTRODUCTION

To ensure the well-being and safety of the population, health policy makers must focus on ocular injuries [1, 2]. Investigating ocular injuries sustained at home is of utmost importance for several reasons. First, the eyes are among the most delicate and vital human organs, and visual function greatly affects the overall quality of life. Therefore, any eye injury may have substantial and long-lasting consequences [3-5]. By understanding the causes and patterns of ocular injuries at home [5], policy makers can develop targeted interventions and preventive measures to mitigate the risk of these injuries [1, 2].

Across all age groups, ocular trauma is second only to cataracts among the most frequent causes of unilateral, partial, or total blindness [6]. Research has indicated that in patients who present to an eye casualty department, eye trauma most commonly occurs in the home [7]. Ocular trauma incurs yearly costs in the millions of dollars, both direct and indirect. Most ocular trauma occurs in developing nations, and citizens of these nations are also the least able to pay for treatment. Research on eye injuries has become increasingly popular as the implications of ocular trauma for public health have been realized [8, 9]. With improved supervision, education, and ocular protection, 46% to 90% of ocular trauma could be avoided [10, 11].

Even relatively minor eye injuries can result in discomfort, missed work, and medical costs. Identifying preventive measures requires determining the causes and extent of ocular trauma [12]. Iftikhar et al. [13] reported an incidence of primary eye trauma of 3.0 per 100 000 individuals, and the lifetime prevalence is 13.5% for men in the USA [14]. The typical location where eye injuries occur has changed from the work environment in the past to the home or public areas at present [15, 16]. Moreover, studies have demonstrated that eye injuries are now the main factor contributing to socioeconomic burden in low- and middle-income nations [17, 18].

Ineffective or unavailable medical care can have several negative effects, including substantial financial hardship. Thus, to implement preventive strategies, we must systematically investigate the epidemiologic features of eye injury [18]. While our homes serve as safe havens for our families, accidents may happen, especially involving the eyes. Different types of eye injuries can occur at home, and an understanding of these is required to prevent long-lasting damage. Foreign objects entering the eye, such as dust, debris, or even a small piece of metal, may cause irritation, redness, and discomfort, and if not treated promptly, can lead to infections or compromised corneal integrity. Inadvertent eye exposure to chemicals [7, 19], such as household cleaners, solvents, or aerosol sprays, can cause severe irritation, burning sensation, and blurred vision. Penetrating injuries and other accidents involving sharp objects, such as knives and scissors, often have a poor prognosis [2, 19]. The severity of injury can range from minor cuts or scratches to more severe conditions such as corneal abrasions and puncture wounds. Reducing the incidence of serious eye injuries requires increased awareness of risk factors and preventive measures [19].

Investigating the causes of ocular injuries at home is crucial for several reasons. First, it can help to identify potential hazards and preventive measures. By identifying common hazardous activities such as improper use of household chemicals, lack of protective eyewear, or unsafe home renovation practices, we can take proactive steps to mitigate the risks [5, 20]. Second, by understanding the specific causes of ocular injuries, medical practitioners can tailor their approaches to diagnosis, treatment, and rehabilitation, ultimately leading to better patient outcomes [20]. Third, it can help to educate the public about the importance of eye safety and to encourage responsible behavior. By disseminating information about these injuries and their preventability, we can empower all individuals to take the necessary precautions to create a safer home environment [2, 20].

The main purpose of this research was to investigate the causes of eye injuries at home and to establish any differences between age or sex subgroups in five metropolitan cities in Iran. The results of this research could greatly help to identify and minimize risk for these injuries and reduce national health costs.

METHODS

In this cross-sectional study, we used a convenience sampling method to recruit individuals with ocular injuries at home. The individuals had presented to 12 public/teaching hospitals in five metropolitan cities in Iran (Tehran, Mashhad, Isfahan, Shiraz, and Ahvaz) from June 1, 2023, to October 31, 2023. These five cities encompass more than one third of the country's population [21]; therefore, they provided a representative sample for investigation. The research was conducted according to the principles of the Declaration of Helsinki. The Ethics Committee of the local institute approved the study protocol. All necessary ethical and legal permissions were obtained before data was accessed.

In a retrospective patient record review, we collected data pertaining to patient demographics, causes of eye injuries, and severity of the injuries based on hospitalization status or whether surgical intervention was required. We fully secured the patient information and maintained confidentiality.

For data collection, we reviewed clinic records within the archives of the emergency departments in the included public/teaching hospitals. There are many hospitals in each included city; however, we analyzed only the data from hospitals that agreed to participate in the research. The 12 public/teaching hospitals included three hospitals in Tehran, three hospitals in Mashhad, two hospitals in Isfahan, two hospitals in Shiraz, and two hospitals in Ahvaz. A final diagnosis and cause of ocular injury was documented in the clinic note created by the ophthalmology resident in the emergency department. If the ophthalmology resident had uncertainty regarding the diagnosis or cause of injury, the senior faculty member verified the diagnosis or cause and documented the findings as confirmed by a consultant. We excluded individuals with incomplete data or rare injuries, such as those caused by strong sunlight or radiation exposure.

Participants from each city were allocated to one of 11 subgroups based on the cause of eye injury: 1) cleaning products, 2) chemical products, 3) kitchen items, 4) cooking activities, 5) toys, 6) falls from height, 7) sports equipment, 8) penetrating or cutting, 9) abrasions, 10) foreign bodies, and 11) direct blows from other individuals. Furthermore, we categorized participants into one of three age groups: children and adolescents (age < 18 years), adults (18 – 64 years), and the elderly (age ≥ 65 years) and into male and female sex groups. To calculate the prevalence of severe ocular injuries [22, 23], we documented the number of injuries requiring hospitalization or surgical intervention.

Data were analyzed using SPSS Statistics for Windows, version 16.0 (SPSS Inc., Chicago, IL, USA). The normality of data distribution was determined using the Kolmogorov – Smirnov test. Categorical data are presented using frequencies and percentages. To compare data among subgroups, we used analysis of variance and least significant difference post hoc tests. The significance level was set at a *P*-value < 0.05. We calculated the prevalence of severe ocular injuries at home in each age group for the entire sample and for each city using the number of individuals who required hospitalization or surgical intervention in each age group divided by the total number of individuals in that specific age group and in the entire sample, as well as in each city, respectively [23].

RESULTS

Of 5008 participants from the five cities, 74% (n = 3711) were male and 26% (n = 1297) were female. Toys were the most frequent cause of injury among children and adolescents, kitchen items were the most common among adults, and cooking activity was the most common among the elderly (Table 1). We found statistically significant differences in all 11 causes of ocular injuries between age groups (all *P* < 0.05) (Table 1).

Pairwise comparisons revealed a significantly higher frequency of injuries caused by kitchen items, toys, foreign bodies, and direct blows by other individuals in children and adolescents than in adults or the elderly, and more injuries caused by cleaning products and abrasions in children and adolescents than in the elderly (all *P* < 0.05) (Tables 1 and 2). We found a significantly higher frequency of injuries caused by cleaning products, cooking activities, falls from height, sports equipment, penetrating or cutting, and abrasions in adults than in

Table 1. Frequencies of the causes of ocular injuries sustained at home according to age group in 5008 cases

Cause of injury	Children/ adolescents, n (%)	Adults, n (%)	Elderly, n (%)	<i>P</i> -value	Total
Cleaning products	88 (25)	205 (58)	58 (17)	0.001	351 (100)
Chemical products	85 (34)	74 (30)	91 (36)	0.018	250 (100)
Kitchen items	463 (49)	398 (42)	91 (10)	0.023	952 (100)
Cooking activities	75 (15)	263 (52)	163 (33)	0.001	501 (100)
Toys	574 (64)	222 (25)	105 (12)	0.001	901 (100)
Falls from height	26 (13)	93 (46)	83 (41)	0.039	202 (100)
Sports equipment	14 (7)	121 (61)	63 (32)	0.012	198 (100)
Penetrating or cutting	149 (37)	188 (47)	64 (16)	0.001	401 (100)
Abrasions	82 (27)	157 (53)	60 (20)	0.001	299 (100)
Foreign bodies	327 (54)	215 (36)	60 (10)	0.001	602 (100)
Direct blows from others	186 (53)	106 (30)	59 (17)	0.043	351 (100)
Total	2069	2042	897	0.044	5008

Abbreviations: n, numbers; %, percentage. Note: We categorized participants into one of three age groups: children/adolescents (age < 18 years), adults (18 – 64 years), and the elderly (age ≥ 65 years).

Table 2. Pairwise comparisons of frequencies of the causes of ocular injuries sustained at home according to age group in 5008 cases

Cause of injury	P-value for pairwise comparison		
	P ₁	P ₂	P ₃
Cleaning products	0.001	0.001	0.041
Chemical products	0.001	0.001	0.091
Kitchen items	0.004	0.001	0.001
Cooking activities	0.001	0.001	0.001
Toys	0.021	0.034	0.001
Falls from height	0.001	0.001	0.001
Sports equipment	0.001	0.021	0.001
Penetrating or cutting	0.094	0.001	0.001
Abrasions	0.035	0.001	0.006
Foreign bodies	0.001	0.001	0.001
Direct blows from others	0.001	0.009	0.004

Note: We categorized participants into one of three age groups: children/adolescents (age < 18 years), adults (18 – 64 years), and the elderly (age ≥ 65 years); P₁, P-value for the comparison between children/adolescents and adults; P₂, P-value for the comparison between children/adolescents and elderly; P₃, P-value for the comparison between adults and elderly.

Table 3. Frequencies of ocular injuries according to cause, age group, and sex group in five metropolitan cities

Group	Subgroups	Tehran, n (%)	Mashhad, n (%)	Isfahan, n (%)	Shiraz, n (%)	Ahvaz, n (%)	P-value
Cause of injury	Cleaning products (n = 351)	102 (29)	71 (20)	76 (22)	51 (15)	51 (15)	0.001
	Chemical products (n = 250)	82 (33)	43 (17)	57 (23)	48 (19)	20 (8)	0.001
	Kitchen items (n = 952)	208 (22)	43 (5)	109 (11)	299 (31)	293 (31)	0.057
	Cooking activities (n = 501)	179 (36)	195 (39)	81 (16)	25 (5)	21 (4)	0.004
	Toys (n = 901)	156 (17)	110 (12)	102 (11)	321 (36)	212 (24)	0.001
	Falls from height (n = 202)	38 (19)	36 (18)	78 (39)	31 (15)	19 (9)	0.001
	Sports equipment (n = 198)	59 (30)	31 (16)	59 (30)	21 (11)	28 (14)	0.019
	Penetrating or cutting (n = 401)	139 (35)	71 (18)	95 (24)	53 (13)	43 (11)	0.078
	Abrasions (n = 299)	45 (15)	81 (27)	55 (18)	32 (11)	86 (29)	0.031
	Foreign bodies (n = 602)	141 (23)	102 (17)	113 (19)	96 (16)	150 (25)	0.091
	Direct blows from others (n = 351)	76 (22)	43 (12)	81 (23)	47 (13)	104 (30)	0.002
Age group	Children/adolescents (n = 2069)	358 (17)	518 (25)	277 (13)	317 (15)	599 (29)	0.068
	Adults (n = 2042)	591 (29)	213 (10)	419 (21)	498 (24)	321 (16)	0.004
	Elderly (n = 897)	276 (31)	95 (11)	210 (23)	209 (23)	107 (12)	0.077
Sex group	Male (n = 3711) / Female (n = 1297)	827 (68) / 398 (32)	536 (65) / 290 (35)	693 (76) / 213 (24)	783 (76) / 241 (24)	872 (85) / 155 (15)	0.105
Total		1225 (24.5)	826 (16.5)	906 (18)	1024 (20)	1027 (21)	0.093

Abbreviations: n, numbers; %, percentage. Note: P-values < 0.05 are shown in bold; We categorized participants into one of three age groups: children/adolescents (age < 18 years), adults (18 – 64 years), and the elderly (age ≥ 65 years).

Table 4. Pairwise comparisons of the frequencies of ocular injuries sustained at home according to cause and age group between five metropolitan cities

Variable	P-value for pairwise comparison									
	P ₁	P ₂	P ₃	P ₄	P ₅	P ₆	P ₇	P ₈	P ₉	P ₁₀
Cleaning products	0.021	0.001	0.005	0.001	0.094	0.001	0.001	0.001	0.001	0.305
Chemical products	0.035	0.009	0.001	0.001	0.048	0.065	0.001	0.065	0.001	0.001
Cooking activities	0.076	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.066
Toys	0.008	0.005	0.034	0.027	0.098	0.001	0.001	0.001	0.005	0.001
Falls from height	0.056	0.019	0.118	0.045	0.009	0.155	0.021	0.016	0.019	0.054
Sports equipment	0.015	0.095	0.001	0.017	0.019	0.035	0.095	0.009	0.001	0.052
Abrasions	0.032	0.053	0.041	0.001	0.001	0.018	0.298	0.021	0.017	0.034
Direct blows from others	0.001	0.087	0.025	0.001	0.017	0.056	0.001	0.001	0.001	0.007
Adults	0.001	0.043	0.043	0.001	0.001	0.001	0.031	0.043	0.022	0.029

Note: P₁, P-value for the comparison between Tehran and Mashhad; P₂, P-value for the comparison between Tehran and Isfahan; P₃, P-value for the comparison between Tehran and Shiraz; P₄, P-value for the comparison between Tehran and Ahvaz; P₅, P-value for the comparison between Mashhad and Isfahan; P₆, P-value for the comparison between Mashhad and Shiraz; P₇, P-value for the comparison between Mashhad and Ahvaz; P₈, P-value for the comparison between Isfahan and Shiraz; P₉, P-value for the comparison between Isfahan and Ahvaz; and P₁₀, P-value for the comparison between Shiraz and Ahvaz.

Table 5. Prevalences of ocular injuries requiring surgery or hospitalization in the three age groups in five metropolitan cities

City	Age group	Total (n)	Need for surgery or hospitalization (n)	Prevalence (%)
Tehran	Children/adolescents	358	157	43.9 ***
	Adults	591	105	17.7 *
	Elderly	276	34	12.3 *
Mashhad	Children/adolescents	518	291	56.2 ***
	Adults	213	113	53.1 ***
	Elderly	95	36	37.9 **
Isfahan	Children/adolescents	277	135	48.7 ***
	Adults	419	109	26.0 **
	Elderly	210	73	34.8 **
Shiraz	Children/adolescents	317	122	38.5 **
	Adults	498	105	21.1 *
	Elderly	209	54	25.8 *
Ahvaz	Children/adolescents	599	331	55.3 ***
	Adults	321	115	35.8 **
	Elderly	107	35	32.7 **
Total	Children/adolescents	2069	1036	50.1 ***
	Adults	2042	547	26.8 **
	Elderly	897	232	25.9 *

Abbreviations: n, number of individuals; %, prevalence in percentage. Note: *: Low prevalence : < 26%; **: Moderate prevalence: 26 – 40%, ***: High prevalence: > 40%; We calculated the prevalence of severe ocular injuries at home in each age group for the entire sample and for each city using the number of individuals who required hospitalization or surgical intervention in each age group divided by the total number of individuals in that specific age group and in the entire sample, as well as in each city, respectively [22, 23]; We categorized participants into one of three age groups: children/adolescents (age < 18 years), adults (18 – 64 years), and the elderly (age ≥ 65 years).

children and adolescents or the elderly (all $P < 0.05$), and more injuries caused by kitchen items, toys, and direct blows by other individuals in adults than in the elderly (all $P < 0.05$) (Tables 1 and 2). However, despite a higher frequency of penetrating or cutting injuries in adults than in children and adolescents (Table 1), the difference was not significant ($P > 0.05$) (Table 2). We observed a significantly higher frequency of injuries caused by chemical products in the elderly than in children and adolescents or adults, and more injuries caused by cooking activities, falls from height, and sports equipment in the elderly than in children and adolescents (all $P < 0.05$) (Tables 1 and 2).

We found statistically significant differences between the five cities in the frequency of ocular injuries caused by cleaning products, chemical products, cooking activities, toys, falls from height, sports equipment, abrasions, and direct blows by other individuals as well as in the frequency of ocular injuries in the adult age group (all $P < 0.05$) (Table 3). However, there were no significant differences between the five cities in the frequency of ocular injuries caused by kitchen items, penetrating or cutting, or foreign bodies; in the children/adolescent or elderly groups; in the sex groups; or in the total sample (all $P > 0.05$) (Table 3).

Pairwise comparisons revealed a significantly higher frequency of ocular injuries in the adult age group in Tehran than in each of the other four cities; in Shiraz than in Mashhad, Isfahan, and Ahvaz; in Isfahan than in Ahvaz and Mashhad; and in Ahvaz than in Mashhad (all $P < 0.05$) (Tables 3 and 4). The frequency of ocular injuries in the adult age group was significantly lower in Mashhad than in the other four cities (all $P < 0.05$) (Tables 3 and 4). We found a significantly higher frequency of ocular injuries caused by cleaning and chemical products in Tehran than in each of the other four cities (all $P < 0.05$); more caused by cooking activities in Mashhad than in Isfahan, Shiraz, and Ahvaz (all $P = 0.01$); more caused by toys in Shiraz than in each of the other four cities (all $P < 0.05$); more caused by falls from height in Isfahan than in each of the other four cities (all $P < 0.05$); more caused by sports equipment in Tehran and Isfahan than in Mashhad, Shiraz, and Ahvaz (all $P < 0.05$); more caused by abrasions in Mashhad and Ahvaz than in Tehran, Isfahan, and Shiraz (all $P < 0.05$); and more caused by direct blows by other individuals in Ahvaz than in the other four cities (all $P < 0.05$) (Tables 3 and 4).

Table 5 lists the prevalences of severe ocular injuries sustained at home in each age group for the total sample and for each individual city. Overall, the prevalence was high ($> 40\%$) in children and adolescents in the overall sample and in each city, except in Shiraz, which had a moderate (38.5%) prevalence that was still higher than that of the adults and the elderly (Table 5). The prevalence of severe ocular injuries in the elderly was low in Tehran, Shiraz, and in the total sample, yet it was moderate in Mashhad, Isfahan, and Ahvaz (Table 5). The prevalence in adults was low in Tehran and Shiraz; was moderate in Isfahan, Ahvaz, and the total sample; and was high in Mashhad (Table 5). Overall, conditions were relatively better in Shiraz and relatively unfavorable in Mashhad in terms of the prevalence of severe ocular injuries among the children/adolescent and adult age groups.

DISCUSSION

In this retrospective medical record review of 5008 eye injuries, male individuals were affected three times more often than female individuals. The three most common causes of ocular injuries were kitchen items, toys, and foreign bodies, accounting for nearly half of the causes. The most frequent causes of injury among children and adolescents, adults, and the elderly were toys, kitchen items, and cooking activities, respectively. The five major metropolitan cities had comparable frequencies of ocular injuries caused by kitchen items, penetrating or cutting, and foreign bodies, as well as the frequencies in children and adolescents, the elderly, both sex groups, and in the total sample. However, with respect to adults, Tehran and Mashhad had higher and lower frequencies of ocular injuries, respectively, when comparing each with the other four cities. Overall, conditions were relatively better in Shiraz and relatively unfavorable in Mashhad in terms of the prevalence of severe ocular injuries at home among the children/adolescent and adult age groups.

Foreign bodies and chemical products are among the most important causes of ocular injuries in different environments [24, 25]. Ho et al. [26] found that foreign body injuries were the most common type of eye injury in the occupational setting, followed by blunt injuries and chemical burns [26]. One of the primary causes of blindness, especially in developing nations, is penetrating eye injuries [27]. Children younger than 15 years sustain most penetrating eye injuries, mostly involving play-related mishaps [27]. In the current study, the most common cause of eye injury at home in the overall sample was kitchen items, followed by toys and foreign bodies, and their frequency was significantly higher in children and adolescents than in adults or the elderly.

Ocular injuries can lead to severe visual impairment or even permanent blindness if left untreated [28]. In a rural community in Bangladesh, Islam and Quddus [6] found that penetrating injury was the most common type, followed by lime burn [6]. However, Gordon [29] reported similar frequencies of eye injuries at work and

at home in Canada. The most common causes of injury were sharp objects, dirt and debris, and blunt objects. Moreover, of all eye injuries, approximately one quarter (22.1%) necessitated time away from work or school [29]. In our study, 36% of ocular injuries required surgery or hospitalization, a rate dissimilar to that reported by Gordon [29].

Studies have ranked Iranian provinces in terms of health infrastructure. Shojaei et al. [30] found that Tehran (with capital city of Tehran), Fars (with capital city of Shiraz), Isfahan (with capital city of Isfahan), and Khorasan Razavi (with capital city of Mashhad) were among the provinces with the highest scores for healthcare infrastructure. Khuzestan (with capital city of Ahvaz) was also ranked at a medium-to-high level in this respect [30]. However, we found that even in these five metropolitan cities with proper health infrastructure, the frequency of ocular injuries and the prevalence of severe eye injuries at home remain alarmingly high among children and adolescents.

An important finding in this research is the high rate of eye injuries among children, which is similar to the findings of Jolly et al. [31]. They reported that corneal abrasions were the most frequent type of injury, followed by blunt and chemical injuries. Penetrating trauma and other serious injuries were uncommon [31]. Most injuries occurred during sports or general play. They proposed that regular staff training and cooperation with non-hospital organizations could raise awareness of pediatric eye injuries [31]. Furthermore, Hoskin et al. [32] found that educational resources for kids and their caregivers could be effective in modifying perceptions of eye health and safety [32]. Given the high prevalence of severe ocular injuries at home in children and adolescents in the overall sample and in most of the metropolitan cities, immediate actions are necessary by policy makers to reduce consequent disabilities [33] in this age group and to maximize productivity of the future workforce [34].

Ocular injuries can occur in various settings, including the home. This study found a higher frequency of avoidable causes of ocular injuries at home, such as kitchen items, toys, and foreign bodies, particularly among individuals aged < 18 years. The main limitation of our study is the lack of functional vision data for those affected. Substantial disability can result from eye injuries that cause vision loss. Understanding the expected visual impacts of the various causes of ocular trauma is beneficial for patients and their healthcare providers. Further longitudinal studies on the visual consequences of ocular injuries at home could clarify the effects of these injuries on visual impairment.

CONCLUSIONS

Ocular trauma was more common in male individuals and the younger age groups. Approximately half of the causes were kitchen items, toys, and foreign bodies, which are avoidable by enhancing public eye health awareness. The prevalence of severe ocular injuries in individuals aged < 18 years was high, highlighting the necessity of nationwide preventive strategies for pediatric ocular injuries. Increased awareness and education regarding eye safety measures at home are needed, especially in individuals aged < 18 years. Many injuries are preventable through simple precautions such as wearing protective eyewear during potentially hazardous activities, keeping chemicals and sharp objects out of reach of children, and ensuring proper lighting and clear pathways to minimize the risk of falls. Successful prevention will require collaboration between healthcare professionals, policy makers, and the public.

ETHICAL DECLARATIONS

Ethical approval: The research was conducted according to the principles of the Declaration of Helsinki. The Ethics Committee of the local institute approved the study protocol. All necessary ethical and legal permissions were obtained before data was accessed. There are many hospitals in each included city; however, we analyzed only the data from hospitals that agreed to participate in the research. We fully secured the patient information and maintained confidentiality.

Conflict of interest: None.

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REFERENCES

- Mahan M, Purt B. Ocular Trauma Prevention Strategies and Patient Counseling. 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024. [pmid: 35593844](#)
- Shah A, Blackhall K, Ker K, Patel D. Educational interventions for the prevention of eye injuries. *Cochrane Database Syst Rev*. 2009;2009(4):CD006527. [doi: 10.1002/14651858.CD006527.pub3](#) [pmid: 19821372](#)
- Dhabaan WA, Almutairi KH, Alzahrani AA, Almutlaq AH, Jali Asiri AAH, Hasan Alshahrani RS, et al. Assessing knowledge and practice about eye injuries first aid, with awareness about the importance of early management among general population in Asser Region, 2020. *J Family Med Prim Care*. 2021;10(5):2022-2027. [doi: 10.4103/jfmpc.jfmpc_2223_20](#) [pmid: 34195142](#)
- Seraj H, Khawandanh S, Fatani A, Saeed A, Alotaibi G, Basheikh A. Population-level investigation of the knowledge of ocular chemical injuries and proper immediate action. *BMC Res Notes*. 2020;13(1):103. [doi: 10.1186/s13104-020-04950-5](#) [pmid: 32098621](#)
- Alem KD, Arega DD, Weldegiorgis ST, Agaje BG, Tigneh EG. Profile of ocular trauma in patients presenting to the department of ophthalmology at Hawassa University: Retrospective study. *PLoS One*. 2019;14(3):e0213893. [doi: 10.1371/journal.pone.0213893](#) [pmid: 30921358](#)
- Islam MS, Quddus AH. Pattern, Causes, and Management of Ocular Injuries at Rural Community Setting of Bangladesh. *Pakistan Journal of Ophthalmology*. 2017;33(4). [doi: 10.36351/pjo.v33i4.43](#)
- Oum BS, Lee JS, Han YS. Clinical features of ocular trauma in emergency department. *Korean J Ophthalmol*. 2004;18(1):70-8. [doi: 10.3341/kjo.2004.18.1.70](#) [pmid: 15255241](#)
- Omolase CO, Omolade EO, Ogunleye OT, Omolase BO, Ihemedu CO, Adeosun OA. Pattern of ocular injuries in owo, Nigeria. *J Ophthalmic Vis Res*. 2011;6(2):114-8. [pmid: 22454720](#)
- Aghadoost D. Ocular trauma: an overview. *Arch Trauma Res*. 2014;3(2):e21639. [doi: 10.5812/atr.21639](#) [pmid: 25147781](#)
- Larrison WI, Hersh PS, Kunzweiler T, Shingleton BJ. Sports-related ocular trauma. *Ophthalmology*. 1990;97(10):1265-9. [doi: 10.1016/s0161-6420\(90\)32421-1](#) [pmid: 2243676](#)
- Archambault C, Gabias C, Fallaha N, Bélanger C, Superstein R. Pediatric ocular injuries: a 3-year review of patients presenting to an emergency department in Canada. *Can J Ophthalmol*. 2019;54(1):83-86. [doi: 10.1016/j.jcjo.2018.02.006](#) [pmid: 30851779](#)
- Jahangir T, Butt NH, Hamza U, Tayyab H, Jahangir S. Pattern of presentation and factors leading to ocular trauma. *Pakistan Journal of Ophthalmology*. 2011;27(2). [doi: 10.36351/pjo.v27i2.503](#)
- Iftikhar M, Latif A, Farid UZ, Usmani B, Canner JK, Shah SMA. Changes in the Incidence of Eye Trauma Hospitalizations in the United States From 2001 Through 2014. *JAMA Ophthalmol*. 2019;137(1):48-56. [doi: 10.1001/jamaophthalmol.2018.4685](#) [pmid: 30286226](#)
- Luo H, Beckles GL, Fang X, Crews JE, Saaddine JB, Zhang X. Socioeconomic status and lifetime risk for workplace eye injury reported by a us population aged 50 years and over. *Ophthalmic Epidemiol*. 2012;19(2):103-10. [doi: 10.3109/09286586.2011.639977](#) [pmid: 22364578](#)
- Desai P, Morris DS, Minassian DC, MacEwen CJ. Trends in serious ocular trauma in Scotland. *Eye (Lond)*. 2015;29(5):611-8. [doi: 10.1038/eye.2015.7](#) [pmid: 25679414](#)
- Hoskin AK, Watson SL, Mackey DA, Agrawal R, Keay L. Eye injury registries - A systematic review. *Injury*. 2019;50(11):1839-1846. [doi: 10.1016/j.injury.2019.07.019](#) [pmid: 31378543](#)
- Al-Attas AH, Williams CD, Pitchforth EL, O'Callaghan CO, Lewallen S. Understanding delay in accessing specialist emergency eye care in a developing country: eye trauma in Tanzania. *Ophthalmic Epidemiol*. 2010;17(2):103-12. [doi: 10.3109/09286580903453522](#) [pmid: 20132093](#)
- Li C, Fu Y, Liu S, Yu H, Yang X, Zhang M, et al. The global incidence and disability of eye injury: an analysis from the Global Burden of Disease Study 2019. *EclinicalMedicine*. 2023;62:102134. [doi: 10.1016/j.eclinm.2023.102134](#) [pmid: 37599904](#)
- Bhagal G, Tomlins PJ, Murray PI. Penetrating ocular injuries in the home. *J Public Health (Oxf)*. 2007;29(1):72-4. [doi: 10.1093/pubmed/fdl074](#) [pmid: 17090631](#)
- Jovanovic N, Peek-Asa C, Young T, Nisic F, Musa S. Eye injury and demographic parameters associated with poor visual outcome. *J Fr Ophtalmol*. 2019;42(8):864-873. [doi: 10.1016/j.jfo.2019.03.018](#) [pmid: 31122763](#)
- Pilehvar AA. Investigating the Relationship Between Informal Economy and Competitiveness in Iran's Metropolises. *J Knowl Econ*. 2022:1-24. [doi: 10.1007/s13132-022-00965-4](#) [pmid: PMC8888817](#)
- Cillino S, Casuccio A, Di Pace F, Pillitteri F, Cillino G. A five-year retrospective study of the epidemiological characteristics and visual outcomes of patients hospitalized for ocular trauma in a Mediterranean area. *BMC Ophthalmol*. 2008;8:6. [doi: 10.1186/1471-2415-8-6](#) [pmid: 18430231](#)
- Tenny S, Hoffman MR. Prevalence. 2023 May 22. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024. [pmid: 28613617](#)
- O'Keefe K, Temple S. An evidence-based approach to abnormal vision in the emergency department. *Emerg Med Pract*. 2020;22(4):1-28. [pmid: 32192282](#)
- Bagley DM, Casterton PL, Dressler WE, Edelhauser HF, Kruszewski FH, McCulley JP, et al. Proposed new classification scheme for chemical injury to the human eye. *Regul Toxicol Pharmacol*. 2006;45(2):206-13. [doi: 10.1016/j.yrtph.2006.04.005](#) [pmid: 16764976](#)
- Ho CK, Yen YL, Chang CH, Chiang HC, Shen YY, Chang PY. Epidemiologic study on work-related eye injuries in Kaohsiung, Taiwan. *Kaohsiung J Med Sci*. 2007;23(9):463-9. [doi: 10.1016/S1607-551X\(08\)70054-8](#) [pmid: 17766215](#)
- Cakmak SS, Unlu MK, Olmez G, Caca I, Sakalar YB, Acemoglu H. Penetrating eye injuries from southeastern Anatolia region of Turkey. *Public Health*. 2004;118(8):570-5. [doi: 10.1016/j.puhe.2003.12.018](#) [pmid: 15530937](#)
- Kyei S, Kwarteng MA, Asare FA, Jemitara M, Mtuwa CN. Ocular trauma among patients attending a tertiary teaching hospital in Zimbabwe. *PLoS One*. 2023;18(10):e0292392. [doi: 10.1371/journal.pone.0292392](#) [pmid: 37792744](#)
- Gordon KD. The incidence of eye injuries in Canada. *Can J Ophthalmol*. 2012;47(4):351-3. [doi: 10.1016/j.jcjo.2012.03.005](#) [pmid:](#)

- 22883844
30. Shojaei P, Bordbar N, Ghanbarzadegan A, Najibi M, Bastani P. Ranking of Iranian provinces based on healthcare infrastructures: before and after implementation of Health Transformation Plan. *Cost Eff Resour Alloc.* 2020;18:4. doi: [10.1186/s12962-020-0204-5](https://doi.org/10.1186/s12962-020-0204-5) pmid: [32025220](https://pubmed.ncbi.nlm.nih.gov/32025220/)
 31. Jolly R, Arjunan M, Theodorou M, Dahlmann-Noor AH. Eye injuries in children - incidence and outcomes: An observational study at a dedicated children's eye casualty. *Eur J Ophthalmol.* 2019;29(5):499-503. doi: [10.1177/1120672118803512](https://doi.org/10.1177/1120672118803512) pmid: [30270661](https://pubmed.ncbi.nlm.nih.gov/30270661/)
 32. Hoskin AK, Philip SS, Yardley AM, Mackey DA. Eye Injury Prevention for the Pediatric Population. *Asia Pac J Ophthalmol (Phila).* 2016;5(3):202-11. doi: [10.1097/APO.0000000000000193](https://doi.org/10.1097/APO.0000000000000193) pmid: [27183290](https://pubmed.ncbi.nlm.nih.gov/27183290/)
 33. Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. *Lancet Glob Health.* 2021;9(4):e489-e551. doi: [10.1016/S2214-109X\(20\)30488-5](https://doi.org/10.1016/S2214-109X(20)30488-5) pmid: [33607016](https://pubmed.ncbi.nlm.nih.gov/33607016/)
 34. Knudsen EI, Heckman JJ, Cameron JL, Shonkoff JP. Economic, neurobiological, and behavioral perspectives on building America's future workforce. *Proc Natl Acad Sci U S A.* 2006;103(27):10155-10162. doi: [10.1073/pnas.0600888103](https://doi.org/10.1073/pnas.0600888103) pmid: [16801553](https://pubmed.ncbi.nlm.nih.gov/16801553/)