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SYSTEMATIC REVIEW

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Factors affecting ocular trauma in Iran: A systematic review study

Atefeh Mir[1] | Maryam Moradi Baseri[2] | Khadijeh Kalan Farmanfarma[3]

[1]Department of Nursing, Clinical Research Center of Sabzevar Vasei Hospital, Sabzevar University of Medical Sciences, Sabzevar, Iran

[2]Department of Enviromental Health, Pars Hospital Shiraz University of Medical Sciences, Shiraz, Iran

[3]Department of Epidemiology, Trauma Research Center, Kashan University of Medical Sciences, Kashan, Iran

Correspondence
Khadijeh Kalan Farmanfarma, Trauma Research Center, Kashan University of Medical Sciences, Kashan, Iran.
Email: kalan_farma@yahoo.com

Abstract

Background and Aims: Ocular trauma (OT) is a a major cause of ocular morbidity and blindness. This study was systematically conducted to determine the factors contributing to OT in Iran.

Methods: In this study, a systematic review of all published articles in Persian and English languages from 2000 to 2023 was conducted to investigate the factors affecting OT in Iran. The included studies encompassed cross-sectional, cohort, and case-control designs. Articles were selected from internationally recognized databases, including PubMed, Web of Science, Scopus, and Google Scholar, as well as Persian databases such as SID and Magiran. The search strategy involved using keywords aligned with the (MeSH) terms, such as "oculars," "trauma," and "Iran." Initially, 403 articles were identified, and ultimately, 14 articles met the inclusion criteria. To ensure the prevention of bias and assess the quality of the selected articles, the Newcastle-Ottawa Scale was utilized.

Result: In the present study, the majority of individuals in the reviewed articles were categorized as having mild eye injuries (13.8%). A higher percentage of injuries was observed in males compared to females, and a higher prevalence of injuries was also observed in the age group of over 30 years compared to other age groups. Among the mechanical causes, sharp trauma had the highest prevalence rate (72.5%), while falls had the lowest prevalence rate (14%), followed by sport-related injuries (29%). Non-mechanical injuries were mentioned in only one article and had a prevalence rate of 1.5%

Conclusion: The results of the current research have shown that among the mechanical injuries, accidents involving motorcycles and sharp objects are the leading causes of OT in Iranians. Therefore, the use of protective equipment such as goggles and adherence to traffic laws play a particularly important role, especially in men higher the age of 30. These findings highlight the necessity for targeted educational and preventive measures to reduce OT in Iran.

KEYWORDS

factors, Iran, ocular trauma, systematic review

1 | INTRODUCTION

Ocular trauma (OT) is considered a leading cause of blindness and visual impairment worldwide, especially in low-income developing countries.[1] Each year, more than 2 million cases of OT occur globally.[2] Approximately 1.6 million people in the Asia region become blind due to OT. Moreover, around 2.3 million individuals experience bilateral visual impairment, while 1.9 million individuals lose one eye due to OT.[3] The global incidence rate of corneal trauma is estimated to be 3.5 per 100,000 individuals.[4] OT includes closed wounds and open eye injuries, with open globe injury (OGI) being defined as full-thickness damage to the cornea, sclera, or both. OGI is an urgent situation that requires prompt recognition and proper surgical treatment to prevent permanent visual loss, particularly in cases with poorer baseline visual acuity, extensive damage to the posterior eye segment, and a positive afferent pupillary defect.[5]

The epidemiological patterns and characteristics of eye injuries vary from one country to another, as eye injuries reflect different levels of socioeconomic status related to access to healthcare, safety standards in the workplace, and levels of industrialization. For example, in industrialized societies, activities related to industry remain the most common cause of eye injuries, while in most impoverished rural communities, the primary cause is related to farming.[6] Work-related eye trauma is the main cause of eye injuries in Iran.[7] Corneal trauma negatively impacts the quality of life of patients and their families, as well as the socioeconomic status and psychological well-being of individuals.[2] Eye injuries can be classified into two categories: mechanical and non-mechanical, such as chemical, thermal, electrical, radiation-induced, or ultrasonic injuries. Non-occupational eye injuries also include domestic or recreational incidents[8] Many risk factors for OT have been documented, including occupational hazards explosives, machinery-related incidents, and eye injuries associated with motor vehicle crashe and traffic accidents including direct impact with steering wheels, windshield and windows and also airbags, assault, industrial accidents and other occupational injuries, falls, domestic accidents especially in children and women and sports injuries.[9] Younger age and male gender are well-known risk factors for OT. Other risk factors include ethnicity and socioeconomic status.[10]

Prevention of OT necessitates the identification of risk factors, comprehensive understanding of the epidemiological distribution, and the evaluation and development of effective preventive measures. In the context of low- and middle-income countries, the emphasis on implementing preventive strategies assumes paramount importance.[11]

On the other hand, in these countries, ocular injuries (OI) exhibit not only variations in terms of causality and severity but also distinct patterns related to the socioeconomic context. These patterns arise due to factors such as inadequate access to appropriate healthcare facilities, utilization of traditional remedies, limited educational opportunities, and a lack of awareness regarding existing limitations.[12] It is noteworthy that Iran, too, conforms to this prevailing pattern. In general, the first step in prevention is to educate people about the risks so that they can avoid them or take action to protect their eyes.[13] injury prevention (health promotion), early presentation by the patient, accurate assessment (good primary eye care and first aid), prompt referral of serious injuries requiring specialist management.[14]

Due to the limited research conducted in Iran, The current study was conducted with the aim of systematically investigating the influential factors in the occurrence of eye injuries among the Iranian population.

2 | METHODS

The current study was conducted in accordance with the PRISMA guidelines.[15]

3 | SEARCH STRATEGY AND DATA SOURCES

The current study conducted a comprehensive review of all peer-reviewed articles published in both Persian and English languages, encompassing the period from 2000 to 2023. The articles included in the analysis specifically explored the Iranian employee population. The search strategy employed in this study followed an academic approach, utilizing relevant keywords and terms. The search strategy included the following components:

((“ocular”[All Fields] OR “oculars”[All Fields]) AND (“injuries”[MeSH Subheading] OR “injuries”[All Fields] OR “trauma”[All Fields] OR “wounds and injuries”[MeSH Terms] OR (“wounds” [All Fields] AND “injuries”[All Fields]) OR “wounds and injuries”[All Fields] OR “trauma s”[All Fields] OR “traumas”[All Fields]) AND (“iran”[MeSH Terms] OR “iran”[All Fields])) AND ((english[Filter]) AND (alladult[Filter])).

The articles were selected from international databases(Pubmed Web of Sience, Scopus, Google Scholar) and Persian (Sid magiran) sources to ensure a thorough representation of the literature. It is worth mentioning that the “OR“ operator was used to connect synonymous terms, while the ‘AND’ operator was employed to combine the obtained results in this study.

Inclusion and exclusion criteria for included studies:

Country and setting: Iran

Study design: cross-sectional, cohort, and case-control studies

languages: published in both Persian and English languages

period of time: published the period from 2000 to 2023

Exclusion criteria for included studies:

Studies conducted outside Iran

Studies published in other languages and outside the time period considered

Incomplete data and inaccessible full-text articles.

4 | STUDY SELECTION

All cross-sectional, cohort, and case-control studies were included in the examination. Studies lacking necessary information and relevance to the topic under discussion, as well as review studies, case series, commentaries, conferences, and letters to the editor, were excluded from the analysis. Ultimately, 14 articles were included in the final stage. The full texts of the reviewed articles were examined.

5 | DATA EXTRACTION AND RISK OF BIAS ASSESSMENT

The abstract and full texts of the articles were independently reviewed by two corresponding researchers (KFF and M) using a prepared checklist that included author name, year of publication, study type, age and gender of participants, sample size, and risk factors (Table 1). A reassessment was conducted by the primary researcher to enhance the accuracy and reliability of the information. In this systematic review, the quality of articles was assessed using the Newcastle-Ottawa Scale.[15] Scores ranging from 7 to 9, 4 to 6, and 4 were categorized as indicating a low, moderate, or high risk of bias, respectively (Table 2).

6 | RESULTS

A total of 403 articles were initially identified. After excluding 325 duplicate articles and 311 irrelevant articles, a final set of 14 articles were included for further analysis (Figure 1). The study findings, including the type of study, sample size, demographic information, eye trauma details, eye complications, eye trauma findings, causes of head injury, treatment characteristics, and visual outcomes, are elucidated in Table 1.

7 | RESULTS OF INDIVIDUAL STUDIES

In the present study, four articles[18–20,22] provided reports on the severity of eye injuries. The majority of individuals in the reviewed articles were categorized as having mild eye injuries (13.8%). A higher percentage of injuries was observed in males compared to females, and a higher prevalence of injuries was also observed in the age group of over 30 years compared to other age groups. Based various anatomical structures of the eye, the highest percentage of injuries was observed in the following categories: eyelid lacerations (29.3%), corneal injuries (78.8%), scleral injuries (31.8%), corneoscleral lacerations (32.5%), periorbital edema (44.4%), hyphema (25.6%), periorbital ecchymosis (53.5%), vitreous injuries (48.7%), and retinal injuries (24.4%). The causes of OI reported in articles,[16,17,21,23,24,26,28] encompass both mechanical and non-mechanical factors. Among the mechanical causes, the highest prevalence rates were observed for sharp trauma (72.5%), motor vehicle accidents (74%), penetrating injuries (68.7%), bird-related injuries (66.6%), metallic injuries (65.7%), car accidents (37.5%), road accidents (20.5%), falls (14%), and sport-related injuries (29%). Non-mechanical injuries were mentioned in only one article[17] and had a prevalence rate of 1.5%.

8 | DISSCUSION

Due to the delicacy and complexity of ocular tissues, any trauma that would be inconsequential elsewhere in the body constitutes a serious matter in the context of the eye. Direct OT can result in various degrees of damage and often lead to permanent loss of vision.[29] Therefore, the current study was conducted with the aim of systematically investigating the factors affecting the occurrence of eye injuries in Iran.

9 | STATUS OF THE EYE COMPLICATION

OI due to medical care and associated direct care costs and lost work time are of great importance in terms of public health. According to current research articles, individuals often experience mild ocular complications. In the majority of studies conducted worldwide, ocular complications are mild and temporary. In fact, on average, one out of every six injured individuals suffers a loss of vision.[30,31] It should be noted that many patients with partial eye injuries do not seek eye care. Additionally, patients who experience OT and receive treatment in settings other than hospitals, such as private clinics and outpatient care centers, are often not included in published country statistics. Furthermore, patients who develop delayed ocular complications, such as cataracts, retinal detachment, and secondary glaucoma, are often classified differently from OT and are diagnosed months or even years after the event.

In developing countries, OI demonstrate a distinct pattern in terms of their etiology, which reflects the absence or inadequacy of safety measures, sanitary facilities, utilization of traditional remedies, poor education, and workers' lack of awareness in hazardous occupations. Moreover, delayed presentation of initial injuries for appropriate treatment and the administration of inappropriate home remedies often exacerbate the prognosis.[32] Weber and colleagues have observed adverse effects resulting from prolonged delays in injured patients seeking treatment at a hospital. They also noted disparities in the context of developing countries compared to industrialized countries, as well as in combat OT.[33]

Patients who seek medical attention for facial injuries frequently display periorbital edema and ecchymosis, both of which are classified as mild sequelae[34] The findings suggest that OI, such as corneal scarring, endophthalmitis, severe OGI, and

TABLE 1 Factors affecting ocular trauma in iran.

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings			
Amini (2020)[18]	Retrospective cohort study,	64,190 Iranian survivors	Age (year) Sex	mean (*SD*) %		**Eye, No. (%) of exposed survivors**			
						Age, year		**sex**	
						≤21 year	>21 year	Male	Female
			Age	23.5 (7.7)	None	21,816 (85.2)	19,022 (85.6)	51,546 (86.4)	1086 (89.5)
			Male	98.0%	Mild	3635 (14.2)	3059 (13.8)	7750 (13.0)	124 (10.2)
					Moderate	63 (0.2)	74 (0.3)	172 (0.3)	3 (0.2)
					Severe	99 (0.4)	61 (0.3)	180 (0.3)	0
					Total	25,613 (100)	22,216 (100)	59,648 (100)	1213 (100)
					P value for χ2 for trend	<0.001	–	<0.001	–
Dehghani (2014)[25]	Retrospective descriptive analysis	1042 patients	Sex age (year)	Patients with endophthalmitis (*N* = 22)	Patients without endophthalmitis (*N* = 1020)	**Variable**	**Patients without endophthalmitis (*N* = 1020) *N* (%)**	**Patients with endophthalmitis (*N* = 22) *N* (%)**	
			Male	19 (86%)	818 (80%)	Visual acuity (VA)	–	–	
			Female	3 (14%)	202 (20%)	No light perception	4 (19%)	99 (9.8%)	
			Age	19.2 ± 16.7	24.8 ± 17.7	Light perception	6 (27%)	200 (19.6%)	
						Hand motion	6 (27%)	214 (20.9%)	
						Finger count	6 (27%)	205 (20.1%)	
						>1/10 Snellen	0 (0%)	212 (20.8%)	
						Undetermined	0 (0%)	90 (8.8%)	
						Presence of foreign body	7 (32%)	132 (12.9%)	
						Site of laceration	–	–	
						Cornea	12 (54.5%)	444 (43.5%)	
						Sclera	7 (31.8%)	246 (24%)	
						Sclerocornea	3 (13.7%)	330 (32.5%)	

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings			
Ehsaei (2013)[16]	Retrospective study	459 patients	Sex age (year)	*N* (%) (mean ± SD)		**Causes of head injury**	**Male**	**Female**	**No. of patients**
			Female	142 (31 %)		Motor vehicle accidents	241	99	340 (74%)
			Male	317 (69 %)		Falls	34	34	68 (14%)
			Age	36.56 ± 19.30		Sport-related injuries	7	4	11 (3%)
						Miscellaneous	34	6	40 (9%)
						Ocular complications		No. of patients	
						Type of complication		–	
						Soft-tissue injuries to the globe and adnexae		–	
						Periorbital ecchymosis		332	
						Laceration of eyelidsl		144	
						Corneoscleral laceration		32	
						Subconjunctival haemorrhage		127	
						Retinal haemorrhage		14	
						Commotio retina		36	
						Vitreous haemorrhage		32	
						Orbital complications		–	
						Orbital wall fracture		27	
						Orbital canal fracture		4	
						Ethmoid sinus fracture with medial involvement		20	
						Orbital rim fracture		24	

(Continues)

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings					
						Globe displacement with orbital fracture		5			
						Cerebrospinal fluid leaks through orbit		4			
						Traumatic ruptured orbit		4			
						Neuro-ophthalmic complications		–			
						Ocular cranial nerve injury (III, IV, VI)		107			
						Optic nerve damage		74			
Etezad-Razavi (2006)[19]	–	40 male patients	Sex age (year)	*N* (mean ± SD)		**Eye Complication (*N*)**					
			Male	40		**No specific complications (grade 1)**	**Mild complications (grade 2)**	**Moderate complications (grade 3)**	**Severe complications (grade 4)**		
			Age	(43.8 ± 9.8)		14	15	5	6		
Ghasemi (2012)[20]	Cross-sectional	292 war veterans	Sex age (year)	*N* (mean ± SD)		**Ocular status (%)**					
			Male	292		**Normal**	**Mild**	**Moderate**	**Severe**		
			Age	(46 ± 7.5)		68.2	13.8	5.4	12.6		
Hashemi (2011)[17]	Cross-sectional	4565 patients	Sex age (year)	*N* (mean ± SD)		**Prevalence (total) (95% confidence interval)**					
			Male	1909		**Blunt trauma**	**Sharp trauma**	**Chemical burn**	**All trauma types**	**Hospitalization**	**Medical care**
			Female	2656		6.1 (5.2–7.1)	4.1 (3.5–4.7)	1.5 (1.1–1.9)	13.3 (12.0–14.5)	2.4 (1.8–2.9)	2.2 (1.7–2.7)
			Age	30.05 ± 18.78							

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings
Khateri (2003)[22]	Retrospe ctive study	34,000 patients	Sex Age	% –		**Distribution by severity of eye in a population of 34,000 iranians with histories of mustard agent exposure**
			Male	95%		**Lesional severity** / **EYE (percent affected)** / **EYE (number affected)**
			Age	between 17 and 30 years		No lesions / 60.7% / 20,638
						Mild lesions / 35% / 11,900
						Moderate lesions / 3.6% / 1224
						Severe lesions / 0.7% / 238
Mansouri (2010)[7]	Prospective, cross-sectional	822 eyes from 768 trauma patients	Sex age work-related	*N* (%) Mean % 		**Comparison of involved tissues between occupational and nonoccupational injured eyes**
			Male	685 (89.2%)		**Involved tissue** / **Total, *n* = 822, *n* (%)** / **Occupational, *n* = 606, *n* (%)** / **Nonoccupa-tional, *n* = 216, *n* (%)** / **OR (95% CI)**
			Age	31.11		Lids / 115 (14) / 33 (5.4) / 82 (38) / 0.09 (0.06–0.15)
			work-related	73.7%		Conjunctiva / 153 (18.6) / 80 (13.2) / 73 (33.8) / 0.30 (0.20–0.43)
						Lacrimal system / 6 (0.7) / 3 (0.5) / 3 (1.4) / 0.35 (0.07–1.76)
						Cornea / 648 (78.8) / 538 (88.8) / 110 (50.9) / 7.62 (5.28–11.00)
						Sclera / 9 (1.1) / 7 (1.2) / 2 (0.9) / 1.25 (0.26–6.06)
						Iris / 21 (2.6) / 14 (2.3) / 7 (3.2) / 0.70 (0.28–1.77)
						Anterior chamber / 46 (5.6) / 20 (3.3) / 26 (12) / 0.25 (0.14–0.46)
						Lens / 6 (0.7) / 4 (0.7) / 2 (0.9) / 0.71 (0.13–3.90)
						Vitreous / 2 (0.2) / 1 (0.2) / 1 (0.5) / 0.36 (0.2–5.70)

(Continues)

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings				
						Retina	13 (1.6)	8 (1.3)	5 (1.3)	0.56 (0.18–1.74)
						Maculal	13 (1.6)	6 (1.0)	7 (3.2)	0.30 (0.10–0.90)
						Choroid	3 (0.4)	3 (0.5)	0 (0.0)	1.00 (0.99–1.01)
						Optic nerve	2 (0.2)	0 (0.0)	2 (0.9)	0.99 (0.98–1.00)
						Extraocular muscles	0 (0.0)	0 (0.0)	0 (0.0)	NA
						Orbit	0 (0.0)	0 (0.0)	0 (0.0)	NA
						Ocular trauma score (ots) among injured, *N* (%)				
						OTS	**Total**	**Occupational**	**Nonoccupa-tional**	***p* value**
						1	2 (0.3)	1 (0.2)	1 (0.5)	0.457
						2	6 (0.8)	2 (0.3)	4 (2.0)	0.044
						3	23 (2.9)	14 (2.3)	9 (4.4)	0.155
						4	77 (9.6)	50 (8.4)	27 (13.3)	0.066
						5	691 (86.5)	529 (88.8)	162 (79.8)	0.001
						Total	799 (100)	596 (100)	216 (100)	–
						Patterns of open globe injuries				
						Open globe injury	**Corneal, *n* (%)**	**Scleral, *n* (%)**	**Corneoscleral, *n* (%)**	
						Full-thickness corneal laceration	13 (1.6)	4 (0.5)	0 (0.0)	
						Rupture	5 (0.6)	1 (0.1)	1 (0.1)	
						Penetrating injury	11 (1.3)	1 (0.1)	2 (0.2)	
						Perforating injury	3 (0.4)	0 (0.0)	1 (0.1)	
Movahedinejad (2015)[21]	Cross-sectional	200 patients	Age Sex other characteristic	(mean ± SD) Frequency (%) Frequency (%)		**Treatment characteristic**	**Frequency**		**Percent**	
			Age	(27.24 ± 17.98)		Type oftreatment	–		–	

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings		
			Male	72 (86.0)		Medical	51	25.5
			Female	28 (14.0)				
			Type of trauma	–		Surgical	149	74.5
			Sharp	145 (72.5)				
			Blunt	55 (27.5)				
			Cause of trauma	–		Duration of hospitalization, days	–	–
			During work	77 (38.5)				
			During a game or sport	58 (29.0)		1–3	131	65.5
			Road accident	41 (20.5)		4-7	63	31.5
			Quarrel	10 (5.0)		>7	6	3.0
			Other	14 (7.0)				
Ojaghihaghighi (2019)[23]	Prospective cohort study	232 patients (351 eyes)	Characteristics	No. (%), average		**Ocular injuries participant details**		
			Age, year	34.3		**Characteristics**	**No. (%), average**	
			Men	171 (73.7)		GCS score	–	
			Women	61 (26.3)		<9	50 (21.6)	
			Facial trauma mechanism	–		9–13	76 (32.8)	
			Total patients	232 (100)		>13	106 (45.7)	
			Car vs. pedestrian	32 (13.8)		External ocular trauma	–	
			Car vs. car	87 (37.5)		Total eyes	351 (100)	
			Motorcycle	58 (25.0)		Eyelid laceration	103 (29.3)	
			Fall onto hard surface	9 (3.87)		Periorbital ecchymosisl	187 (53.3)	
			Sport-related injury	9 (3.87)		Cutaneous orbital-area bleeding	6 (1.7)	

(Continues)

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings	
			Fall from height	21 (9.1)		Periorbital edema	156 (44.4)
			Assault	12 (5.2)		Nonorbital facial trauma	55 (14.2)
			Other	4 (1.72)			
			Visual acuity	–			
			Normal	73 (31.5)			
			Abnormal	20 (8.6)			
			Unable to cooperate	139 (59.9)			
Bohrani Sefidan (2022)[24]	Retrospective study	131 patients	Characteristic	*N* (%)		**Injury characteristics of patients (n¼131) diagnosed with post-traumatic endophthalmitis**	
			Age, years	–		**Characteristic**	***N* (%)**
			19–29	38 (29.0)		Location of wound	–
			30–44	51 (38.9)		Cornea	95 (72.5)
			45–59	25 (19.1)		Sclera	26 (19.9)
			≥60	17 (13.0)		Corneosclera	10 (7.6)
			Sex	–		Zone of injury	–
			Female	9 (6.9)		I	94 (71.8)
			Male	122 (93.1)		II	36 (27.5)
			Laterality	–		III	1 (0.8)
			Left eye (OS)	75 (57.3)		Tissue prolapse	–
			Right eye (OD)	56 (42.7)		Iris	11 (8.4)
			Nature of injuring object	–		Vitreous	5 (3.8)
			Metallic	86 (65.7)		Absent	115 (87.8)
			Non-metallic	35 (26.7)		Hyphema	–
			Unknown	10 (7.6)		Present	18 (13.7)

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings	
			Location where trauma occurred	–		Absent	113 (86.3)
			Work	106 (80.9)		Hypopyon	–
			Home	25 (19.1)		Present	91 (69.5)
			Mechanism of injury	–		Absent	40 (30.5)
			Penetrating injury	90 (68.7)		Traumatic cataract	–
			intraocular foreign body	41 (31.3)		Present	86 (65.6)
				Absent		45 (34.4)	
				Retinal detachment		–	
				Present		32 (24.4)	
				Absent		99 (75.6)	
				Nature of IOFB		–	
				Metallic		27 (65.9)	
				Stone		6 (14.6)	
				Wood		5 (12.2)	
				Others		3 (7.3)	
				Location of IOFB		–	
				Anterior chamber		4 (9.8)	
				Lens		7 (17.1)	
				Vitreous		20 (48.7)	
				Retina		10 (24.4)	

(Continues)

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings	
Shaeri (2016)[26]	Cross-sectional descriptive applied study	82 patients	Demographic status	*N* (%)		**Frequency distribution of injury type on ocular trauma**	***N* (%)**
			Gender	–		Eyelid laceration	25 (24.5)
			Female	17 (20.7)		Conjunctive laceration	8 (7.8)
			Male	65 (79.3)		Intracranial foreign body	23 (22.5)
			Age (year)	–		Intraocular foreign body	15 (14.7)
			0-7	17 (20.7)		Hyphema	26 (25.6)
			7-20	22 (26.8)		Orbital cellulites	1 (0.98)
			20-40	30 (36.6)		Corneal laceration	4 (3.92)
			40-60	4 (4.9)		Total	102 (100)
			<60	9 (11)		Eyelid laceration	25 (24.5)
			Occupation	–		Conjunctive laceration	8 (7.8)
			Child	13 (15.9)		Intracranial foreign body	23 (22.5)
			Employee	2 (2.4)		Intraocular foreign body	15 (14.7)
			Worker	18 (22)		Hyphema	26 (25.6)
			Farmer	1 (1.2)		Orbital cellulites	1 (0.98)
			House wives	2 (2.4)		Corneal laceration	4 (3.92)
			Student	17 (20.7)		Total	102 (100)
			Self employed	19 (35.4)			
			Location of accident	–			
			Work	15 (18.3)			

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings
			Home	32 (39)		
			Sport fields	11 (13.4)		
			Transport	17 (20.7)		
			Others	7 (8.6)		
			Requency distribution of type of damaging means and ocular trauma type			
			Type	*N* (%)		
			Damaging means	–		
			Transport vehicle	13 (15.9)		
			Gun	5 (6.1)		
			Explosives events	5 (6.1)		
			Stick	15 (13.9)		
			Knife and other cutting tools	18 (21.9)		
			Fist	5 (6.1)		
			Contact with earth	6 (7.3)		
			Industrial tools	6 (7.3)		
			Stone	6 (7.3)		
			Ball	4 (4.9)		
			Dog	1 (1.2)		
			Type of ocular trauma	–		
			Penetrating	22 (26.8)		
			Blunt	25 (30.5)		
			Explosive	3 (3.7)		

(Continues)

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings				
			Biting by	1 (1.2)						
			Falling	4 (4.9)						
			Unspecified	27 (32.9)						
Malek (2011)[27]	Retrospective descriptive	7100 occupational accidents 377 cases of eye trauma	**Frequency of eye damage in miners by year**			**The frequency of eye accidents according to age groups and relative to the total number of accidents**				
			Year	***N* (%)**		**age (year)**	***N***	**Number of eye incidents**	**Total number of incidents**	**Ratio of eye injuries to total accidents (%)**
			2003	63 (16.7)		<20	78	17	83	20.4
			2004	62 (16.4)		20-29	2578	162	2582	6.3
			2005	62 (16.4)		30-39	2899	90	2915	3.1
			2006	62 (16.4)		40-49	1231	45	1255	3.5
			2007	64 (16.9)		50-59	238	63	249	25.3
			2008	64 (16.9)		≥60	76	–	16	–
			Time of eye accident (hours)			Total	7100	377	7100	5.3
			hour	***N* (%)**						
			8-10	201 (53.3)						
			10-12	103 (27.3)						
			12-14	28 (7.4)						
			14-16	45 (12)						
			Total	377						

TABLE 1 (Continued)

First author (year)/reference	Type of study	Sample size	Demographic Items (age, year) and (sex)	Demographic findings	Eye trauma items/ eye trauma risk factors	Eye trauma findings	
Tabatabaei (2018)[28]	–	30 patients	Demographic status	(Mean ± SD) *N* (%)		**Visual outcomes for patients entering the study**	
			Age	23.3 ± 18.5		**Parameter**	***N* (%)**
			Male	20 (66.7%)		Eye	–
			Female	10 (33.3%)		OD	16 (53.3%)
			Bird	–		OS	14 (46.7%)
			Hen	1 (3.3%)		Lens	–
			Mynah	20 (66.6%)		Cataract	11 (36.7%)
			Rooster	8 (30.1%)		Clear	18 (60.0%)
						PCIOL	1 (3.3%)
						Vitrectomy during primary repair	–
						No	22 (73.3%)
						Yes	8 (26.7%)
						Lensectomy	–
						No	21 (70.0%)
						Yes	9 (30.0%)
						Endophthalmitis	–
						No	27 (90.0%)
						Yes	3 (10.0%)
						Corneal infiltration	–
						No	24 (80.0%)
						Yes	6 (20.0%)

TABLE 2 Quality assessment of the studies (Newcastle-Ottawa Scale).

Study	Selection					Outcome			
cohort	Representativeness of the exposed cohort	Selection of the non-exposed cohort	Ascertainment of exposure	Outcome not present at start	Comparability	Assessment of outcome	Adequacy of follow up of length	Adequacy of follow up	Overall
Amini (2020)[18]	0	0	1	0	-/-	1	1	1	4
Ehsaei (2013)[16]	0	0	1	0	1	1	1	0	4
Ojaghihaghighi (2019)[23]	0	0	1	0	1	1	1	1	5
Bohrani Sefidan (2022)[24]	0	0	1	0	1	1	1	1	5
Khateri (2003)[22]	1	0	1	0	0	1	1	1	5

Selection						Outcome		
Cross-sectional	Representativeness of the sample	Sample size	Non-respondents	Ascertainment of the exposure	Comparability	Assessment of the outcome	Statistical test	Overall
Dehghani (2014)[25]	1	1	0	2	1	0	1	6
Mansouri (2010)[7]	1	1	1	2	0	2	1	8
Ghasemi (2012)[20]	1	1	1	2	1	2	1	9
Hashemi (2011)[17]	1	1	1	2	1	2	1	9
Movahedinejad (2015)[21]	1	1	1	2	0	2	1	8
Shaeri (2016)[26]	1	1	1	2	1	0	1	7
Malek (2011)[27]	1	1	0	2	0	2	1	7

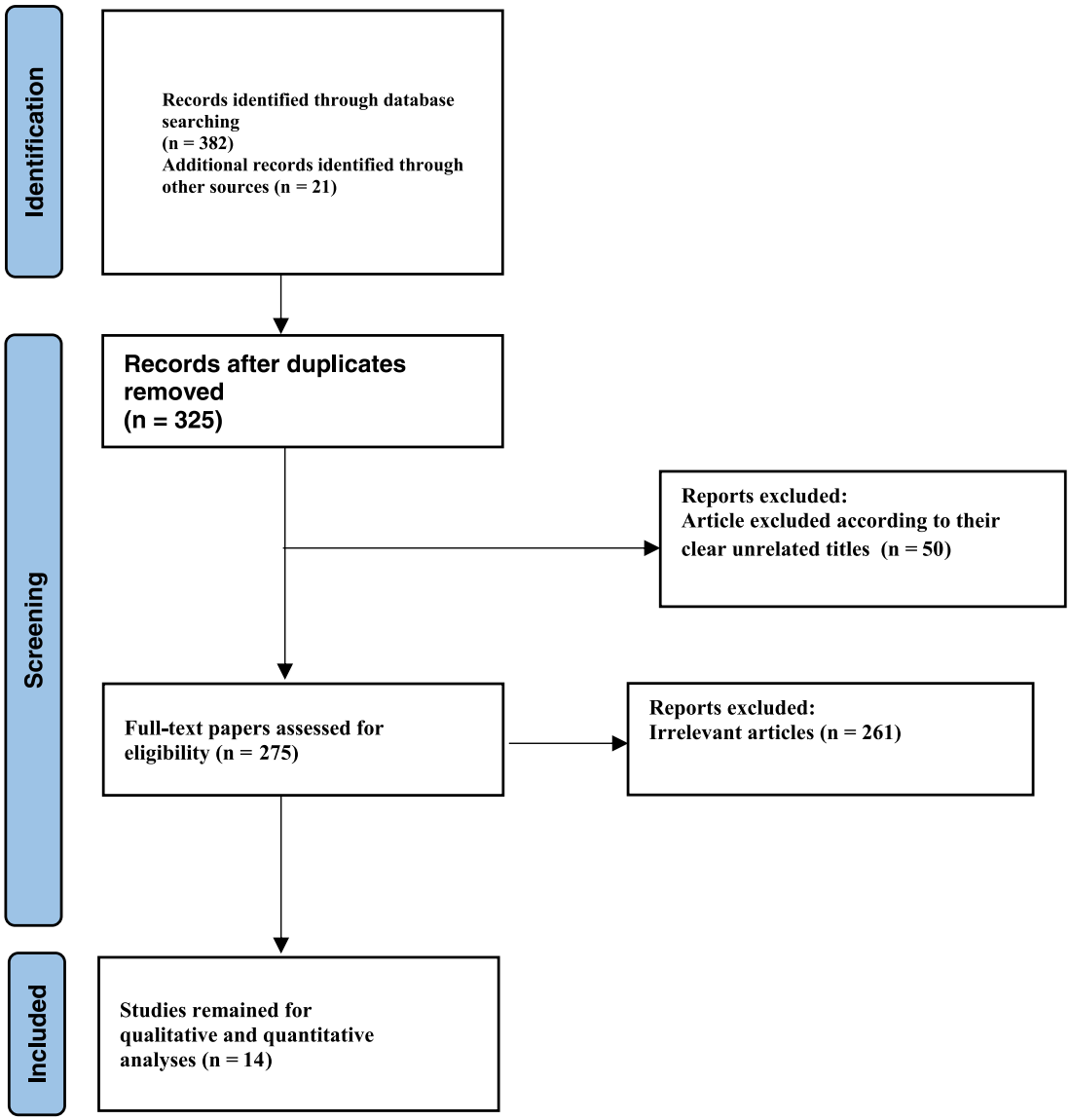

FIGURE 1 Flowchart of the included eligible studies in systematic review.

phthisis bulbi, can result in visual impairment in one eye within an 8-week timeframe[35] The elevated pressure exerted on the orbital circuit due to the impact may potentially impact the vascular perfusion to the optic nerve, choroid, and retina, leading to visual loss.[30]

10 | SEX AND AGE

The present study revealed that OT in Iran is more prevalent among men than women, particularly in the age group of over 30 years. Similar findings of higher OT rates among men compared to women have been reported in other parts of the world as well.[1,36]

This can be attributed to the fact that men are more likely to work outside the home and are exposed to road accidents, thus increasing their susceptibility to injuries.[37] The gender disparity in the occurrence of OI can be rooted in cultural, socioeconomic, occupational, and lifestyle factors that shape individuals' lives.[34,38]

11 | MECHANICAL AND NON-MECHANICAL FACTORS

Foreign bodies, mechanical causes, and falls are identified as the primary factors contributing to OI.[39] Furthermore, road accidents are recognized as the predominant cause of facial trauma and visual impairment in one eye.[40]

In our study, trauma caused by accidents, falls, and sharp objects was one of the main causes of eye injuries in Iran, in line with other studies.[12,41]

In countries with low to moderate income levels, the proliferation of vehicles and advancements in transportation infrastructure have resulted in an upsurge in accident rates. Additionally, the occurrence of armed conflicts in the Middle East and North Africa region plays a significant role in the prevalence of OI within these areas.[1] In general, the utilization of protective measures, such as eyewear, coupled with prompt initiation of initial treatment, significantly enhances visual outcomes.[38]

Given that eye trauma is the primary cause of blindness in developing countries, such as Iran, there has been a lack of research in these areas. Therefore, it is recommended to conduct multicenter studies to efficiently collect and share information about eye trauma to reduce its impact.

One of the limitations of this study is the need for improvement in data collection methods and the establishment of suitable conditions for further research in this field.

12 | CONCLUSION

The results of the current research have shown that among the mechanical injuries, accidents involving motorcycles and sharp objects are the leading causes of OT in Iranians. Therefore, the use of protective equipment such as goggles and adherence to traffic laws play a particularly important role, especially in men higher the age of 30. These findings highlight the necessity for targeted educational and preventive measures to reduce OT in Iran.

AUTHOR CONTRIBUTIONS

Atefeh Mir: Funding acquisition; data curation; investigation. **Maryam Moradi Baseri**: Conceptualization. **Khadijeh Kalan Farmanfarma**: Conceptualization; writing—original draft; writing—review and editing; methodology; project administration; validation.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared. All the data in this review are included in the manuscript.

TRANSPARENCY STATEMENT

The lead author Khadijeh Kalan Farmanfarma affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ORCID

Atefeh Mir http://orcid.org/0000-0001-6666-1379
Maryam Moradi Baseri http://orcid.org/0009-0004-2393-1921
Khadijeh Kalan Farmanfarma http://orcid.org/0000-0002-4663-6616

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