

Original Article

Occupational Eye Injuries among a Group of Workers in Cairo, Egypt

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Abstract

Background & Objective(s): Occupational eye injuries can result in serious morbidity and great economic loss. Employees in every industry are at risk of eye injuries. Ocular injuries at work are preventable, so safety education is a priority. This study aims at describing the most frequently encountered types of occupational eye injuries and their causes among different working groups as welders, carpenters, mechanics, accountants and delivery staff.

Methods: The study included 400 workers recruited from the emergency department of El – Demerdash hospital presenting with occupational eye injuries. The participants received ophthalmological examination and intervention according to their condition and filled an interview questionnaire, including socio-demographic data and occupational background. A focus group discussion was conducted among 12 workers who were interviewed later when they came for follow up. The session was about their opinion regarding causes of occupational eye injuries and best methods for prevention.

Results: Workers involved in jobs requiring manual activities represented (62%) of those with occupational eye injuries. About 62% reported in-availability of protective equipment and 17% only reported receiving safety pre-employment training programs. About 47% knew that they were at risk of eye injuries. Foreign body injury was the commonest cause of occupational eye injury among the study population (32%). The percentage of manual workers reporting deep injuries (17.9%), requiring surgical intervention (46.2%), working with shift schedules (59%), with longer work duration (23.1%) and stating that their colleagues suffered from similar injuries in the last year (40.6) was significantly higher than that of mental workers.

Conclusion: Eye injuries are an important category of work-related injuries to which attention should be drawn and resources allocated in the form of protective equipment and training programs especially to manual workers who face several hazardous work exposures. The recommended methods for prevention of occupational eye injuries by focus group discussion were better training of workers and improvement of the working environment of workers

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INTRODUCTION

Occupational eye injuries are defined as any injury that occurs in the eye and / or adnexa, and the injury happened in the workplace. ⁽¹⁾ Occupational Safety and Health Administration (OSHA) reported that eye injuries at work are responsible for an estimated 300 million dollars a year in lost productivity, medical treatment and workers' compensation. Moreover, it was found that appropriate protective eye wear can prevent more than 90% of serious eye injuries. ⁽²⁾ Occupational eye injuries range from simple eye strain to severe trauma

that can cause permanent damage, vision loss and blindness.

Occupational eye injuries can lead to serious morbidity and great financial loss. Work-related ocular injury is a preventable factor causing vision loss worldwide. It is a major cause of emergency ophthalmic visits ^(3,4) Occupational eye injuries are reported to happen to the younger working populations more. About 90% of all these eye injuries are avoidable ⁽⁵⁾ Ocular trauma remains a global preventable cause of visual morbidity. A significant proportion of eye injuries occurs in the workplace. The incidence and severity of work-related eye

injury are higher in developing than in developed countries.⁽⁶⁾ Above 65,000 occupational ocular injuries are reported every year in the United States.⁽⁷⁾ While in Hong Kong, the annual incidence was estimated to be around 8,000 cases⁽⁸⁾ So, it was found that the incidence of eye injuries varies by population such that it becomes necessary to conduct epidemiological studies in each region.⁽⁹⁾ Occupational eye injury can result in lost working days, and if severe, many visual effects can occur. They were reported to account for 5 – 6.1 % of all causes for workers' compensation claims in Singapore in 2006. The majority of these injuries are minor and are managed largely by accident and emergency staff. They can result in time off work, and if severe longstanding visual sequelae may occur.⁽¹⁰⁾

The results of several studies have shown that the causes of ocular injuries at work could have been prevented and are mainly related to the misuse or non-use of protective eye equipment.⁽¹⁰⁾ There is no job nature, which has its workers not at risk of eye injuries.⁽¹¹⁾ It was found that ocular occupational injuries were more frequent in the manufacturing industry, followed by construction, agriculture and services and among those without pre-work safety training. This work also revealed that injury due to striking by the foreign body on external eye and burns confined to eye, and adnexa are the most common occupational eye injuries.⁽¹²⁾ Personal protective devices can be used to protect the wearer's face, including the eyes from several hazardous occupational exposures as light, heat, particles.^(13,14) It is estimated that 90% of eye injuries can be prevented if eye protective equipment is worn.⁽¹⁵⁾

In some developed countries as United States, eye injuries must be reported to the health care and surveillance system, while in many developing countries, employers and health care providers may not report preventable injuries. The most important action to protect workers' vision at work is to always wear appropriate protective eye wear, which can prevent more than 90 percent of the serious eye injuries.⁽¹⁶⁾ Initial interventions in the Emergency Department (ED) play an important role in the prevention of morbidity in patients with ocular trauma.⁽¹⁷⁾

Immediate care through first aid measures should be given to victims of accidents before trained medical staff arrive. It involves rapid and simple measures such as irrigation of chemical burns. In some situations, immediate action can save life, or eye sight. It is highly recommended to refer cases with eye injuries to hospitals immediately.⁽¹⁸⁾ For instance, in case of chemical burns, the patient's eyelid should be kept open while irrigating with water for at least five minutes, patching the eyelid and adding a protective shield is mandated in case laceration is suspected. The patient is instructed not to squeeze the eye tightly shut because it greatly elevates the intra-ocular pressure.⁽¹⁹⁾ Moreover, topical anesthetics are not to be given because they can result in a corneal breakdown. As regards topical

steroids, they can make several conditions much worse, such as viral and fungal infections.⁽²⁰⁾

Workers in developing countries are being exposed, while there exists a widespread knowledge about the risks and effective prevention methods.⁽²¹⁾ Moreover, the informal workforce in developing countries as self-employed, independent service workers accounted for up to 60% of the gross domestic product.⁽²²⁾

The current study aimed at determining the factors related to occupational eye injuries and their most common types in an attempt to help in planning for safe workplaces.

METHODS

A cross-sectional study was carried out starting from November 1, 2016 to July 31, 2017. All cases presenting with occupational eye injuries (Occupational eye injuries were defined as any injury occurring to the eye and/or adnexa that occurred in the workplace) to El-Demerdash outpatient ophthalmology clinic were included in the study after obtaining oral consent and assuring confidentiality of data. The total included subjects were 400.

Participants filled an interview questionnaire, which included socio-demographic and occupational background questions, data describing the injury: its cause and the type of medical intervention they received at the ophthalmology clinic.

A focus group discussion was conducted for 12 workers, who were interviewed later when they came for follow up. The session was about their opinion regarding causes of occupational eye injuries and best methods for prevention.

All patients were subjected to the following:

1-Careful medical and ophthalmic history taking that helps to differentiate the diagnosis and lead to appropriate treatment.

2- Assessment of visual acuity, which may not be possible sometimes so counting fingers and perception of light was helpful.

3- The anterior segment of the eye was examined using Slit Lamp to determine the presence of foreign bodies, chemosis, corneal haze, presence of pus or blood in the anterior chamber, and to determine the extent of corneal injury. Fluorescein stains were used to determine the leak of aqueous in full-thickness corneal injury (Seidel test).

4- Fundus examination if possible using indirect Ophthalmoscopy.

Data was coded and entered to SPSS version 12 program for statistical analysis and tabular presentation.

Ethical Considerations

The study was approved by the Institutional Review Bard and Research Ethics Committee of the Faculty of Medicine – Ain Shams University Hospital administrative permissions were obtained. The study conformed to the international guidelines of research ethics and that of Helsinki declaration. An oral consent was obtained from

the participated workers after ensuring the confidentiality of data through anonymous questionnaires.

RESULTS

Table (1) shows a description of the socio-demographic and occupational background of the study participants, where 69% were males, mainly working in manual jobs (62.8%) and in the private sector (63.2%). About 40%

worked as shifts. Regarding safety measures, 62.2 % stated that personal protective equipment (PPE) were not available at the workplace. This may explain the highest percentage, unfortunately, of workers never using PPE (65.8%). In addition, only about 17% received pre-employment training about work safety. About 70% had pre-employment examination (PEE), and about half of the workers were periodically medically examined (PME). Around 47% knew that they were at risk of eye injuries.

Table (1): Description of the El-Demerdash outpatient ophthalmology clinic participants regarding their socio-demographic and occupational background (November 1, 2016 to July 31, 2017)

| Socio-demographic & occupational characteristics | Workers (n=400) No. (%) |
|---|----------------------------|
| Gender | |
| Males | 276 (69.0) |
| Females | 124 (31.0) |
| Age in years (mean \pm SD) | 33.57 \pm 8.26 |
| Work duration in years (mean \pm SD) | 9.24 \pm 6.16 |
| Workplace | |
| Private | 253 (63.2) |
| Governmental | 147 (36.7) |
| Occupation | |
| Manual job ^a | 251 (62.8) |
| Mental jobs ^b | 149 (37.2) |
| Shift work | |
| Yes | 162 (40.5) |
| Availability of personal protective equipment at the workplace | |
| Yes | 151 (37.8) |
| Frequency of wearing personal protective equipment | |
| Never | 263 (65.8) |
| Yes rarely | 40 (10.0) |
| Yes sometimes | 94 (23.5) |
| Yes always | 3 (0.7) |
| Receiving pre-employment training about work safety | |
| Yes | 67 (16.8) |
| Receiving a pre-employment examination | |
| Yes | 279 (69.8) |
| Receiving periodic medical examination | |
| Yes | 207 (51.8) |
| Knowledge of possible risk of eye injuries because of job nature | |
| Yes | 189 (47.2) |

^a manual jobs: as welders, carpenters, mechanics, agricultural workers and others.

^b mental jobs: depending on mental capabilities as administrative staff and accountants

Table (2) shows a significant variation in depth of injury, type of intervention, reporting that colleagues suffered from similar work injury, shift work, work duration and duration of sick leave at different types of occupations. The percentage was significantly higher among manual workers compared to mental workers. The causes for eye injury in both groups were foreign body trauma (32%),

chemical trauma (29%) and blunt trauma (15%). Focus group discussion was conducted among 12 workers who were five car mechanics, five welders and two carpenters. The results revealed that the most common causes stated were: lack of training, unavailability of PPE, unsafe working environment as: bad illumination, improper aeration, non-maintenance of machines.

Table (2): Characteristics of the eye injuries encountered by the El-Demerdash outpatient ophthalmology clinic participants (November 1, 2016 to July 31, 2017)

| Characteristics of eye injuries | Manual workers (n=251) No. (%) | Mental workers (n=149) No. (%) | Total (n=400) No. (%) | Chi square | p value |
|---|--------------------------------------|--------------------------------------|-----------------------------|--------------------|---------|
| Depth of injury | | | | | |
| Superficial ^a | 206 (82.1) | 136 (91.3) | 342 (85.5) | 6.388 | 0.011 |
| Deep ^b | 45 (17.9) | 13 (8.7) | 58 (14.5) | | |
| Subsequent visits to ophthalmology clinic | | | | | |
| Yes | 243 (96.8) | 145 (97.3) | 388 (97) | 0.081# | 0.776 |
| No | 8 (3.2) | 4 (2.7) | 12 (3) | | |
| Cause of injury | | | | | |
| Foreign body | 84 (33.5) | 44 (29.5) | 128 (32) | 40.56 | 0.000 |
| Chemical trauma | 72 (28.7) | 44 (29.5) | 116 (29) | | |
| Blunt trauma | 43 (17.1) | 17 (11.4) | 60 (15) | | |
| Allergic conjunctivitis | 27 (10.8) | 16 (10.7) | 43 (10.75) | | |
| Physical trauma | 18 (7.2) | 0 (0.0) | 18 (4.5) | | |
| Prolonged computer use | 7 (2.8) | 28 (18.8) | 35 (8.75) | | |
| Type of medical intervention | | | | | |
| Non-surgical ^c | 135 (53.8) | 116 (77.9) | 251 (62.75) | 23.170 | 0.000 |
| Surgical ^d | 116 (46.2) | 33 (22.1) | 149 (37.25) | | |
| Requirement of sick leave | | | | | |
| Yes | 243 (96.8) | 145 (97.3) | 388 (97) | 0.081 ^e | 0.776 |
| No | 8 (3.2) | 4 (2.7) | 12 (3) | | |
| Duration of sick leave N = 388^f | | | | | |
| ≤ 10 days | 24 (9.6) | 3 (2) | 27 (7) | 38.35 | 0.000 |
| > 10 - < 30 days | 120 (47.8) | 117 (78.5) | 237 (61) | | |
| ≥ 30 days | 99 (39.4) | 25 (16.8) | 124 (32) | | |
| Suffering of similar work injury last year | | | | | |
| Yes | 88 (35.1) | 38 (25.5) | 126 (31.5) | 3.957 | 0.047 |
| No | 163 (64.9) | 111 (74.5) | 274 (68.5) | | |
| Colleagues suffering similar work injury last year | | | | | |
| Yes | 102 (40.6) | 36 (24.2) | 138 (34.5) | 11.232 | 0.001 |
| No | 149 (59.4) | 113 (75.8) | 262 (65.5) | | |
| Shift work | | | | | |
| No | 103 (41) | 117 (78.5) | 220 (55) | 53.089 | 0.000 |
| Yes | 148 (59) | 32 (21.5) | 180 (45) | | |
| Work duration | | | | | |
| < 5 years | 41 (16.3) | 50 (33.6) | 91 (22.75) | 21.17 | 0.000 |
| 5 – 15 years | 152 (60.6) | 84 (56.4) | 236 (59.0) | | |
| > 15 years | 58 (23.1) | 15 (10.1) | 73 (18.25) | | |

^a Superficial includes conjunctival and scleral wounds, chemical corneal burn, scleral wound with foreign body, punctate epithelial keratitis, epithelial corneal ulcer, extra-ocular foreign body, lid contusion, dry eye, lid laceration

^b Deep injury includes orbital with avulsed eye lids, rupture globe, retinal detachment, intraocular foreign body, cataract

^c Non- surgical = medical treatment

^d Surgical = primary repair, primary repair with lid reconstruction, amniotic membrane graft, stem cell transplantation, primary repair with vitrectomy, removal of foreign body

^e Fisher's exact test

^f as (12) participants reported that they did not require a sick leave

DISCUSSION

Occupational eye injuries represent an important sector of work-related injuries as a whole and may lead to losses in manpower, production and unfortunately may be complicated eventually by vision loss. The current study aimed at tracking occupational eye injuries to describe their main characteristics, as a way to develop preventive

programs at workplaces. This study showed that most of the workers presented to the hospital with occupational eye injuries belonged to group one workers namely welders, carpenters, agricultural workers, mechanics, and workers in glass and perfume production factories, construction workers. Of these, welders were the most common presenting group with occupational eye injuries. A study from Nigeria showed that 85.3% of welders had at least

one injury in the past year.⁽²³⁾ In a study among a group of welders, it was found that all of them had abrasions, and more than three-fourths of them each of lacerations, foreign body in the eye, flash burns and contusions. This may be referred to their job nature, which puts them at risk of exposure to fire hazards, electric shock, flying objects and explosion risk. Forrest et al., 2009⁽³⁾ reported that occupations which have increased risk of eye injuries are production, transportation, farming, mining or construction.

According to the Bureau of Labor statistics report in 2011, it was found that workers in production, construction, installation and maintenance, service, transportation sectors accounted for 87% of eye injuries involving days away from work in 2008. It was stated that these injuries were a result of flying objects, chemicals, harmful radiation or a mixture of these factors.⁽²⁴⁾ The risk in agriculture is high due to the fact that workers have to do a number of different tasks during the day without the use of protection.⁽²⁵⁾ Lamellar lacerations among construction workers, superficial corneal foreign body in welding, grinding, cutting metal, hammering and drilling were commonly found in another work⁽¹⁰⁾, intraocular foreign body was reported among workers with metallic objects.⁽²⁶⁾ Hence, the results of these studies confirm ours, which declare that group of manual workers are at higher risk of occupational eye injuries.

When studying the causes of occupational eye injuries, the current work revealed that the most common causes were foreign body, chemical and blunt trauma. Most of the eye injuries encountered were superficial and did not require surgical intervention. Other studies with similar results found that photo-keratitis, corneal abrasions and lacerations; blunt injuries and chemical burns were the main types of work related ophthalmological injuries.^(27, 28) In contrast, Kanoff et al., 2010⁽²⁹⁾ found that penetrating eye injuries and intra ocular foreign agents were the highest reported. According to NIOSH, 2013, the majority of job-related eye injuries are a result of small particles or objects striking the eye as metal slivers, wood or cement chips, nails which if penetrate the eye ball may end up in permanent loss of vision. Large objects striking the eye or face or a worker running into an object causing blunt trauma could also occur. Chemical and thermal burns and ultraviolet radiation burns (welder's flash) could similarly damage the eyes and surrounding tissues.⁽³⁰⁾ Eye injuries are related to exposure to chemicals, lasers or heat without using adequate safety measures.⁽³¹⁾

In the current study, about one-third of participants stated they used PPE. In 2001, in Singapore, Voon et al., found that 43.7% of patients had not used eyewear for protection at the time of injury though it was available, while 34.6% were not provided with protective devices.⁽³²⁾ Five years later, Woo and Sunder, in the same country found that 32% of reported cases were not provided with protective equipment, while 38.7% did not use the PPE, which were available to them.⁽³³⁾ It was important to ask the participants if they knew their job nature exposes them

to the risk of eye injuries, where it was found that 47.2% had this knowledge. In compliance with the present study, Desai et al., 1996 reported that 47% were aware of any risk of injury associated with their job.⁽³⁴⁾ This reflects the need for increased educational and awareness programs about eye safety and compliance with using protective equipment can lead to reducing eye injuries.

In the current work, when comparing workers of the two groups, it was found that manual workers with eye injuries had longer work duration, higher percentage of those working with shift work schedules, higher percentage of those reporting similar colleague work injuries in the previous year, more of those needing surgical interventions and with deep injuries. This may be explained by the job nature of manual workers, which demands their exposure to hazardous agents and more rapid pace of work, hence more probabilities of eye injuries. The finding that longer work duration was associated with the higher percentage of eye injuries among the group of manual workers may be explained by over-confidence and thus hurrying up and being more reluctant in wearing personal protective devices. Chen et al., 2009⁽⁷⁾ stated that the risks of eye injury are higher among workers with no special workplace safety training, not using PPE, and those who have work duration above five years. Predictors of eye injury in one study were age less than 30 years, smoking and organizational training were predictors associated with more than 10 injuries among welders.⁽³⁵⁾ In another study, it was found that the most common factors associated with eye injury at work were exposures to welding light followed by drilling and cutting injuries. Carelessness and hurrying up were reported causes also.⁽³⁶⁾

Focus group discussion in the current work showed that the most common causes stated were: lack of training, non-availability of PPE, unsafe working environment as: bad illumination, improper aeration, non-maintenance of machines. This agrees with other studies where inadequate use of safe machinery and proper protective devices remain important factors leading to occupational ocular injuries.^(37, 38)

Accordingly, for prevention of occupational eye injuries, we can recommend better training of workers, enhance the role of supervisors, assuring safe work environment and PPE, as eye goggles, which fit well and are comfortable. Routine employee physical examination should be carried out regularly and should include vision testing, employers have to make available first aid measures at workplaces and train workers on their use, besides; eye wash stations have to be present and accessible to all workers.

Conflict of Interest: None to declare.

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