

Brief Report

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Prevalence and causes of occupational eye injuries in Gampola, a rural town in Sri Lanka

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Abstract

Background: Occupational eye injuries cause significant ocular morbidity with possibly devastating social and economic consequences. However, the simple use of personal protective eyewear during exposure to hazards during work can reduce the injury burden.

Materials and methods: A cross-sectional descriptive study was carried out among 438 patients admitted to the eye ward at Base Hospital – Gampola, Sri Lanka, a secondary-level healthcare institution from September 2020 to November 2021. Data was collected using a participant-administered structured questionnaire.

Results: Our research shows that most occupational eye injuries occur among young working-age male rural workers who are the primary income earners of their families. Projectile injuries from foreign bodies constituted the main cause of occupational eye injuries (55.46%) with chemical injuries also being a significant cause (7.14%). Lack of usage of personal protective eyewear during occupational exposure (80.3%) is a significant risk factor. The average delay in presentation for medical treatment was 1.48 days (SD 2.69) with lack of significant symptoms being the major cause for delay (54.79%).

Conclusion and recommendation: Occupational eye injuries are a common cause of presentation to a specialized eye unit with a significant socioeconomic impact on the individual as well as the society. The majority of such injuries are preventable if suitable knowledge and practice regarding wearing personal protective eyewear are present. Therefore, improved awareness among the target community regarding basic preventive measures and improved access to healthcare facilities with a minimum delay to seek medical care will reduce the disability caused by such injuries.

Keywords: Occupational eye injuries, rural Sri Lanka



INTRODUCTION

The workplace is identified by the World Health Organization as an important setting for a healthy lifestyle¹. However, workplace injuries are becoming more common, especially in the developing world with rapid industrialization².

Occupational eye injuries are an important cause of morbidity as they can lead to loss of vision, loss of productivity, loss of income in economically vulnerable groups, and workplace litigations³. There are many agents found in workplaces that can cause eye disease or injury. While many of these agents are often found in everyday living environments, dangerous exposures are most likely to occur in the workplace.

Rapid industrialization and economic development are causing an increased use of machinery and mechanization of work even in traditionally labour-intensive occupations such as agriculture. Therefore, the number of people involved in sectors that are at risk of occupational injury is increasing. Welders are a common population who are at risk of occupational eye injuries. Since most of them are male and young, sight-threatening damage to the eyes could affect their livelihood as well as their quality of life. The social consequences to society and the economic impact on the country can be significant.

Welding is the process in which metal or other thermoplastic materials are joined together by the application of heat, pressure, or both with or without the use of filler metal⁴. Welders and grinders are in particular at risk for occupational eye injuries due to the nature of their occupation. A large number of people who perform welding and/or grinding intermittently, especially, non-occupational welding, are also at risk for eye injuries.

A study done in 2017 among patients presenting to the accident and emergency section of the National Eye Hospital in Sri Lanka showed the majority of the injured were young males. Most of them were sole breadwinners in their families and had low socioeconomic status. It was also found that the majority of the participants were not provided with protective eyewear during their occupational exposure to hazards⁵.

Ocular injuries are also highly preventable [6]. Worldwide, more than half a million blinding injuries to the eye occur every year⁷. The age distribution for severe ocular trauma is bi-modal, with a large number of injuries affecting males⁸. A study done in the United States of America has estimated the economic impact of ocular trauma; due to hospital admission, investigations and in-patient treatment, to cost millions of dollars annually⁹.

The use of protective eyewear is an important step to prevent occupational eye injuries¹⁰. However, the usage of protective eyewear during exposure to hazards during work seems to be lacking in the developing world. The educational status has an important association with personal protective equipment usage where workers with better education are significantly more likely to use personal protective equipment than workers with less education¹¹.

Base Hospital Gampola, Sri Lanka, provides secondary-level healthcare services for a large population in the central highlands of Sri Lanka. This population is predominantly rural. Although many patients are admitted to the eye ward at Base hospital - Gampola for treatment of ocular injuries, no study on the prevalence of such injuries has been carried out within the hospital or its catchment area. The nature of these injuries is elusive. The prevalence of usage of personal protective eyewear among the population also needs to be assessed. Therefore, we carried out the following study to determine the prevalence of occupational eye injuries among patients admitted to the eye ward and to identify factors which may help in the prevention and reduction of the injury burden.

OBJECTIVES:

The objectives of the study were to find the prevalence of occupational eye injuries among the study population, to find out the types of injuries that have occurred, to assess the usage of personal protective eyewear among patients admitted with eye injuries and to find out the practices of care and care seeking behavior of patients with eye

injuries prior to presentation to a secondary level healthcare institution.

MATERIALS AND METHODS:

A cross-sectional observational study was conducted among patients admitted to the eye ward at Base Hospital, Gampola from September 2020 to November 2021 by convenience sampling. All patients admitted were invited to participate and data was collected from patients consenting to participate in the study. Data collected included demographic details of the patients, types of occupational eye injuries, practice patterns regarding usage of protective eyewear and initial medical treatment prior to admission using a participant administered structure questionnaire. A 10% non-response rate was accounted for. Data were described using means and percentages and Chisquared test was used to identify statistically significant relationships. Ethical approval for the study was obtained from the ethical review committee of the National Hospital, Kandy and administrative clearance was obtained from the director of Base Hospital, Gampola.

RESULTS:

Data were collected from 438 participants and consisted of 272 male (62.1%) and 166 female patients (37.9%). 298 patients had presented with ocular injuries, 238 (79.8%) had ocular injuries due to occupational exposures and 60 (20.2%) due to non-occupational exposures. Among the patients with occupational eye injuries, 225 were males (94.52%) and 13 were females (5.48%). The prevalence of occupational eye injuries among patients presenting to the eye ward was 543 per 1000 population.

The study sample had an average age of 42.47 +/- 13.39 with an age range of 17-76 years. The majority of injuries occurred in the 20-40 age group (51.3%). Fewer injuries were reported in patients less than 20 years (3.8%) or more than 60 years (8.43%).

The majority of the participants had been educated up to the secondary school level (79.6%) and were living in rural areas (64%). Most respondents were

married (81.3%) with 67.8% being the primary income earner of the family. A significant proportion of respondents had a low monthly income with 43.8% earning less than 5 US dollars per day.

Patients with occupational eye injuries were categorized according to their occupation and the two largest proportions of workers were day labourers (28.56%) and welders (24.36%).

Table 01: Occupation of patients with occupational eye injuries

Occupation	Number	Percentage
Labourers	68	28.56
Welder	58	24.36
Mason	28	11.76
Carpenter	16	6.72
Mechanic	17	7.14
Farmer	8	3.36
Driver	6	2.52
Security/Armed forces	7	2.94
Teacher	2	0.84
Businesspeople	9	3.78
Electrician	2	0.84
Miscellaneous occupations	20	8.4

NATURE OF INJURY:

The commonest cause for occupational eye trauma was projectile metallic foreign body impact during grinding of metal pieces (55.46%). Categorization according to the most common mechanisms which caused occupational eye trauma is mentioned in table 02.

Table 02: Mechanisms of causation of Occupational eye injuries

Mechanism of cause	Number	Percentage
Grinding of metal	132	55.46
Impact of tree branch	43	18.06
Chemical spill	15	6.3
Flame arc burn	3	1.26
Nail impact	8	3.36
Stone impact	10	4.2
Finger impact	15	6.3
Other flying object impact	9	3.78
Miscellaneous causes	3	1.26

Categorization of injuries according to the type of injury caused by different mechanisms (figure 01) revealed that the majority of patients had superficial injury to the cornea due to projectile grinder pieces (54.2%), 11.6% patients had injuries from other flying objects, 6.72% of patients had flame burns and 3.84% had chemical spills with industrial acids or alkalis. Other chemicals such as tree sap spill during agricultural work amounted to 3.36%.

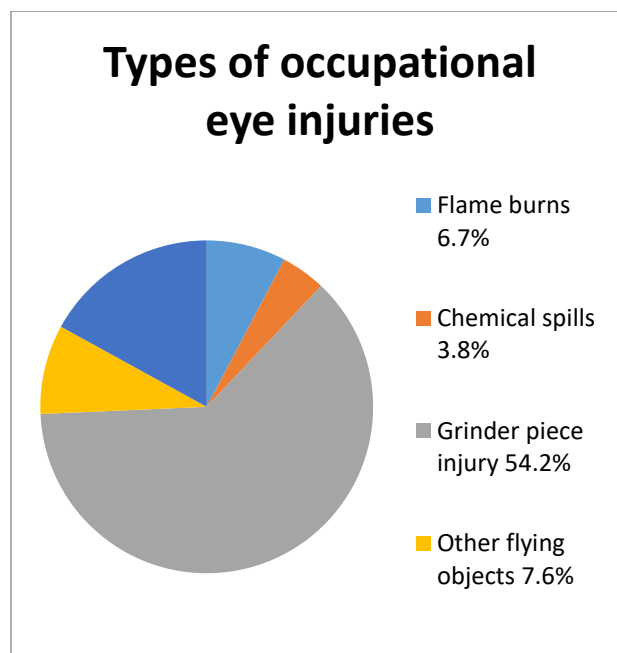


Figure 01; Types of occupational eye injuries among study participants

HEALTHCARE SEEKING BEHAVIOUR:

Initial first-aid had been provided at the time of injury to 108 patients (43.69%). The type of first-aid provided included washing the eye with clean water (39%), application of liniments (2.52%) and pain relief (2.1%).

The delay of presentation to the eye ward for medical treatment on average was 1.48 (Median 1, range 0-30) days after injury. The number of patients who presented within 3 days or less after the injury was 88.3%. The reasons for the delay were lack of significant symptoms (54.06%), lack of transport facilities (16.27%), presence of other commitments (15.11%), had ignored their symptoms or self-medicated (5.81%), or had obtained treatment from a local hospital or family physician before considering presentation for specialized treatment (8.72%).

EYE PROTECTION

Personal protective eyewear had been worn during the presenting injury by only 19.7% whilst the vast majority (80.3%) had not worn personal protective eyewear during the current occupational exposure. The types of personal protective

eyewear worn were safety spectacles (11.34%), protective eye goggles (6.72%), eye shields (0.42%), protective face shields (0.84%), and protective helmets (0.42%).

Personal protective eyewear was provided by the workplace in 45.6%. However, of the patients provided with personal protective eyewear from their workplace, only 24% of patients had worn the equipment during the current occupational exposure. The majority (51.26%) had never worn personal protective eyewear during their usual work.

Table 03: Frequency of use of personal protective eyewear during occupational exposures

Frequency of wear	Number	Percentage
Never	122	51.26
Rarely	2	0.84
During exposures where serious injuries would likely result	23	9.66
On most occasions	19	7.98
Almost always	46	19.32
Always	26	10.92

DISCUSSION:

The workplace is an important aspect of a person's life since it is the place where a person earns a living and therefore spends a significant proportion of the day in association with it. The World Health Organization places much emphasis on occupational health and health-related issues in the workplace. The WHO defines occupational health as an area of work in public health to promote and maintain the highest degree of physical, mental and social well-being of workers in all occupations. Its objectives include the maintenance and promotion of workers' health and working capacity; as well as the improvement of working conditions and the working environment to become conducive to safety and

health; in addition to the development of work organization and working cultures that should reflect essential value systems adopted by the undertaking concerned, and include effective managerial systems, personnel policy, principles for participation, and voluntary quality-related management practices to improve occupational safety and health¹².

With Sri Lanka being a developing country, the emphasis on health at the workplace usually is of secondary consideration in most instances, with occupational safety protocols not implemented or ignored. Therefore, to prevent occupational injuries and harm to health, certain measures, protocols, equipment are necessary to prevent bodily harm, especially in blue collar occupations where employees are physically involved in work.

The eye is an organ comprised of delicate tissues to which even minor injuries can cause serious harm leading to significant debilitation. Ocular injuries can result in chronic symptoms and pain, permanently altered vision, loss of binocular vision, loss of stereoacuity, legal blindness as well as complete blindness. This will lead to loss of the patient's occupation and significantly impact and impair their ability to carry out normal activities of daily living.

Through our research, we found that the impact of occupational eye injuries disproportionately affected young working-age males in the low-income strata. This is in keeping with similar studies conducted to describe patterns of ocular trauma⁵. These individuals are at a social disadvantage as well due to their limited social safety net, limited access to occupational safety measures and equipment, insurance or job security. Injuries and bodily harm occurring whilst carrying out their occupation will most likely have to be cared for by the patient and caregivers in their private capacity. Although the Sri Lankan government provides free healthcare at the point of contact, all other ancillary healthcare expenses will need to be borne by the patient and the family.

The majority of study participants with occupational eye injuries were employees (69.2%) whilst 30.8% were owners of their own establishments. Also, 43% of the study participants with occupational eye injuries had a monthly income of less than 30,000 Sri Lankan rupees.

Therefore, a significant socioeconomic burden is placed on these workers and their families due to occupational eye trauma. The workers most affected were welders, which represented 24.36% of the study participants with day labourers and masons also representing a significant proportion of the study participants, 28.56% and 11.76% respectively. The major mechanism of occupational eye injuries was the impact of small projectile metal pieces during the operation of industrial grinder machines, which represented 55.46% of injuries.

Data regarding the usage of personal protective eyewear during occupational exposure showed that the usage of any type of personal protective eyewear was low with only 19.7% of participants using any form of protective eyewear. The majority of the study participants (80.3%) never wore any form of personal protective eyewear, which is also similar to findings of likewise studies published in the literature [5]. Studies show that the use of personal protective eyewear is effective at reducing ocular injuries and such interventions can lead to a reduction in the burden of eye injuries¹³. Protective eyewear usage has also been shown to reduce agriculture-related eye injuries in up to 90% of cases¹⁴. This low usage of personal protective eyewear could therefore be attributed as a significant contributing factor to the high prevalence of such injuries.

Delay in presenting and seeking acute medical treatment after an ocular injury will negatively impact the outcome following such injury. The main reason for the delayed presentation was the lack of significant symptoms, which represented 54.79% of the study participants. This is significant as the majority of ocular injuries will seem innocuous to the patient due to lack of significant deterioration of vision or presence of ocular pain, but may lead to serious and intractable sight-threatening complications later. For instance, a corneal foreign body due to a grinder piece located away from the visual axis of the patient may initially cause only mild symptoms such as epiphora, but may lead to a corneal ulcer which may be difficult to treat. Injury with vegetative matter following agriculture-related ocular trauma may produce no symptoms in the initial few days, but inoculation of fungal spores in the cornea may

lead to fungal keratitis necessitating excision of the infected corneal tissue and corneal allograft transplantation. Lack of transport (16.43%) and presence of other commitments (15.54%) were also reasons given by the participants for their delay in presentation, which shows the socioeconomic impact such injuries have on a predominantly rural community.

Occupational eye injuries are especially important as a community healthcare burden since it is a major cause for presentation to the eye ward for medical treatment. Since the majority of occupational eye injuries are preventable with the appropriate usage of suitable personal protective eyewear, this represents a significant burden of excess and avoidable eye injuries in the community. Occupational eye injuries also negatively impact the social and financial conditions of the patient by causing impairment of vision or prolonged hospital stay that could lead to a vicious cycle that further deteriorates the socioeconomic status of the patient. This study was designed mainly to identify the disease burden in the community and try to elaborate on factors which may lead to such occupational eye injuries. However, more data is needed to find out what further interventions can be done to increase awareness, improve access to healthcare facilities and create a safe workplace environment.

RECOMMENDATIONS:

1. Improve awareness among the target community regarding common occupational eye injuries, their disease burden and simple and basic preventive measures
2. Improve access to healthcare for patients with occupational eye injuries
3. More research into reasons for not wearing personal protective eyewear during occupational exposures with the potential to cause eye injuries.

Author declaration**Author contribution**

SCD and MAA conducted study design, analysis and preparation of manuscript, SCD, MAM, PW, UL, IK conducted data collection, data entry and revision of final manuscript.

Conflict of interest

Authors declare that there is no conflict of interest.

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Ethical clearance:

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Availability of data:

Data could be produced on request.

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