

Original Research



Prevalence, patterns and associated factors of occupational eye injuries among patients attending National Eye Hospital, Colombo

Niluka Jeewanthi Gunathilaka^{1*} & Dulani Lakmali Samaranyake²

¹Ministry of Health, Sri Lanka; ²Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

*Correspondence: nilukagunathilaka@yahoo.com  <https://orcid.org/0000-0001-6887-8790>

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Abstract

Introduction: Occupational eye injuries (OEIs) cause substantial morbidity, disability and economic loss globally. Local studies on OEIs and their prevention are scarce.

Objectives: To describe socio-demographic, occupational, clinical characteristics and associated factors among patients presenting with OEIs to National Eye Hospital, Colombo and their practices on prevention and first aid on OEI

Methods: A descriptive cross-sectional study was conducted in 218 consecutive patients presenting with OEIs to National Eye Hospital, Colombo. Data were collected using an interviewer-administered questionnaire and clinical-records. Practices on prevention and first aid were assessed and separate total scores were calculated.

Results: Of the 218 participants, majority were males (n=213; 97.7%) with mean age of 34 years (SD=11.5). Most of them were married (65.6%) as well as the sole bread winners (58.3%). Most affected were welders (29.8%) and construction workers (19.7%). Flying-particles (41.7%), grinding-particles (36.7%) and chemicals (11%) were main causes, resulting in 57.3% foreign bodies, 10.1% abrasions and 5.9% chemical-burns. Thirteen (6%) injuries were bilateral, 18 (8.7%) had partial/complete vision loss and 121 (55.5%) were recurrent. Majority had goggles (90.7%), spectacles (60.8%), hand-shields (64.1%) but not face-masks (9.4%) or welding-helmets (32.4%). Personnel protective equipment (PPE) usage was compulsory in 63.3% workplaces but only 16.5% used PPE during injury, reasons being unavailability (22.5%) and low priority (20.6%). The PPE use was significantly ($p=0.004$) higher in settings where it was compulsory.

Conclusions & Recommendations: The OEI were common among young male workers and in some occupations. Availability and utilization of PPE was poor and overall practices in first aid were unsatisfactory. Legislation, provision of PPE and worker education targeting a behaviour change on prevention and first aid are recommended.

Keywords: occupational eye injuries, personnel protective equipment (PPE), practices, prevention, first aid

Introduction

Work-related injuries are one of the major causes of morbidity and mortality throughout the world, both in developed and developing countries. According to the International Labour Organization (ILO), an occupational injury is defined as any personal injury, disease or death resulting from an unexpected and unplanned occurrence from or in connection with work (1). Occupational eye injuries (OEI) are defined as any type of eye injury that occurs in the workplace and that in most instances result in visual morbidity followed by significant disability.

Eye injuries range from very mild, non-sight threatening injuries to serious injuries resulting in loss of vision. The common types of OEIs are corneal abrasions, corneal lacerations, corneal foreign bodies, ultraviolet (UV) keratitis, traumatic iritis, blood in anterior chamber and orbital blow out fracture. According to available evidence, about 70% of OEIs are due to contact with an object or equipment, while exposure to harmful substances and environments are responsible for 26% of the injuries (2-3). Industries such as construction, welding and grinding have been identified as largely predisposing to work related eye injuries (4-5). Male workers who make the largest contribution to the labour force are the main victims of OEIs and they are usually affected during the most productive years of their life. Thus, the importance of policies and standards in preventing eye injuries has been widely recognized. The Occupational Safety and Health Administration (OSHA) recommends that all employers should ensure that the workplace is harm free for the worker and that eye and face protection needs to be given for the employee from the potential hazards such as chemical, radiological, mechanical irritants (6). In Sri Lanka, according to the Factories Ordinance 1942, it is a mandatory responsibility of the employer to ensure health, safety and welfare of persons at workplace and provide free personnel protective equipment if the workers are engaged in high-risk activities. In this background, workers exposed to injurious substances need to be provided appropriate eye protectors (7).

In Sri Lanka, occupational safety and health situation in most workplaces leave a lot to be desired. Hospital records show that a large number of patients present with OEIs, while anecdotal evidence shows that the awareness and practices of workers regarding prevention eye injuries are minimal in most work settings. Further, the affected workers' awareness and practices on first aid related to eye injuries remain to be a major determinant of the outcome of their injuries. Hence, primary and secondary prevention of occupational eye injuries is an area which needs more attention in the Sri Lankan setting. However, there is minimal evidence on occupational eye injuries in the South Asian settings as well as in Sri Lanka. In this background, this study aimed to describe the characteristics and associated factors among patients presenting with OEIs to the National Eye Hospital, Colombo and to describe their practices on prevention and first aid.

Methods

A descriptive cross-sectional study was conducted in the National Eye Hospital, Colombo (NEH) in 2014. The study population comprised 218 patients presenting to the outpatient department (OPD) following an eye injury which occurred during occupation engagement, from 8.00 a.m. to 5.00 p.m. during the data collection period. Patients who were severely injured making it difficult to communicate with the research team, who needed emergency in ward or operative care and patients presenting more than once within the data collection period were excluded.

The sample size was calculated applying the probable estimation of 85% of patients presenting to eye hospital with ocular trauma not adhering to any preventive measures (8) at the significance level 95% with a relative precision of 10% and non-response rate of 10%. The calculated sample size was 218. Data were collected using consecutive sampling method in the OPD until the required sample size was achieved.

A pretested interviewer-administrated questionnaire (IAQ) was used for data collection. Information on OEI was extracted from the patients' clinical records. Information on socio-demographic and occupational characteristics, practices on identifying and prevention of hazards, personal protective equipment (PPE) and first aid were assessed through multiple questions that were given equal-weighted scores. For further analysis, the total score was converted to a dichotomous variable and categorized into two groups by median taken as the cut-off value.

Data analysis

Data analysis was carried out using Statistical Package for the Social Sciences (SPSS) version 17. Categorical variables were presented in frequencies and percentages. Bivariate analysis was done between sociodemographic, occupational characteristics and clinical outcomes using Chi- squared test and Fishers Exact Test. Clinical outcomes were defined as loss of vision and cornea being affected following the injury. P value of 0.05 was considered as statistically significant.

Results

The response rate of participants was 100%. The majority presenting with OEI were males (n=213; 97.7%), with highest level of education of grade 6-11 (n=118; 54.2%). Most of them belonged to the 21–30-year age group (n=84; 38.5%) with a mean age of 34 years (SD=11.5). Of the patients, 65.6% were married while 58.3% were the sole bread winner of the family. Most of them (42.7%) had a monthly income of LKR 20 001-30 000.

As shown in Table 1, 29.8% of the participants were welders, 19.7% were construction workers and 6.4% each of motor mechanics and electricians in the sample. Further, 90 patients (41.3%) were permanent employees while 150 (68.8%) represented the private sector. Mean working hours per week was 54.6 hours (SD=14.1 hrs), with the largest proportion being 61-70 duty hours per week. Majority (n=134; 61.5%) had not received any vocational training in relation to their current occupation. Of those who had, 21.6%

(n=47) had more than one year of training while 36.2% (n=79) were working in the field.

Work-related eye injuries

Crushing, cutting and drilling (n=186; 85.3%) were the commonest activities predisposing to OEIs. Other commonly engaged activities were welding and activities which exposed them to UV, IR rays (n=102; 46.7%) and grinding (n=98; 45%). Only 28.4% (n=62) of patients were engaged in chemical mixing or spraying. The commonest cause of OEI were particle matters (n=87; 41.7%), and foreign body in the eye (n=125; 57.3%). Most affected part of the eye was cornea (n=146; 67.0%) followed by conjunctiva or sclera (n=61; 28.0%). Majority of the patients (n=205; 94.0%) had unocular eye injury. Following the injury, 33 patients (15.1%) had partially reduced vision and one patient complete vision loss (Table 2).

Results of the bivariate analysis (Table 3) indicate that there were no significant associations of their characteristics found with vision loss. However, there were significant associations with male sex, cornea being affected and working in constructions and welding.

Practices on prevention and first aid

Regarding practices on prevention, 63% (n=137) stated that PPE use was compulsory in their workplace. Most of study participants (79%) claimed that they use PPE in day-to-day work. However, 80.7% (n=176) were not using PPE during the time of the injury. Figure 1 shows reasons for not using PPE, in which the commonest reasons were unavailability of PPE, considering it is not important, no time to wear PPE, and interference with the vision. Factors influencing the use of PPE at the time of injury indicated PPE use being compulsory in the workplace as a significant factor (p=0.004). Patients from workplaces where PPE use was compulsory (n=31; 23.0%) were more likely to wear them compared to those from workplaces where it was not compulsory (n=5; 7.0%).

Majority of the patients (n=129; 59.2%) had received first aid following the eye injury at the workplace and

99 (45.4%) had done the first aid by themselves and 15 each (6.9%) by a trained worker and untrained worker. The commonest first aid they had performed was washing the injured eye with clean water (n=128; 58.7%). There were 40.8 % (n= 89) patients who did not receive any first aid at the time of injury. Of them, 55.1% (n=49) were not interested in having first aid. No first aid facilities were available for 7.8% (n=17).

Discussion

In the current study, the majority of workers (98%) affected were males. In most countries, male workers are the major contributors to the labour-force, and this is 74.9% in Sri Lanka (9). Further, males are the ones who engage in dangerous tasks, which make them more vulnerable to all types of work-related injuries. The studies conducted in Sri Lanka as well as in other countries (8, 10-11) show similar findings.

The mean age of the affected workers was 34 years (21-30 years being the commonest age group) and results are similar in developed as well as developing countries (3, 12-13). This indicates that in the situation of permanent loss of vision, the disability is likely to cause a major impact on their quality of life and productivity. Majority of the workers being married and being the sole bread winners shows that the impact of OEIs is not limited to the patient and workplace, but to the entire family. The findings of Dissanayake et al. (8) also showed that 84.2% of workers affected by OEIs were the sole breadwinners of the family. Workers in the current study were having a lower education level, which may have led them to be ignorant of the hazardous situations and safety measures that can be applied to prevent injuries or not knowing the correct way of applying those preventive measures (14-15). Usually, the workers are educated about the hazards unique to each occupation, importance of prevention of such injuries and the methods of prevention during vocational training. Lack of such training is prominently seen (38.5%) highlights its importance.

Most of the OEIs were caused by flying particles and commonest eye injury presenting was foreign body

in the eye. According to the studies done in Singapore and Scotland, a similar pattern of injuries can be identified (16-17). The major work activities that generate such particles were crushing, cutting and welding. The study findings of other countries also show similar results (16, 18-19). In the current study, welders and construction site workers were at the highest risk due to the nature of their work, and a similar pattern is seen in other studies as well (11, 20-21). The bivariate analysis also confirms these results.

In the current study, a very small percentage of patients were shown to experience partial or complete vision loss due to the OEI. This is likely to be an underestimation, because the current study excluded the patients who were seriously ill, in need of emergency in-ward care or operative interventions. Hence, the impact of OEI on visual disability in the working population cannot be undermined. Also, experiencing OEI in the past was noted in the majority (55.5%). This denotes an extremely unsatisfactory situation, where the working conditions of these workers have not improved even after recurrent injuries. This also highlights the deficiencies in the preventive health care provided at the time they present for the first time with such an injury.

Although PPE use was compulsory in many workplaces, which is a positive sign in occupational safety, its implementation appears to be less strictly enforced to motivate most of the workers to use them. Some studies done in Sri Lanka (22) report a high usage of PPE but being self-reported data, overestimation is possible. Main reasons given for not using PPE at the time of the injury were unavailability and not considering it as important. The latter indicates that although the workers had awareness on PPE, they were not convinced enough of its importance. Most of the studies in other settings have also shown similar reasons for poor compliance to PPE (13, 16). Therefore, it is essential not only to provide PPE but also to improve the workers' motivation, targeting a behavioural change.

The factors associated with the usage of PPE at the time of OEI had shown, that a substantial increase in the use of PPE can be achieved by making usage of

Table 1: Socio-demographic and occupational characteristics of the patients presenting following occupational eye injuries (N=218)

Socio-demographic characteristics	No.	%
Age*		
20 or less	16	7.3
21-30 years	84	38.5
31-40 years	65	29.8
41-50 years	30	13.8
51- 60 years	18	8.3
More than 60	5	2.3
Level of education		
No schooling	4	1.8
Up to grade 5	17	7.8
Grade 6 to 11	118	54.2
Passed GCE Ordinary Level	59	27.0
Passed GCE Advanced Level and above	20	9.2
Marital status		
Married	143	65.6
Unmarried/Widowed/ Divorced	75	34.4
Monthly income (Rs.)		
20 000 or less	41	18.8
20 001-30 000	93	42.7
30 001-40 000	50	22.9
40 001-50 000	17	7.8
More than 50 000	17	7.8
Type of occupation *		
Welding	65	29.8
Construction work	43	19.7
Motor Mechanic	14	6.4
Electrician	14	6.4
Labourer	10	4.6
Lathe machine operators	09	4.1
Technical workers	08	3.7
Carpenter	05	2.3
Printers	03	1.4
Others**	47	21.6

Nature of employment		
Permanent	92	42.2
Temporary	44	20.2
Contract basis	41	18.8
Self employed	41	18.8
Sector of employment		
Government/ cooperation/ Board	27	12.4
Private	150	68.8
Self-employed	41	18.8
Received any vocational training		
Yes	84	38.5
No	134	61.5
Total	218	100.0

* Percentages calculated out of the total sample

** Occupations included in this category are drivers, painters

PPE compulsory in the workplaces. Legislation, coupled with firm implementation of rules can be used to improve the practice of PPE use further. In this regard, it was an encouraging finding that almost all (98%) the patients agreed that having legislation to make PPE use compulsory is important. This is supported by available evidence from other settings as well (23).

The recommendation regarding first-aid is that there should be a worker competent in first-aid available in every work shift and the situation in the current study population was far from satisfactory. However, it should be noted that these recommendations are not practical for most informal workplaces which operate under limited capital and few workers (24). These findings highlight that the attention towards first aid facilities and practices in Sri Lanka needs to be improved substantially. This situation seems to be slightly better in developed countries (25). The negative attitudes such as first aid not being perceived as important, are likely to be arising out of lack of awareness. Therefore, even if the first aid facilities are improved, without a change in such negative attitudes, behaviours cannot be made

optimum. Further, these negative attitudes may act as barriers when it comes to dissemination of knowledge and inculcating a first aid culture among the workers.

Conclusions & Recommendations

The OEIs affect workers in the prime of their work life, resulting adversely on their productivity and household economy. Commonest groups affected were welders and construction workers, with injuries due to flying particles, grinding particles and chemicals commonly affecting the cornea of the eye. Despite the majority having recurrent work-related eye injuries, the use of PPE was found to be poor. In view of these findings, establishing and maintaining an information system which captures all occupational eye injuries that will promote the development of new preventive strategies is recommended. Further, to have effective safety and preventive strategies, a multidisciplinary approach should be developed for fostering constructive working relationship between healthcare professionals, local authorities, voluntary organizations, employers and employees.

Table 2: Injury characteristics among the patients having occupational eye injuries (N=218)

Details of the injury	No.	%
Injury type		
Foreign body in the eye	125	57.3
Abrasion	22	10.1
Chemical injury with base	9	4.1
Abrasion & foreign body	8	3.7
Laceration	8	3.7
Chemical Injury with Acid	4	1.8
Epithelial defect & foreign body	3	1.4
Burn	3	1.4
Contusion	33	1.4
No Harm	3	15.1
Injured part of the Eye		
Cornea	146	67.0
Conjunctiva/ sclera	61	28.0
Cornea & conjunctiva	4	1.8
Eye lid	2	0.9
Eyebrow	1	0.5
Not Applicable	4	1.8
Affected uniocular or biocular		
Affected uniocular	205	94.0
Affected biocular	13	6.0
Loss of vision following the Injury		
No vision loss	184	84.4
Partly reduced	33	15.1
Complete vision loss	1	0.5
Person responsible for the injury		
Self	188	86.2
Other worker	26	11.9
Do not know	4	1.8
Previous eye injuries		
No previous injuries	97	44.5
Once	36	16.5
Two times	29	13.3
Three to five times	39	17.9
Six to twenty times	13	5.9
More than twenty times	4	1.8
Total	218	100.0

Table 3: Bivariate analysis between sociodemographic or occupational characteristics and clinical outcomes

Characteristics	p value	
	Vision loss	Cornea affected
Age	0.1	0.22
Sex	0.79	0.03*
Education	0.21	0.103
Marital status	0.21	0.115
Bread winner	0.33	0.219
Income	0.76	0.253
Type of occupation	0.59	0.005*
Nature of employment	0.74	0.591
Sector of employment	0.65	0.162

*Significant tested at 95% confidence level using Chi-Squared Test

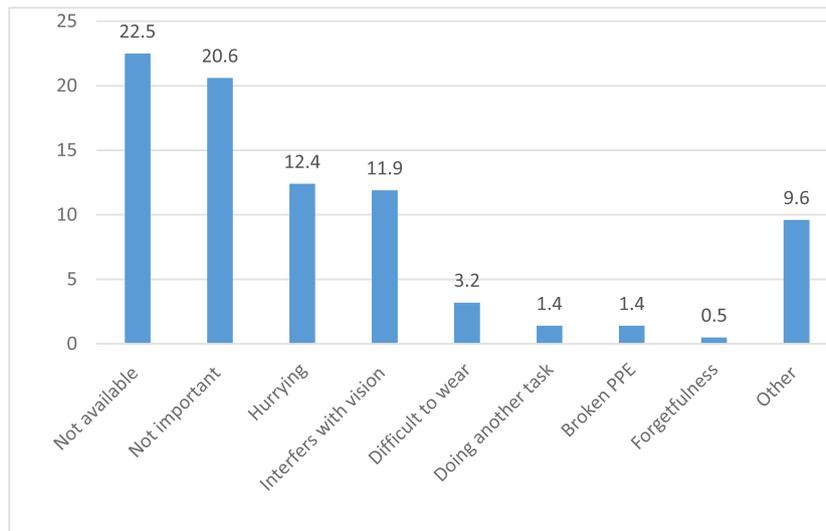


Figure 1: Reasons for not using PPE at the time of injury (N=176)

Public Health Implications

- Occupational eye injuries are found to be common and recurrent among those seeking care at the National Eye Hospital, Colombo.
- Prevention of such injuries is minimally addressed in most work settings.
- There is a need to monitor OEIs and implement proper preventive strategies at multiple levels - employers, employees and health service providers.

Author Declarations

Competing interests: No conflicts of interest

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Author contributions: NG- Designing the study, data collection, data analysis and manuscript development; DS- Designing the study, data analysis and manuscript development

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