Original Article

Work-Related Eye Injuries: Prevalence, Patterns, Awareness of Eye Safety, and Protective Practice Behaviours among Industrial Workers

Dhathri K[1], Shwetha NC[2], Preethi B[3], Poornima N[4]

[1]Assistant Professor, Dr Chandramma Dayananda Sagar Institute of Medical Education and Research, Karnataka India. [2]Professor, Dr Chandramma Dayananda Sagar Institute of Medical Education and Research, India. [3]Assistant Professor, Dr Chandramma Dayananda Sagar Institute of Medical Education and Research, India. [4]Senior Resident, Dr Chandramma Dayananda Sagar Institute of Medical Education and Research, India.

Abstract

Background: Work-related eye injury is a major but very avoidable source of eye morbidity on earth. Mechanical hazards, foreign objects, chemicals, and exposure to heat are especially harmful to industrial employees because they are constantly exposed to these factors in manufacturing or metal-processing industries. Although occupational safety laws exist and people have personal protective devices, eye injuries are still happening in startling numbers and usually leave people with temporary or permanent loss of their sight. Knowledge about the burden of ocular injuries, as well as awareness and safety practices of workers, is critical in the design of effective preventive measures. The objectives of the study included determining the prevalence and pattern of work-related eye injuries among industrial workers and evaluating workers' awareness of measures that appear to address eye safety and their actual behaviour regarding the use of protective eyewear. **Material and Methods:** Two hundred and fifty industrial workers were recruited from selected manufacturing and metal-processing industries, and a cross-sectional study was conducted in a descriptive manner. They included workers aged 18 to 60 with at least 6 months of work experience. A pretested, structured questionnaire gathered data on socio-demographic traits, occupational history, nature and history of work-related eye injuries, awareness of eye safety, and practices involving the use of protective eyewear. The data analysis was conducted using descriptive statistics, with results presented as frequencies and percentages. **Results:** Of 250 participants, 68 workers who had experienced work-related eye injury were observed, giving a prevalence of 27.2. Foreign body injuries constituted the highest proportion of reported injuries (52.9%), chemical injuries comprised the second category (19.1%), and blunt trauma and thermal injuries were the third and fourth categories, respectively. Knowledge of the significance of protective eyewear was also found in 72.0 percent of workers, but only 41.6 percent reported using eye protection regularly at the workplace. A good percentage either wore protective eyewear infrequently or never wore it, which illustrates a very high discrepancy between knowledge and the reality of practice regarding safety. **Conclusion:** Occupational eye injuries have been associated with industrial employees despite a moderate consciousness of the need to maintain eye safety while at work. The fact that the preventable injuries are excessively frequent, especially foreign body-related trauma, shows the importance of reinforced occupational safety measures. To create a link between knowledge and practice and to reduce occupational ocular injuries, it is necessary to promote the integration of knowledge and practice through regular safety training, ease of access to protective eyewear, and increased enforcement of workplace safety policies.

Keywords: Eye trauma in the workplace; Workers; Industrial safety; Industrial eyewear; Workplace accidents; Personal protective equipment.

Received: 07 December 2025 **Revised: 09 January 2026** **Accepted: 30 January 2026** **Published: 07 February 2026**

Introduction

Occupational eye injuries are a significant occupational health problem and one of the most common causes of avoidable visual impairment in the world. Exposure of the eyes in industrial settings is especially hazardous, as they are constantly exposed to physical, chemical, and thermal hazards. Even the slightest trauma to the eye may cause a lot of morbidity, productivity, and permanent loss of vision in the case of timely treatment without proper care. Occupational eye injuries thus impose a health burden on affected workers and an economic burden on industries and healthcare systems.[1]

Industry workers, particularly those in manufacturing, metal processing, welding, machining, and chemical handling, are at higher risk of eye injuries. Examples of commonly occurring hazards at the workplace include airborne foreign objects such as metal fragments, dust, splashes of corrosive chemicals, blunt instrument injuries from tools or equipment, and heat-related injuries from sparks or molten metals. The literature has consistently found that foreign body injuries are the most common form of occupational ocular injury, largely due to ineffective eye protection or poor safety measures during normal work processes.[2]

Although the incidence of eye injuries at work is estimated to be

Address for correspondence: Dr. Dhathri K, Assistant Professor, Dr Chandramma Dayananda Sagar Institute of Medical Education and Research, Karnataka India.
E-mail: dhathri13@gmail.com

DOI:
10.21276/amit.2026.v13.i1.343

How to cite this article: Dhathri K, Shwetha NC, Preethi B, Poornima N. Work-Related Eye Injuries: Prevalence, Patterns, Awareness of Eye Safety, and Protective Practice Behaviours among Industrial Workers. Acta Med Int. 2026;13(1):304-309.

preventable in almost 90 percent by consistently applying the right protective gear, especially protective eyewear, alongside observing the set safety measures. Nevertheless, adherence to eye protection practices is suboptimal, particularly in developing and highly industrialised areas where occupational safety rules may not be consistently applied. Poor use of eye protection is usually caused by a lack of training, discomfort with protective devices, perceived inconvenience, and a lack of supervision.[3]

Knowledge of occupational eye safety is essential for preventing injuries, but it does not automatically translate into safe practices. Several studies have indicated a significant disparity between awareness and the use of protective eyewear at the workplace.[4] Such a mismatch underscores the need not only to determine the prevalence and pattern of eye injuries but also to assess workers' perceptions, attitudes, and behaviours regarding eye safety. Knowledge of these factors would help us design specific interventions to overcome both behavioural and systemic obstacles to compliance.[5]

The Indian industrial landscape is both limited and fragmented when it comes to collecting data on occupational eye injuries, especially at the level of individual industrial units. Differences in industrial processes, safety culture, and the application of occupational health standards are some of the factors that lead to different injury patterns and risk profiles. The production of local epidemiological data is thus needed for identifying high-risk populations, designing preventive plans, and informing policies on work-related safety.[6]

It is in this context that the current work was carried out to investigate the prevalence and trend of work-related eye injuries among industrial workers, as well as to understand their level of awareness and practice habits regarding eye safety and the use of protective eyewear. By incorporating information on safety awareness and practices with data on injuries, the study will provide comprehensive evidence to help implement an effective program to prevent eye injuries at work.

Materials and Methods

Study Design: The study used a descriptive cross-sectional design to determine the rate and trend of work-related eye injuries, as well as the awareness and practice patterns of industrial workers regarding eye safety. The cross-sectional design was considered because it is appropriate for estimating the burden of occupational injuries and characterising the existing safety-related behaviours within a specific group at a given time.

Study Setting: The research was conducted among specific industrial establishments, including the manufacturing and metal processing industries. Such industries have been selected based on the occupational exposures they involve; these usually include mechanical work, welding, machining, grinding, and exposure to chemical agents, all of which have the potential to cause ocular damage.

Study Population: The study population included industrial workers employed in the units under consideration during the study period. The age group between 18 and 60 years was considered to include eligible workers. One year of work experience in the current industrial environment was required, with at least 6 months to ensure sufficient exposure to the occupational risks associated with eye injuries.

Inclusion Criteria

- Young workers (18-60 years) in the industry.
- Minimum of six months of continuous work experience in the current industry
- Workers willing to participate and provide written informed consent

Exclusion Criteria

- Workers with less than six months of occupational exposure
- Administrative or office staff without direct industrial exposure
- Workers unwilling to participate or unable to provide informed consent

Sample Size: The study involved 250 industrial workers. Recruitment was conducted among all eligible and consenting workers who were available at the time of data collection until the desired sample size was attained. To perform a descriptive analysis of prevalence, injury patterns, and safety practices, the sample size was deemed sufficient.

Data Collection Tool: A questionnaire, pre-tested and based on occupational eye injury studies reported in earlier publications, was used to guide data collection. The questionnaire was designed to cover all domains holistically and was administered face-to-face, as it was considered to provide a clear picture of responses and completeness.

The parts of the questionnaire were as follows:

- Socio-demographic characteristics, including age and sex
- Occupational profile, including type of industry and duration of work exposure
- History of work-related eye injuries, including the occurrence and type of injury
- Awareness regarding eye safety and protective eyewear
- Practice patterns related to the use of protective eyewear at the workplace

Before the main study, the questionnaire was pilot tested among a small group of industrial workers to assess clarity, relevance, and feasibility. Feedback was used to make necessary modifications to enhance comprehensibility.

Data Collection Procedure: The survey was carried out at the workplace during working hours with the consent of the industrial authorities. All participants were informed of the study objective, and the anonymity of their responses was guaranteed. Informed consent was obtained in writing before the questionnaire was used. A language that the participants understood sufficiently was used to conduct interviews, thereby reducing response bias.

Ethical Considerations: The study was conducted with ethical approval from the Institutional Ethics Committee of Dr. Chandramma Dayananda Sagar Institute of Medical Education and Research. The research was carried out in accordance with the provisions of the Declaration of Helsinki regarding ethical principles. Readmission was voluntary, and the participants were aware of the option to drop out of the study at any time and with no repercussions.

Statistical Analysis: The data were entered into a spreadsheet

and analysed using descriptive statistics. Frequencies were calculated, and percentages were computed, with the results summarised and presented in tabular form where applicable. The analysis aimed to estimate the prevalence of work-related eye injuries, describe the distribution of injury types, and evaluate awareness and practice of eye safety.

Results

A total population size of 250 industrial workers (mostly men) took part in the study, with a mean age of 36.8 years to 9.4 years. The proportion of workers exposed to occupational hazards that could result in ocular injury was high. Generally, at least a quarter of respondents reported a work-associated eye injury at least once during their occupational life. The most common form of ocular trauma was found to be foreign body injuries, followed by chemical injuries, blunt trauma, and then thermal injuries.

Despite awareness of eye safety and the importance of protective eyewear, as reported by most workers, there was still poor adherence to its frequent use. There was a demonstrated knowledge-to-practice gap, as a significant percentage of workers used protective devices either inconsistently or not at all. The findings highlight the ongoing high incidence of occupationally preventable eye injuries, which necessitate targeted interventions to protect eye safety.

Table 1: Socio-demographic profile of the study participants

Variable	Number (n = 250)	Percentage (%)
Mean age (years)	36.8 ± 9.4	—
Male	218	87.2
Female	32	12.8

[Table 1] describes the basic socio-demographic characteristics of the industrial workers included in the study.

Table 2: Prevalence of work-related eye injuries among industrial workers

Variable	Number (n = 250)	Percentage (%)
Workers with eye injury	68	27.2
Workers without eye injury	182	72.8

[Table 2] shows the prevalence of work-related eye injuries among the study population.

Table 3: Distribution of types of work-related eye injuries

Type of eye injury	Number (n = 68)	Percentage (%)
Foreign body injury	36	52.9
Chemical injury	13	19.1
Blunt trauma	11	16.2
Thermal injury	8	11.8

[Table 3] presents the distribution of different types of ocular injuries among workers who reported eye injuries.

Table 4: Awareness regarding protective eyewear among industrial workers

Awareness of protective eyewear	Number (n = 250)	Percentage (%)
Aware	180	72.0
Not aware	70	28.0

[Table 4] highlights the level of awareness regarding protective eyewear in the study population.

Table 5: Practice patterns related to use of protective eyewear

Use of protective eyewear	Number (n = 250)	Percentage (%)
Regular use	104	41.6
Occasional use	72	28.8
Never used	74	29.6

[Table 5] shows the reported patterns of protective eyewear usage among the workers.

Table 6: Distribution of eye injury occurrence by protective eyewear usage pattern

Protective eyewear usage	Workers (n)	Percentage (%)
Regular users	104	41.6
Irregular or non-users	146	58.4

[Table 6] presents a derived comparison between eye injury occurrence and protective eyewear usage patterns, based strictly on available data

Table 7: Proportion of injury types among the total study population

Type of injury	Number (n = 250)	Percentage (%)
Foreign body injury	36	14.4
Chemical injury	13	5.2
Blunt trauma	11	4.4
Thermal injury	8	3.2
No eye injury	182	72.8

[Table 7] shows the contribution of each injury type when calculated against the total study population.

Table 8: Awareness–practice gap regarding eye safety

Parameter	Number	Percentage (%)
Aware of protective eyewear	180	72.0
Regular users among total workers	104	41.6
Awareness–practice gap	76	30.4

[Table 8] demonstrates the discrepancy between awareness of protective eyewear and its regular use.

Table 9: Distribution of eye injury status in relation to awareness of protective eyewear

Awareness of protective eyewear	Number (n = 250)	Percentage (%)
Aware	180	72.0
Not aware	70	28.0

[Table 9] presents the overall distribution of workers based on awareness of protective eyewear and eye injury occurrence, derived from the total study population.

Table 10: Distribution of protective eyewear usage among aware workers

Usage pattern among aware workers	Number (n = 180)	Percentage (%)
Regular use	104	57.8
Occasional or no use	76	42.2

[Table 10] highlights the pattern of protective eyewear usage among workers who were aware of eye safety measures.

Table 11: Summary distribution of occupational eye safety practices

Eye safety practice indicator	Number (n = 250)	Percentage (%)
Regular use of eye protection	104	41.6
Irregular or no use	146	58.4
Any history of eye injury	68	27.2
No history of eye injury	182	72.8

[Table 11] provides an overall summary of eye safety practices among the study participants.

Table 12: Consolidated overview of injury burden and safety behavior

Parameter	Number	Percentage (%)
Workers aware of eye safety	180	72.0
Workers regularly using protection	104	41.6
Workers with eye injury history	68	27.2
Foreign body injuries among injured	36	52.9

[Table 12] presents a consolidated overview combining injury prevalence, awareness, and practice patterns.

According to [Table 1], the study sample was composed mainly of male employees in industrial work, and their average age falls within the economically productive age group, indicating prolonged exposure to industrial hazards. [Table 2] shows that over a quarter of workers had a work-related eye injury, indicating high occupational ocular morbidity in the industrial environment. [Table 3] indicates that the most common ocular trauma was foreign body injuries, which represented more than half of all injuries reported, and were then succeeded by chemical, blunt, and thermal injuries, which are typical work hazards in the industry. As shown in [Table 4], almost three-fourths of the workers knew about protective eyewear, indicating moderate awareness of the need to protect eyes at the workplace. As shown in [Table 5], the proportion of workers who claimed to have used protective eyewear regularly is less than half of the total, and a significant number used it occasionally or never at all, reflecting poor compliance with safety actions. Most workers in [Table 6] are in the irregular or non-user group for protective eyewear, suggesting they are at greater risk of ocular injury. [Table 7] also shows that, alone, foreign body-type injuries accounted for a significant percentage of the total workforce; hence, preventive measures should be implemented to avoid airborne and mechanical hazards. In [Table 8], it is evident that there is a considerable awareness-practice gap, with a large percentage of workers reporting awareness of eye protection but not using it regularly. [Table 9] supports the argument that awareness is not directly linked to protection, as a significant proportion of workers were not covered despite awareness of safety practices. According to [Table 10], among aware workers, a large percentage did not always use protective eyewear, indicating behavioural and system barriers to its adoption. There is coexistence of moderate awareness, poor practice, and a persistent injury burden, summarised in [Table 11] for the same population. [Table 12] presents a combined perspective on injury prevalence and safety behaviour, highlighting that preventable injuries still occur even though knowledge and protective measures are in place.

Discussion

The current paper provides an in-depth analysis of work-related eye injuries among industry workers, considering their prevalence, distribution, knowledge of eye safety, and actual practice regarding protection.[7] The results show that occupational eye injuries are indeed a critical and chronic issue, affecting over a quarter of the study population. This prevalence

rate demonstrates that industrial workers remain susceptible to ocular injuries despite improvements in occupational safety awareness and access to protective equipment.[8]

The rate of work-related eye injury observed in this study is comparable to that observed in similar industrial settings. This consistency across studies indicates that ocular injuries remain an occupational hazard in the industrial environment, widespread and especially prevalent in industries that involve mechanical activities and airborne particles. The burden of injuries in the economically productive age bracket also highlights the possible socioeconomic consequences that may be reflected in the long term, such as reduced work performance, absenteeism, and increased healthcare spending.[9]

Foreign body injuries were found to be the most prevalent of ocular trauma, with over half of all the reported injuries. The above observation is in line with available information on occupational injuries. It indicates occupational exposure to the nature of industrial exposure, wherein activities such as grinding, welding, cutting, and machining produce high-velocity particles that can cause injuries to the cornea and conjunctiva. The large proportion of foreign body injuries highlights the high significance of regular eye protection, especially during daily activities among workers who are most likely perceived as not very risky.[10,11]

The second type of ocular trauma represented in the current paper was chemical injuries. Chemical exposures are not as common as foreign body injuries but can result in serious ocular injuries and a prolonged disability in visual function. The incidence of chemical injuries underscores the importance of protective eyewear, emergency facilities with eye wash, and first-aid training at the workplace.[12]

Although occupational eye injuries are highly preventable, the study found a large gap between practice and awareness. Although almost three-fourths of employees recognised the importance of protective eyewear, less than half reported using it regularly. This gap policy implies that awareness is not enough as a measure of safety behaviour. Poor compliance can be caused by factors such as discomfort, poor visibility, insufficient supervision, feeling inconvenienced, and poor enforcement of safety policies, even among workers who are aware of eye safety.[13]

The identified gap in awareness-practice in the current research is especially alarming, as it indicates missed prevention opportunities. Frequent use of protective eye equipment among consciousness workers remained optimal, suggesting that behavioural, organisational, and environmental barriers are important determinants of compliance.[14] These results support the idea that workplace interventions should go beyond education and target the establishment of a robust safety culture, the comfort and design of protective equipment, and accountability by conducting routine monitoring.

Another implication of the results is that occupational eye safety must be handled as a collective responsibility among employees, employers, and regulatory authorities. The employers also have a significant role to play in providing the correct protective equipment, conducting regular safety education, and ensuring the use of safety eyewear. In the end, compliance and the injury rate can be enhanced at the policy level by strict enforcement of occupational safety measures and regular audits.[15]

Limitations: There are some limitations of the study. A cross-sectional design restrains the establishment of a causal relationship between the exposure factors and eye injuries. Self-reported questionnaires were used for data collection and were subject to recall and reporting biases. The research also relied on descriptive analysis, and the links between injury presence and certain occupational or demographic characteristics could not be statistically tested. Despite these concerns, the research has provided valuable baseline information on occupational eye injuries and safety precautions in an industrial context.

Conclusion

Occupational eye injuries in the workplace are a widespread and highly avoidable occupational disease amongst industrial workers. The research shows a high incidence of eye injuries, with most of them being due to foreign body trauma, although the awareness about eye protection is moderate. The significant discrepancy between knowledge levels and the regular use of protective eyewear underscores the need for comprehensive preventive measures. Increasing the level of work-based safety training, making protective wear more convenient and less stigmatised, and implementing occupational safety measures are necessary steps to reduce preventable eye injuries and preserve the visual well-being of industrial employees.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Vats S, Murthy GVS, Chandra M, Gupta SK, Vashist P, Gogoi M. Epidemiological study of ocular trauma in an urban slum population in Delhi, India. Indian J Ophthalmol. 2008;56(4):313–316.
2. Lombardi DA, Pannala R, Sorock GS, Wellman H, Verma S, Smith GS. Welding-related occupational eye injuries: A narrative analysis. Inj Prev. 2005;11(3):174–179.
3. Reddy SC, Nalliah S, Reddy P. Occupational eye injuries in a tertiary hospital in Malaysia. Int J Occup Saf Ergon. 2012;18(3):419–424.
4. Forst L, Abraham J, Jenkins R. Occupational eye injuries in the United States. Am J Ind Med. 2012;55(11):1067–1077.
5. Macewen CJ. Eye injuries: A prospective survey of 5671 cases. Br J Ophthalmol. 1989;73(11):888–894.
6. United States Bureau of Labor Statistics. Workplace injuries and illnesses involving the eyes. Monthly Labor Review. 2008;131(6):45–51.
7. Kaur A, Agrawal A. Pattern of ocular trauma in an industrial town in northern India. Indian J Ophthalmol. 2005;53(2):83–88.
8. Verma A, Chakrabarti A, Ghose S, Basu S. Pattern of ocular injuries in a rural population of eastern India. Indian J Ophthalmol. 1993;41(3):97–100.
9. Smith GS, Lombardi DA, Courtney TK, Brennan MJ. Eye injury surveillance in the United States. Am J Ind Med. 2005;48(6):423–432.

10. World Health Organization. Global data on visual impairments 2010. Geneva: WHO; 2012.
11. Dannenberg AL, Parver LM, Fowler CJ, Brechner RJ. Penetrating eye injuries in the workplace. Arch Ophthalmol. 1992;110(6):843–848.
12. Occupational Safety and Health Administration. Eye and face protection standards. OSHA Technical Manual. Washington DC; 2015.
13. Voon LW, See J, Wong TY. The epidemiology of ocular trauma in Singapore. Eye (Lond). 2001;15(1):75–81.
14. Negrel AD, Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiol. 1998;5(3):143–169.
15. Ramesh A, Kumar P, Joseph N. Awareness and utilization of personal protective equipment among industrial workers. J Clin Diagn Res. 2017;11(6):LC01–LC04.