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**Original Research Article**

# Epidemiological profile of occupational ocular injury in a tertiary eye care centre of North India

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## ABSTRACT

**Background:** Occupational ocular injuries are quite common among industrial and agricultural workers. It is an important cause of preventable vision loss in developing as well as developed countries. The principal objective of our research work was to study epidemiological profile of occupational ocular injuries and use of protective eye wear at workplace in North India.
**Methods:** A prospective, hospital based observational study was conducted on 400 patients of occupational ocular injuries attending emergency services and OPD in Regional Institute of Ophthalmology, PGIMS Rohtak, Haryana, India during June 2016 to March 2020.
**Results:** Out of 400 patients of occupational ocular injuries, majority were male (92%) and most common age group affected was 31-40 years (48%) followed by 21-30 years (30%). Most common injured patients were of manufacturing industry (45%) followed by construction site (30%) and agriculture based industry (25%). Metallic foreign body (70%) was found to be the most common cause of occupational ocular injury in 70% cases followed by chemical injury in 10% cases. Ocular injuries were more common in temporary workers (65%) who were not having proper safety training and not using protective devices at workplace.
**Conclusions:** Occupational ocular injuries most commonly affect young productive population leading to temporary or permanent vision loss. Avoidance of protective glasses and lack of basic safety training make them more vulnerable for ocular injuries. Therefore, all workers should be encouraged to adopt basic safety measures and proper safety training should be given to them. It will not only help in reducing the ocular morbidity, but will also enhance the economic productivity.

**Keywords:** Ocular trauma, Preventable blindness, Occupational health, Occupational ocular injury

## INTRODUCTION

Occupational ocular injuries are an important cause of preventable blindness all over the world. It mostly affects young productive population and therefore it has an immense socioeconomic importance.[1] Ocular trauma constitutes nearly 75% of all ocular emergencies and occupation related ocular injuries are an important cause of it.[2] In a study conducted in North India, occupational ocular injuries constituted 22% of all ocular injuries.[3] Occupational eye injuries are also common in developed countries like Australia with an estimated incidence of 1.7 to 6.9 injuries or 1000 workers/year, while in USA, it is estimated at 5.37/1000 workers/year.[4-6] Occupational ocular injuries leads to almost 65000 job absentee in USA.[7,8] Therefore occupational ocular injuries are not only a health hazard, but also a burden on health system and economy.

Out of all occupational eye injuries, corneal foreign body is the most common type of occupational injury.[9,10] These injuries are commonly seen in manufacturing industry workers, metal industry workers, welders and construction site workers.[11-13] Corneal FB can cause vision loss either by scarring in visual axis or by secondary infections ranging from keratitis to endophthalmitis.[14] Occupational ocular injuries not only cause ocular morbidity but their healthcare cost also cause an economic burden. Since 75% of these injuries are preventable by personal protection equipment, basic safety training and protective eye wear measures should be taken for their prevention in this rapidly industrializing world.[15,16]

As there is limited data on epidemiological profile of occupational ocular injuries in India and socioeconomic impact of these injuries has not been highlighted, objective of our work is to study epidemiological profile of occupational ocular injuries and use of protective eye wear at workplace in North India. Such information is important in organizing regular and comprehensive workshops to educate workers regarding the impact of occupational injuries and importance of personal protective eye gear at workplace.

## METHODS

A prospective, hospital based observational study was conducted in Regional Institute of Ophthalmology, PGIMS Rohtak, Haryana, India during June 2016 - March 2020 after taking ethical clearance from Institutional Ethics Committee, PGIMS Rohtak.

### *Sample size*

400 patients of occupational ocular injuries attending emergency and OPD of Regional Institute of Ophthalmology PGIMS, Rohtak were included in this study.

### *Inclusion criteria*

All patients with occupation related ocular injuries reporting to casualty and ophthalmology OPD were included in our study.

### *Exclusion criteria*

Any kind of birth injury or congenital ocular defect leading to visual deficit were excluded from our study.

400 patients of occupational ocular injuries were enrolled in our study after taking an informed consent. At initial visit, identity of each patient was recorded including hospital registration number, name of patient, address, age, sex, occupation and education of patient. Then a detailed history was recorded, particular attention being paid to activity in which patient was engaged at the time of injury, mechanism of injury, pre-existing ocular status, time between injury and first presentation to eye department, reason for late presentation and whether patient was wearing protective eye wear at the time of injury. A thorough ocular examination was conducted in all patients which included visual acuity, pupillary reflexes, detailed slit lamp examination and fundus examination. Then ocular injury was classified as per BETT's classification.[17]

The data was collected and entered in patients proforma. Visual acuity was graded according to WHO categories of visual impairment and ocular injury was classified as per BETT's classification. Then collected data was analyzed and entered in Microsoft excel spread sheet. Then statistical analysis of data was done with SPSS (Statistical Package for Social Sciences) ver. 21.0.

## RESULTS

During entitled time period of our study, 400 patients with occupation related ocular injuries were analyzed regarding their demographic profile and a thorough slit lamp examination was done in every patient to classify ocular injury as per BETT's classification.[17] The mean age of patients with occupation related ocular injuries was 32.5±0.64 years. Out of 400 patients of occupational ocular injuries, majority were male (92%) and most common age group affected was 31-40 years (48%) followed by 21-30 years (30%), 41-50 years (15%) and > 50 years (7%) (Figure 1 and 2).

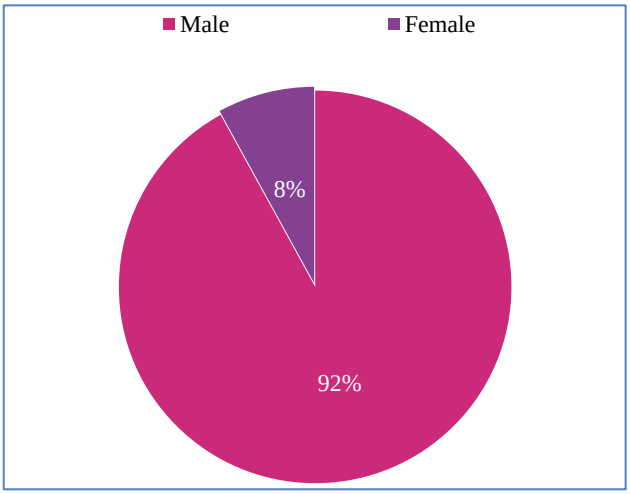


**Figure 1: Male predominance in occupational ocular injuries.**

Most of the occupational ocular injury patients were of manufacturing industry (45%) followed by construction site (30%) and agriculture based industry (25%) (Figure 3).

Most common cause of occupational ocular injury was metallic foreign body (70%) followed by chemical injury (10%), thermal burn (8%), arc rays (4%), glass (4%) and explosive exposure in 4% cases (Figure 4).

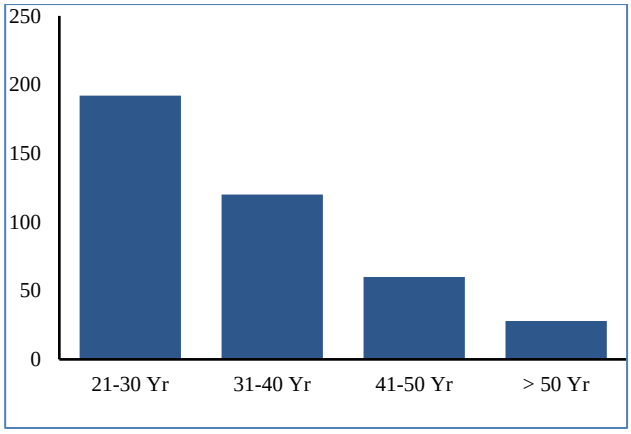


**Figure 2: Number of patients in different age groups.**

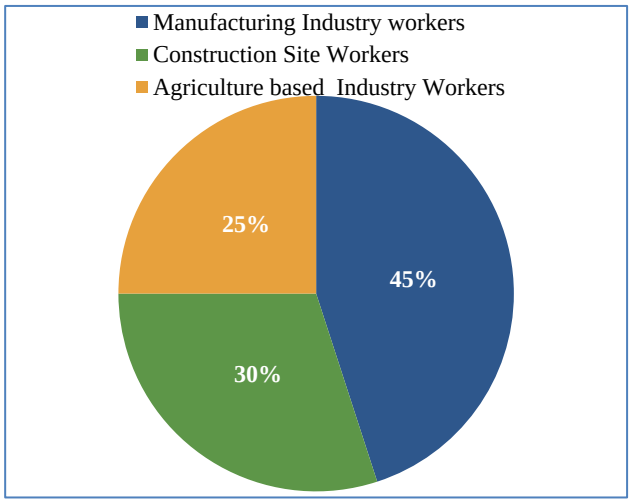


**Figure 3: Occupation of patients.**

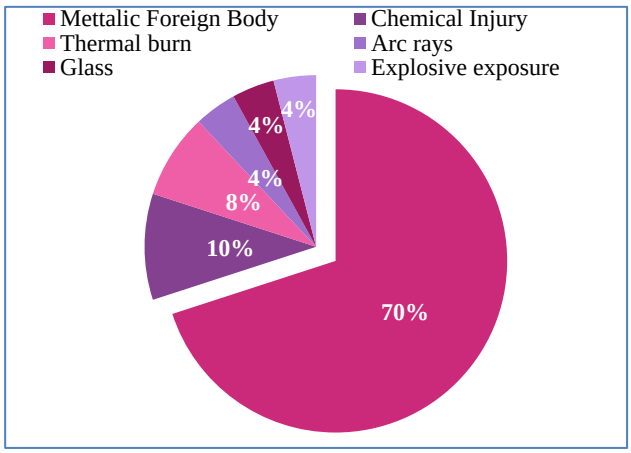


**Figure 4: Causes of occupational ocular injury.**

In our study, most common diagnosis among all injured patients was foreign body on the cornea and conjunctiva (60%) followed by contusion of the eye and adnexa (12%), superficial wound of the lid and adnexa (10%), burn confined to lid and adnexa (10%) and open globe injury in 8% patients (Figure 5).

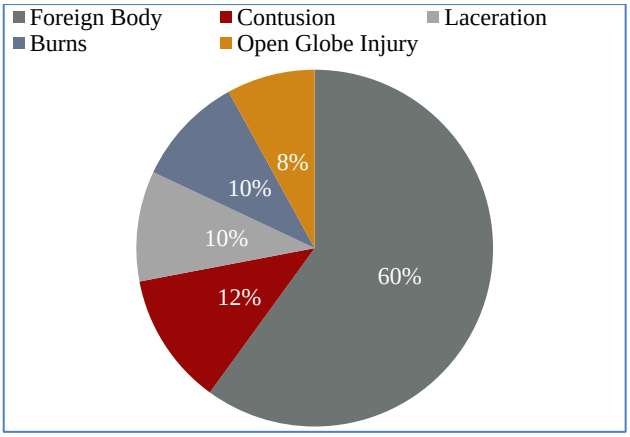


**Figure 5: Type of occupational ocular injury.**

Time of presentation to hospital varied and was strongly associated with education of patient. 47% of patients presented within 24 hours of symptoms, 23% presented within 48 hours while 20% presented within 2-4 days and 10% presented after 4 days. 40% of occupational ocular injury patients were illiterate, grade 1-5 (30%), grade 6-10 (20%) and only 10% were educated till grade 11 and above.

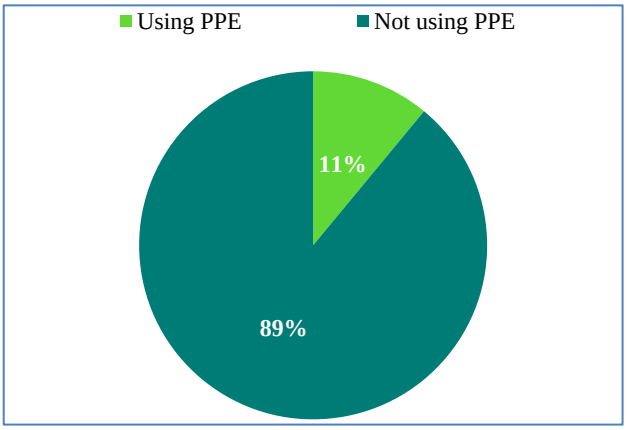


**Figure 6: Use of PEP at the time of injury.**

When patients were inquired regarding basic safety training, only 34% reported about receiving adequate health education on occupational hazards while 66% patients had not received any kind of health education. This awareness and education were found to be comparatively lower in the construction and metallic industry workers, which in turn were the most affected. Despite low health education, 70% of patients were aware about risk of eye injuries in their occupation. But only 45% were aware about visual impairment secondary to occupational ocular injuries.

In our study, we found only 44% of patients were provided with protective glasses and only 11% of ocular injury patients were wearing protective glasses at the time of injury. Most common reason for not wearing protective eye wear was unavailability of personal eye protection

(PEP) in 56% cases, 20% forgot to wear and 13% found it uncomfortable to wear. In our study, only 35% affected patients were permanently employed while 65% were temporary.

## DISCUSSION

Occupational ocular injury is an important cause of preventable blindness worldwide. It not only causes ocular morbidity but also an eminent economic impact, on the industry as well as on the worker and their families. Prevention is always better than cure, so all workers should be given proper safety training and made aware about risks associated with their occupation and how to prevent it. They should be made aware about importance of use of PEP at workplace.

In our study, 92% workers were male and 48% were in the age group of 31-40 years. Therefore, it depicts that risk of occupational ocular injury does not decrease with work experience. It is consistent with studies conducted by Kanoff et al and Bauza et al.[18,19]

As per our study, most of the occupational ocular injury patients were manufacturing industry workers (45%) followed by construction site workers (30%) and agriculture-based industry workers (25%). These findings are consistent with Chi et al conducted in southeast China and Kundu et al but not with the study of Yu et al conducted in Hong Kong.[20-22] This discrepancy among different studies of different areas can be due to variable distribution of industries in different areas.

We found most common diagnosis among all injured patients is foreign body on the cornea and conjunctiva (60%) followed by contusion of the eye and adnexa (12%), superficial wound of the lid and adnexa (10%), burn confined to lid and adnexa (10%) and open globe injury (8%). In our study, most common occupational ocular injury was found to be caused by metallic foreign body injury (70%) followed by chemical injury (10%), thermal burn (8%), arc rays (4%), glass (4%) and explosive exposure (4%). Protective eye equipment is utmost important in the prevention of occupational ocular injuries. But in our study, 89% of the workers were not wearing protective glasses at the time of accident. In a study conducted by Thompson et al, they also found that only 13% of the workers with occupational ocular injuries were wearing protective eye wear at the time of injury.23 In a study conducted by Chen et al, they found that protective devices reduced ocular injury by 60%, even though only 18.4% workers were wearing protective glasses at the time of injury.[24]

In our study, time of presentation to hospital varied and was strongly associated with education of patient. Only 47% of patients presented within 24 hours of symptoms. Among all patients, 40% of occupational ocular injury patients were illiterate, grade 1-5 (30%), grade 6-10 (20%) and only 10% were educated till grade 11 and above. As per study conducted by Kumar et al, 86.6% of patients had an education of 10$^{th}$ standard or below which is consistent with our study.[25]

In our study, we found that only 44% of patients were provided with protective glasses and only 11% of ocular injury patients were wearing protective glasses at the time of injury. Most common reason for not wearing protective eye wear was unavailability of PEP in 56% cases, 20% forgot to wear and 13% found it uncomfortable to wear. In our study, only 35% affected patients were permanently employed while 65% were temporary. An employer must provide safe working conditions for all his employee, whether they or temporary or permanent. All workers must be given proper safety training, personal protection equipment and must be made aware about consequences of not using protective eye wear at workplace.

Our study has few limitations, unlike developed countries we don't have any reporting or surveillance system in our country. This study was conducted in a tertiary care center, despite that many cases of occupational ocular injuries are being managed in other hospitals and they are not being reported. So, this data can not truly depict epidemiological profile of occupational ocular injury in North India, but can be taken as a baseline for refrence. Therefore, reporting of occupational injuries by employer and health care provider should be mandatory which will be extremely helpful in evolving policy making and enhancing preventive measures.

## CONCLUSION

Occupational ocular injuries which constitute almost 20% cases of ocular trauma, are an important and preventable cause of blindness. Industrial workers are usually poorly educated and have nominal understanding of the impact of occupational ocular injury on vision and life, therefore education and awareness is necessary to prevent occupational injuries. An employer must provide safe working conditions for all his employee, whether they or temporary or permanent. All workers must be given proper safety training, personal protection equipment and must be made aware about consequences of not using protective eye wear at workplace. Regular and comprehensive workshops must be conducted to educate workers regarding the impact of occupational injuries.

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