

## Etiological causes and epidemiological characteristics of patients with occupational corneal foreign bodies: A prospective study in a hospital-based setting in India

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**Purpose:** Corneal foreign bodies (CFBs) due to occupational exposure have been largely ignored in Indian literature, especially nonmetal workers. Our study looks at a broad range of occupations and settings that contribute to CFB in our local Indian population. The study objective was to determine the occupations, level of education and demographics of patients presenting with CFB acquired during occupational work. **Methods:** Prospective hospital-based study at a tertiary eye hospital in Gurgaon, Haryana, India, within duration of 9 months. Patients presenting with CFB were asked a set of questions relating to their occupation, level of education, understanding of the potential complications of CFB, and demographics. **Results:** A total of 83 patients were included in the study. CFB were attributed only to males. 66% of patients were in the age group of 14–29 years. 30% of patients were in the age group 30–44 years and 4% of patients were between 45 and 60 years old. The metal work industry was responsible for 47% of presentations. The construction industry was responsible for 27% of presentations. Electricians and carpenters combined were responsible for 10% of presentations and 17% of presentations occurred in other sectors. **Conclusion:** CFB occur across a number of occupations in the construction industry, not just metallic workers. Among a population that is generally poorly educated and have nominal understanding of the impact that CFB can have on vision, occupational hazard education is necessary to address this problem.

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Occupational ocular injuries are an important cause of ocular trauma.<sup>[1]</sup> In an Indian study occupation-related accident constituted 20.1% of all ocular trauma.<sup>[2]</sup> Among occupational injuries, a corneal FB is the most common form of injuries.<sup>[3,4]</sup> Such injuries are commonly seen in metal industry workers including welders and construction industry.<sup>[5-7]</sup> A corneal FB can cause scars on visual axis and also secondary infections ranging from keratitis to endophthalmitis thereby decreasing vision.<sup>[8]</sup> The healthcare costs of such injuries also cause economic burden.<sup>[9]</sup> Since over ¾ of the injuries are preventable by personal protection equipment,<sup>[10]</sup> taking measures toward their prevention is justifiable. We are not aware of any other study assessing the occupational corneal FB in India. The purpose of this study is to assess the settings in which such injuries occur and the level of awareness regarding eye safety among workers. We believe this common cause of ocular morbidity should be prevented in this rapidly industrializing region.

## Methods

### Data source

This hospital-based cross-sectional study was done at a tertiary eye hospital in urban-city of Gurgaon, Haryana. We evaluated

all patients who presented with a CFB sustained during occupational work during the period of April to December 2017. All patients were subject to a set of questions [Table 1], asked by the concerned doctor in their respective suitable language, these questions were orally asked and filled appropriately by the ophthalmologist. This study was approved by the institutional review board and adhered to the Declarations of Helsinki. Verbal consent was taken from all the patients before completing the questionnaire. This hospital based cross-sectional study was approved by the ethics committee (meeting on 12-07-2016).

### Variables

We recorded the demographic information of each patient which included age, gender, and education. In order to know the settings in which the injury occurred we enquired about the business sector of their occupation, type of activity at the time of injury, and whether they were wearing protective glasses at the time of injury. Data were obtained about the number of years in the present sector, similar injuries in the past, availability of protective glasses at work, attempted self-removal of FB by the patient, and the technique used if self-removal was attempted. To evaluate

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the awareness of occupational eye safety we enquired about the time between the injury and the visit to ophthalmologist, whether they were aware their work can cause eye injury, repetitive FB injury can cause significant visual impairment and self-removal of foreign body can cause potential harm to the eye.

#### Data measurement

A slit lamp evaluation of each patient was done. The site and depth of foreign body were noted. The presence of a rust ring, any evidence of superadded infection and any corneal scar due to previous FB injury were noted.

### Results

The duration of symptoms before the patient presented to hospital varied. 77% of patients had symptoms for 0 to 2 days. 17% had symptoms for 3 to 5 days and 6% had symptoms for more than 5 days. When patients were inquired about health education on safety from occupational hazards, 49% reported having received adequate education and 51% reported not receiving any education. When patients were asked about their awareness of their occupation holding a risk for eye injury, 67% of patients were aware and 33% of patients were unaware. 31% of patients had a previous CFB and 69% of patients presented with their first CFB. 56% of patients were aware that such CFB could cause serious visual impairment. 44% of patients were unaware that such injuries could cause serious visual impairment. 53% of patients were provided with protective glasses from their employer and 47% of patients were not provided with any protective glasses. 14% of patients were wearing glasses at the time of injury and 86% of patients were not wearing glasses at the time of injury. Patients were asked about the number of years they have worked in the sector. 17% worked in the sector less than 1 year, 45% worked in the sector for between 1 and 5 years, 17% worked in the sector for between 5 and 10 years and 22% worked in the sector for more than 10 years. When inquired about their knowledge that self-removal could cause serious infection, 51% reported knowing the risk of serious infection and 49% reported not being aware of any risk of serious infection.

Presence of a rust ring was found in 58% of patients and not found in 42% of patients. The site of the foreign body was off the pupillary area in 76% of patients and on the pupil in 24% of patients. There was a superadded infection in 17% of patients and no superadded infection in 83% of patients. Corneal scar due to past foreign body injury was found in 24% of patients and not found in 76% of patients.

### Discussion

This study demonstrated that younger people, in the age bracket of 14–29 years old, were responsible for 66% of the presentations of CFB [Table 2]. A previous study by Zghal-Mokni *et al.* demonstrated a higher mean age of 31 years old, for occupation-related CFB.<sup>[11]</sup> The preponderance among younger employees suggests the increasing care that older employees tend toward. The education of employees suffering from an occupational related CFB was assessed. 95% of patients had an education of 10<sup>th</sup> standard or below. This resonated with other literature that also looked at an Indian specific demographic. One study by Kumar *et al.* calculated 86.6% of patients to have an education of 10<sup>th</sup> standard or below.<sup>[12]</sup> This may suggest a link between higher education and reduced incidence of CFB related to occupational exposure. Table 3 summarizes the occupational

**Table 1: Summary of Questions asked to patients presenting with occupational corneal foreign body to the OPD**

What is your level of education?	
How long have you had symptoms for?	
What is the name of the business sector that you are a part of?	Metal work industry Construction industry Electrician Carpenter Other
What was the activity that you were performing at the time of injury?	Metal grinding Welding Cement work Wood cutting Others
Were you given health education on safety from occupational hazards? Y/N	
Are you aware this work can cause injury to eye? Y/N	
Did you get such injury in the past? Y/N	
Are you aware such injuries can cause serious visual impairment? Y/N	
Are you provided with protective glasses? Y/N	
Were you wearing glasses at the time of injury? Y/N	
What is the reason for not wearing eye protection?	1. Not provided with the protector 2. Removed protector for sometime 3. Forgot to wear 4. Protector uncomfortable 5. Others
What is the number of years that you have worked in your current sector?	
Did you attempt the removal of foreign body yourself?	
What material did you use to remove the foreign body?	
Are you aware that removal of a corneal foreign body can cause serious infection	

**Table 2: Summary of patient demographics**

Age	
14-29 years	66%
30-44 years	30%
45-60 years	4%
>60 years	0%
Gender	
Male	100%
Education	
Illiterate	28%
Grade 1-5	24%
Grade 6-10	43%
Grade 11 and above	5%

type and the activity that the patient was doing at the time of injury accompanied by the visual acuity they had at presentation.

Health education on the risk of eye injury is part of certain occupations. Our study demonstrated that 49% of patients that presented had received education on occupational hazards, and conversely, 51% of the patients did not receive health education on such hazards. This awareness and education were considerably lower in the construction and metallic industry workers, which in turn were two of the most affected business sectors. The implication is that having received health education

on ocular risks is not enough of a protective factor in preventing eye related work injuries. In contrast, a study in Southwest China<sup>[2]</sup> demonstrated that among a patient base of 453 patients, 22.5% received safety training. Despite the low health education, it was found that 67% of patients that presented were aware that their occupation entailed the risk of injuries related to the eye. However, a smaller percentage of 58% were aware that eye related injuries could incur significant visual impairment. This suggests that employees are generally aware of risk of eye injury, but do not appreciate the serious nature of such injuries.

The particular demographic assessed in our study demonstrated that only 53% of patients were provided with protective glasses and conversely, 47% had not been provided with protective glasses. Of these, only 27% of patients with protective glasses were wearing it at the time of injury. A study done in Southern India<sup>[13]</sup> done among welders found that none of the participants were wearing eye protection at the time of injury. Of the reasons for not wearing the eye protection in our study, 6% simply forgot to wear the glasses and 12% believed the eye protection to be too uncomfortable [Table 4]. This suggests that eye protection is not adequately enforced in the workplace and ergonomics is a potential inhibitive factor for employees.

**Table 3: Summary of occupation and activity at time of injury, presenting vision**

Business sector	Metal work Industry	47%
	Construction Industry	27%
	Electrician	4%
	Carpenter	6%
	Others	17%
Activity at time of injury	Metal grinding	53%
	Welding	14%
	Cement Work	5%
	Wood cutting	5%
	Others	23%
Presenting vision	6/6-6/9p	81%
	6/12-6/18p	14%
	<6/24	5%

**Table 4: Summary of reasons given for not wearing eye protection, Methods and materials of self removal of CFB, Depth of CFB**

Reasons for not wearing eye protection	
Removed protector for some time	39%
Forgot to wear	13%
Protector uncomfortable	24%
Others	24%
Material used for self-removal	
Self-removal not attempted	54%
Tap water	24%
Cloth	13%
Currency note	5%
Paper	4%
Superficial or deep Corneal foreign body	
Superficial	45%
Deep	55%

## Limitations

There were a number of limitations in our study. Recall bias was present with reference to the details of past CFB injuries. Since the study was conducted in an exclusive eye care institute there was a chance on missing out on patients in the study, who may have had extensive facial injuries or burns associated with ocular manifestations, who may have found their way to a multispeciality hospital. Also, selection bias was present since Gurgaon is a rapidly industrializing area, so the occupations that present to our hospital were specific to the construction in the near-by area.

## Conclusion

CFB occurs across a number of occupations in the construction industry, not just metallic workers. Among a population that is generally poorly educated and have nominal understanding of the impact that CFB can have on vision, education is necessary to address this problem. Thus, it may be advisable for all business sectors, especially the more affected metallic and construction industries, along with eye care organizations, to establish regular and comprehensive educative workshops or awareness drives to prevent such disastrous incidents to their employees in the near future. Such education has been proven to be effective at the community level, considering the largely illiterate patient base.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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