

Different Types of Corneal Foreign Bodies Post Injury and its Correlation with Specific Occupation

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ABSTRACT

Introduction: Corneal foreign bodies (CFBs) are one of the most common ophthalmological emergency cases. The aim of the study was to know about the different types of CFBs post injury and its correlation with specific occupation.

Material and Methods: This was a hospital based prospective observational study of 90 patients carried out in department of ophthalmology at tertiary care centre who were diagnosed to have CFB on slit lamp examination.

Results: The most common type of CFBs found in our study was metallic CFBs with male preponderance working in industrial area.

Conclusion: Most of the occupation hazard can be prevented by public awareness and use of protective eye wears.

Keyword: Corneal Foreign Body (CFB), Ocular Trauma, Protective Eye Wear (PEW)

INTRODUCTION

Corneal foreign bodies (CFBs) are one of most common ophthalmological emergency cases.^{1,2,3} This type of injury often occurs at work, domestic and leisure activity (home, garden, playing), sports or windy day.^{4,5} Ocular trauma is the leading cause of unilateral loss of vision and is a considerable cause of visual impairment with utilization of ophthalmic service resources.^{6,7}

CFBs are small particles that impinge upon cornea.⁸ They cause multiple ocular symptoms, including red eye, foreign body sensation, irritation, tearing, pain, and blurred vision.⁹ Timely and appropriate removal of a corneal FB is necessary as they may cause corneal opacities, rust rings and secondary infection like bacterial keratitis to endophthalmitis.^{10,11}

These CFBs are a common occupational hazard and cause ocular morbidity and loss of time of work despite the use of safety precautions.^{12,13} The aim of the study was to know about the different types of CFBs post injury and its correlation with specific occupation.

MATERIAL AND METHODS

A hospital based prospective observational study was conducted at ophthalmology department in a tertiary care centre from January 2019 to December 2019. Ninety (90) cases of CFBs were included in the study who fulfilled the inclusion and exclusion criteria.

Inclusion criteria

1. Participated voluntarily in this study.
2. Age between 10 years to 60 years.
3. Diagnosed or had a suspected diagnosis of cornea FB

3. Were able to complete the anterior segment examinations with clear anterior segment colour photography.
4. Had lesions with a depth that did not exceed 2/3 of the corneal thickness.

Exclusion criteria

1. Age less than 10 years or more than 60 years.
2. Full thickness penetrating corneal injury with CFB.
3. Injury with signs of corneal infection.

The study adhered to tenets of the Declaration of Helsinki and was approved by the institutional review board and ethics committee. Verbal consent was obtained from the patient before completing the questionnaire. We recorded demographic information from each patient which includes – Age, Gender, Education, Occupation, activity at the time of injury (at work, during leisure and domestic activities), any eye wash done or medicine used after the injury, time between the injury and patient's visit to ophthalmology department, previous similar eye injuries, availability of protective eyewear at work, whether eyewear were used during the injury.

Each patient underwent careful, comprehensive examination after putting topical anaesthesia. Slit lamp bio microscopic examination was done following which anterior segment photography was taken focusing mostly on cornea and the depth of CFBs. The CFB was marked as central, paracentral and peripheral taking into account 3 mm radius as central, 3 to 6 mm radius as paracentral and beyond that as peripheral as noted in Figure 1. Fluorescein stain was used if required to delineate foreign body and residual abrasion. Corneal foreign bodies were removed using a 26 gauge needle or tubercular syringe under topical anaesthesia. Topical antibiotic along with tear substitute were prescribed for treatment.

STATISTICAL ANALYSIS

Results are described as frequencies and percentages for categorical data and means \pm SD for numerical data using SPSS version 24 (SPSS Inc., Chicago, IL, USA).

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Different types of CFBs pictures taken with the help of slit-lamp adapter are shown in figure - 3-10.

RESULTS

Ninety eyes of 90 patients (12 females and 78 males) with a mean age of 36.7 ± 10.8 years were included in the study. Table-1 shows the affected patients mostly belong to age group of 31 to 40 years 42.22% (n=38) and 41 to 50 years 23.33% (n=21). This was followed by adults between 21 to 30 years 21.11% (n=19). There were 78 males (86.67%) and 12 females (13.33%). Male:Female ratio was found to be 6.5:1. CFBs were common in right eye 56.67% (n=51) compared to left eye 43.33% (n=39).

Table 2 and figure-2 shows the most common CFB material was metallic iron particles 53.33% (n=48), followed by dust particles 16.66% (n=15). Other particles like wood matter/thorn 11.11% (n=10), glass 7.78% (n=7), insects 5.56% (n=5). Other (glue, plastic, gun powder) were 5.56% (n=5). Different types of CFBs pictures taken with the help of slit-lamp adapter are shown in figure - 3-10.

Table 3 shows Industrial workers were most commonly affected accounting to 54.44% (n=49) followed by construction workers 15.55% (n=14), domestic work 11.11% (n=10). CFB trauma due to agricultural work was 10% (n=9).

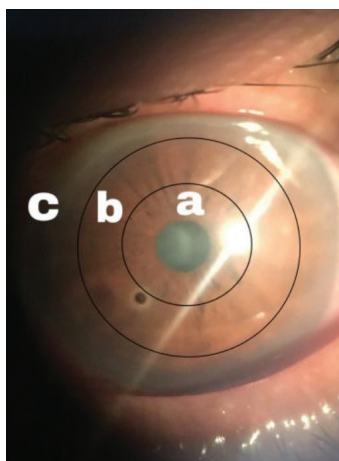


Figure-1: (a=central, b=paracentral, c=periphetal)

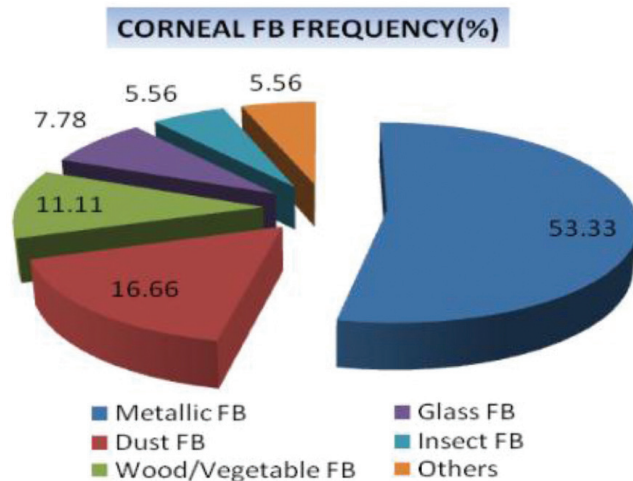


Figure-2: Pie chart showing different types of CFBs frequency as per Table 2

Variable	Frequency out of 90	Percentage
Gender		
Male	78	86.67
Female	12	13.33
Age		
10 -20 years	5	5.56
21 – 30 years	19	21.11
31 – 40 years	38	42.22
41 – 50 years	21	23.33
51- 60 years	7	7.78
Side		
Right eye	51	56.67
Left eye	39	43.33

Table-1: Socio-demographic profile of subjects with CFB

Corneal FB material	Frequency (%)
Metallic FB	48 (53.33%)
Dust FB	15 (16.66%)
Wood/Thorn	10 (11.11%)
Glass FB	7 (7.78%)
Insect FB	5 (5.56%)
Others (Plastics, Glue, Gunpowder)	5(5.56%)
Total	90(100%)

Table-2: Various types of CFBs found in the eye

Occupation		Percentage
Industrial work	49	54.44
Construction work	14	15.55
Agricultural work	9	10.00
Domestic work	10	11.11
Others	8	8.88
Total	90	100

Table-3: Distribution of CFBs as per occupation

Occupation		Mean time in days
Industrial work	49	1.38
Construction work	14	1.35
Agricultural work	9	2.66
Domestic work	10	3.10
Others	8	2.25
Total	90	2.15

Table-4: Mean time of presentation to ophthalmic OPD post injury

Location on Cornea	Frequency (%)
Central	18 (20%)
Paracentral	56 (62.23%)
Peripheral	16 (17.77%)

Table-5: Location of corneal foreign body on cornea

Preventable use of PEW	Frequency (%)
Yes	59(65.55)
No	8(8.89)
Uncertain	23(25.56)
Total	90(100)

Table-6: Distribution of cases on basis of injury preventable on basis of protective eye wears.

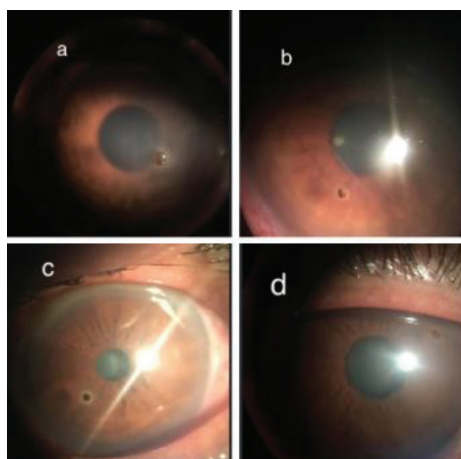


Figure-3: (a, b, c, d) Metallic or Iron FBs

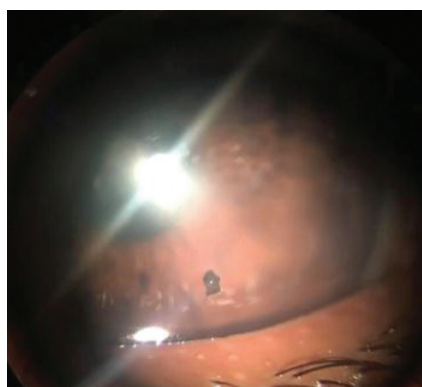


Figure-4: Dust particle

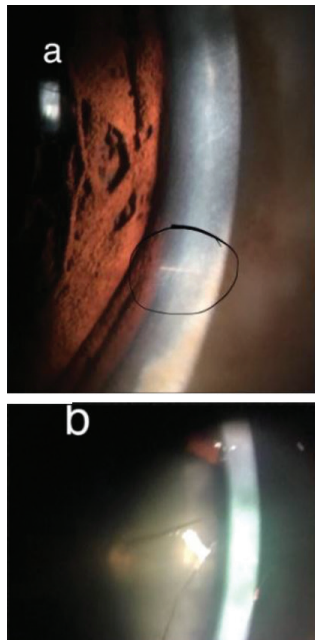


Figure-5: Wood/Thorn CFB

and other occupations account to 8.88% (n=8). Table 4 shows the mean time of presentation of patients to ophthalmology OPD was 2.15 days. The earliest presentations were of construction workers with mean time of 1.35 days, followed by industrial workers with mean time of presentation as 1.38 days. The mean time of presentation to ophthalmology OPD by agricultural workers was 2.66 days

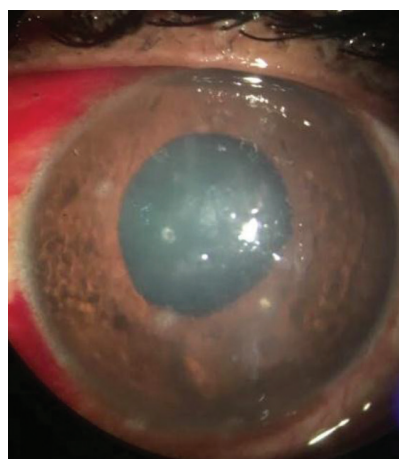


Figure-6: Glass FBs

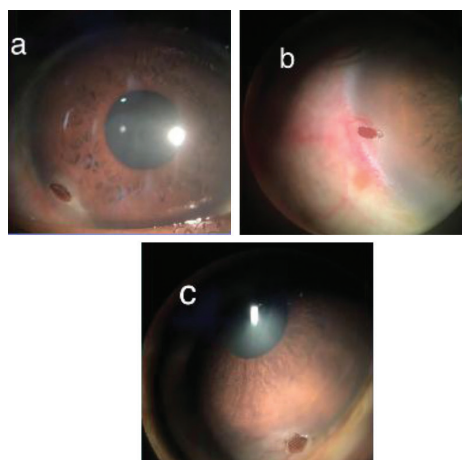


Figure-7: (a, b, c) Insect exoskeleton



Figure-8: Plastic FB

and that of domestic workers was 3.10 days. Others patients with CFBs presented in 2.25 days.

Table 5 depicts that the location of majority of corneal foreign body was paracentral 62.23% (n=56) followed by central 20% (n=18) and peripheral 17.77% (n=16)

Table 6 shows a total of 65.55% (n=59) injury of CFBs could have been prevented by use of protective eye wear, 25.26% (n=23) injury has doubtful prevention with protection and only 8.89% (8) could not have been prevented with the use of protective eye wear.

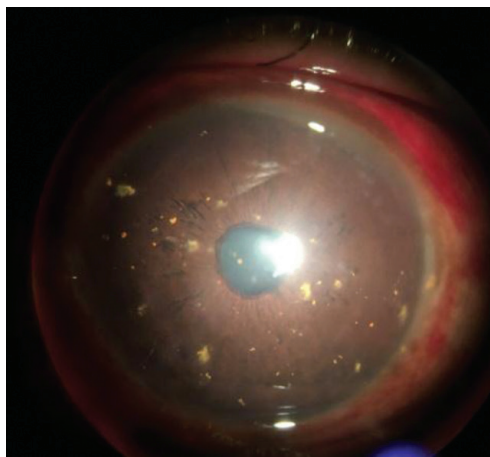


Figure-9: Gun powder

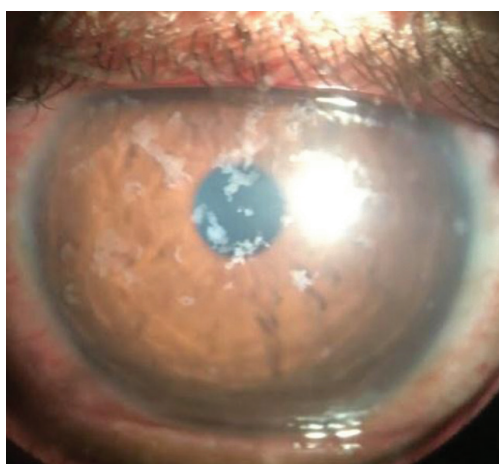


Figure-10: Glue-Feviquick

DISCUSSION

CFBs are one of the most common ocular injuries which may not cause much visual impairment.^{14,15} The discomfort and pain associated these injuries is estimated to be the most common reason for attending the ophthalmic clinics and departments.

Our study showed male preponderance with male to female ratio of 6.5:1. The male to female ratio ranged in other studies from 3:1 as per Jahangir Tehmina¹⁶ et al. to 14:1 in study of Guerra Garcia RA¹⁷ et al. The male predominance might be due to the greater exposure of men to risks such as industrial and construction work, sports, traffic accidents and alcohol intake.¹⁶ The age commonly affected by CFBs injury in our study, ranged from between 10 to 60 years in which there was predominance of this injury during 31 – 40 years. The mean age was found to be 36.7+/- 10.8 years. Reports of Guerra Garcia RA¹⁷ et al and also indicate mean ages ranging from 30 to 35 years. In most reports, injuries occurred in men under 50 with higher incidences in the 3rd and 4th decades of life which is consistent to our findings.¹⁸

The study of Yigit Ozlem¹⁴ et al and Radha I Dass¹⁸ et al showed majority of FB to be metal fragments. Most of them were metallic iron foreign bodies. Our study revealed similar results where 53.33% patients had metallic CFB injury.

CFBs comprises 35% of all occupational ocular trauma¹⁹ and mostly affects men in their active lifetime.^{18,20} In similar study 70% corneal foreign body injuries occurred in metal cutting industry.²¹ In a Canadian study 21% eye injury occurred during welding.²² In our study we found majority of patients (55.55%) with metallic CFBs came from Industrial work dealing with metals (welding, grinding and cutting). The second most common occupation exposure was of construction workers which includes sand, metal, dust, cement, paint particles.¹⁸ The agricultural workers mostly get injured by vegetative matter like wood and thorns and if not treated leads to corneal ulcers as per Thylefors B.²³ The domestic injuries resulting from vigorous house/office cleaning and renovation work.

Our study showed right eye was more involved compared to left eye.²⁴ This may be due to blinking reflex is more in the left eye which may prevent foreign body entering the eye. In our study majority of CFBs were found in paracentral (62.23%) area followed by central (20%) and peripheral (17.77%) area of cornea. Similar findings were seen by Reddy P²⁴ et al.

Our study revealed that majority of injury occurred as the workers were not using protective eye wear even though this was available in their work place. Reasons given by the patients for not wearing the PEWs were discomfort, not able to see properly while working, forgot wearing and felt it wasn't necessary. Our study showed that 65.55% patients could have been prevented by PEW. In the study of Jahangir Tehmina¹⁶ et al. over 3/4 of the injuries were preventable by protective devices.^{24,25} Workplace standards should be adjusted and revised to increase the protective capacity of PEW.²⁶

Most of the CFB injuries are superficial, but they account for significant amount of time taken off work to attend hospitals and follow up on regular basis. Thus ocular morbidity may result in loss of working hours and healthcare cost which has adverse economic impact.

CONCLUSION

The most common type of CFB found in this study was metallic FBs. Most of the CFBs were found in the paracentral area of the cornea.

CFBs are commonly seen ocular injury in day to day life. The industrial workers get injured by metallic FB due to the use of high speed grinding and drilling machines at work place. Many construction workers are exposed to sand, metal, dust, cement, paint particles at their working place. At the same time farmers are exposed to various FBs like dust or vegetative matter. Thus, industrial, construction and agricultural work are the occupations wherein workers are more prone to CFBs injury. Most of these injuries are superficial, usually without visual disability so they don't affect the patient's quality of life.

It was observed that most of these CFB injuries could have been prevented if proper precautions and PEWs were used. Most of the cases were not aware of various safety precautions and the use of PEWs at work places. Workers should be educated about such eye injuries and steps should

be taken to initiate public awareness programme on large scale. This will help in improving healthcare and reducing workers economic burden.

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