

Ocular Surface Foreign Bodies: Types, Location and Correlation With Occupation and Use of Protective Eyewear

Anima Deshar^{1*}, Subash Pokharel², Kripa Lopchan³,
Isha Shrestha⁴, Nischal Ghimire⁵

¹Department of Ophthalmology, Patan Academy of Health Sciences, Ramlal Golchha Eye Hospital Foundation, Biratnagar, Morang, Nepal, ²Department of Retina, Nava Dristi Eye Hospital, Ramlal Golchha Eye Hospital Foundation, Biratnagar, Morang, Nepal, ³Ramlal Golchha Eye Hospital Foundation, Biratnagar, Morang, Nepal, ⁴Pediatric Ophthalmology and Strabismus, Ramlal Golchha Eye Hospital Foundation, Biratnagar, Ramlal Golchha Eye Hospital Foundation, Biratnagar, Nepal, ⁵Fellowship in Uveitis and Medical Retina, Birat Rani Eye Hospital, Biratnagar, Nepal. *Corresponding Author's Email: animadesar@gmail.com

Abstract

The case sheets of the patients who visited Ramlal Golchha Eye Hospital Foundation with ocular surface foreign bodies (OSFB) from May 2023 to April 2024 were retrospectively reviewed. In our study, 460 eyes of 450 patients had OSFB which accounted for 1.56% of the total number of patients visiting the hospital and 13.73% of patients visiting cornea clinic. Male patients accounted for 87.33% with Male: Female ratio being 6.9:1. Single eye was affected in 97.7% while both eyes were affected in 2.22%. The most affected age group was 20-30 years accounting for 30.67%. The mean age was 33.41±13.4 years (0.5 yrs to 71yrs). The most common OSFB was metal particle accounting for 57.11%, followed by caterpillar hair 11.11%. The most common location of the OSFB was on Cornea (72.44%), followed by conjunctiva 21.11%. In 6.4% of cases OSFB was seen in both conjunctiva and cornea. Presenting visual acuity was 6/18 or better in 90.21% of the patients. Among the industrial worker 58.89% (149) used protective eye wear (PEW). None of the cases with other occupation used any kind of PEW. As most of these OSFB injuries could have been prevented using PEW, workplaces with high risk should be identified and workers should be educated about such eye injuries and steps should be taken to initiate public awareness program.

Keywords: Awareness, Ocular Surface Foreign Bodies, Ocular Trauma, Protective Eye Wear.

Introduction

Ocular trauma is an important cause of monocular loss of sight worldwide (1). In one of the most carefully conducted epidemiological studies of ocular trauma in Nepal, it was found that ocular trauma is the second leading cause of blindness in Nepal after cataract accounting for 7.9% of all blind eyes and, 8.6 persons per 1000 had signs and history of ocular trauma (2). Among all ocular injuries the most common type is superficial foreign body or ocular surface foreign body (1, 3). A foreign body is any object that does not belong to the body. Foreign body in the eye can be extra ocular or intra ocular. When it is on the ocular surface i.e. conjunctiva and cornea, it is called as ocular surface foreign body while it is called intraocular when it is inside the eyeball. Ocular surface foreign body (OSFB) is a common ocular morbidity with annual incidence of 1.05 (4) and constituting 58.2% of all ocular trauma (3). OSFB is more common in developing countries (5-7). The magnitude of patients getting extra-ocular

foreign body in the eye is high in industrial and agricultural area. Though it is graded as mild type of ocular injury (8) it majorly affects the economically active population causing loss of working days and economy (1, 9-11). If not addressed properly it can cause loss of vision with the complications like keratitis, rust ring and corneal scar (12).

Ocular surface foreign bodies can be the metal particles, caterpillar hair, insects or parts of insects (wings or legs), sand or dust, hull/husk/awn of grains, parts of the plant stem, contact lens or threads of cotton (13). In most of the cases ocular surface foreign bodies are found on the surface of the cornea and palpebral part of the conjunctiva, usually sulcus subtarsalis (14-16). It may also be found on the bulbar conjunctiva, conjunctival fornices or caruncle (5, 7, 8). OSFB pathophysiology involves a sequence of mechanical, inflammatory and potentially infectious processes. When a foreign body contacts the cornea, it causes

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direct trauma to the corneal epithelium, potentially penetrating deeper into the stroma, depending on the velocity, size and type of foreign object.

The corneal nerves and epithelium initiate a strong inflammatory response following injury. The mechanical disruption prompts epithelial cells to release pro-inflammatory cytokines, including interleukins (IL-1 and IL-6) and tumor necrosis factor-alpha (TNF- α), which attract neutrophils and macrophages to the site of injury. While the inflammatory process helps neutralize foreign contaminants, it can also lead to edema, increased vascular permeability and cellular infiltration, especially if the foreign body remains embedded.

Organic foreign bodies, such as plant materials, carry a higher risk of microbial colonization, potentially leading to bacterial, fungal, or parasitic infections. In contrast, inorganic materials, such as metallic or glass foreign bodies, are typically inert but may provoke a toxic reaction if they oxidize or release ions, as observed in iron (siderosis) or copper (chalcosis) deposits.

If the body fails to eliminate the foreign object or the inflammation becomes chronic, corneal stromal scarring and neovascularization may compromise corneal transparency and visual acuity.

Patients with OSFB present with pain, blurring of vision, foreign body sensation, photophobia, inability to open eyes and redness (5–8). It can rarely be asymptomatic with the findings being incidental (17). The patient may encounter this type of injury in various settings like industrial (4, 5, 7) or agricultural workplace (14) at home, while playing, while riding vehicles, or just by the wind (7, 18). The impacted foreign bodies can cause erosion of ocular surface increasing the risk for infection (4, 19, 20).

Thorough examination of the ocular surface with lid eversion in the patient with history of foreign body sensation cannot be overemphasized (5, 21, 22). Proper examination and treatment help in reducing ocular morbidity (5, 6, 23, 24).

Though ocular trauma is common it is largely preventable cause of ocular morbidity (3, 25, 26). Use of protective eye wear and safe occupational environment can greatly prevent OSFB. For Prevention and management of OSFB, a good knowledge of types of foreign bodies, place of trauma, common location of FB, vulnerable age

group and gender, awareness and use of protective eye wear are required (27, 28). There is paucity of studies on this topic from eastern region of Nepal. This study aims to study the magnitude of superficial foreign bodies and to identify the factors leading to it in Ramlal Golchha Eye hospital Foundation, a tertiary eye care center in eastern Nepal. This would help to determine the type of intervention needed for management and methods of prevention in minimizing the impact of serious injuries.

Methodology

This is a retrospective study done in Ramlal Golchha Eye Hospital Foundation, a tertiary eye hospital in the eastern region of Nepal. Biratnagar is an industrial city in Nepal and can represent urban-rural agglomeration (29).

The records of all the patient who visited the emergency or Outpatient Department (OPD) of the eye hospital with OSFB for 1 year period (May 2023 to April 2024) were collected and evaluated. Patient data consisting of name, age, sex, address, occupation, nature of foreign body, location on the ocular surface, duration from the time of impact to the presentation, associated infection, presenting visual acuity, use of protective eye wear (PEW) were noted.

Detailed slit lamp examination was performed. Topical anesthesia was achieved by instilling lidocaine hydrochloride 4%. Fluorescein dye was instilled to help locate the foreign body and to assess the presence of conjunctival or corneal epithelial defect. Superficial foreign bodies were removed with the help of cotton bud or forceps while impacted foreign bodies were removed with the help of sterile 26-gauge needle mounted on syringe. After removal of the foreign body topical antibiotic drops was instilled into the eye. Topical antibiotic eye drops were prescribed. In all the cases foreign bodies were removed by ophthalmologists.

The data was collected and entered in Microsoft excel. Statistical analysis was performed. Descriptive analysis was done by calculating frequency and percentage (for categorical data), while mean and standard deviations were calculated for continuous data. Graphical and tabular representation of data was done.

Results

In our study, 460 eyes of 450 patients had OSFB which accounted for 1.56% of the total number of patients visiting the hospital and 13.73% of patients visiting cornea clinic. Male patients accounted for 87.33% while female patients accounted for 12.67% with Male: Female ratio being 6.9:1. Right eye was affected in 47.33%, left eye was affected in 50.44% while Both eyes were affected in 2.22%.

The most affected age group was 20-30 years accounting for 30.67% followed by 30-40 years accounting for 26%. The working population 20-60 years accounted for 83.33%. The mean age was 33.41 years (0.5 yrs to 71yrs), as shown in Table 1. The most common OSFB was metal particle accounting for 57.11%, followed by caterpillar (CP) hair 11.11%, as shown in Table 2. Organic FB was seen in 32.89% while inorganic FB was seen in 10%.

Table 1: Age Distribution of Ocular Surface Foreign Body (OSFB)

Age group (years)	Number	Percentage
0-10	10	2.22
10-20	44	9.78
20-30	138	30.67
30-40	117	26
40-50	75	16.66
50-60	45	10
60-70	17	3.78
70-80	4	0.8
Total	450	100

Table 2: Nature of Ocular Surface Foreign Body (OSFB)

Nature of OSFB	Number	Percentage
Metal particle	257	57.11
Organic		
CP hair	50	11.11
Vegetative matter (unidentified)	44	9.78
Insect wing	27	6
Awn of grain/maize	21	4.67
Insect	3	0.67
Stick	3	0.67
Inorganic		
Sand	27	6
Soot	7	1.6
Plastic piece	6	1.33
Cyanoacrylate glue	4	0.89
Sticky tika	1	0.22
Total	450	100

The most common location of the OSFB was on Cornea which was 72.44% followed by conjunctiva which was 21.11%. In 6.4% of cases OSFB was seen in both conjunctiva and cornea.

Among the corneal foreign bodies (FB), 54.60 % was seen in paracentral cornea, 25.25% in the central cornea and 20.25% in the peripheral cornea, as depicted in Figure 1.

Of the 29 cases who had the FB in both cornea and conjunctiva, 9 cases were CP hair, 7 was iron

particle, 4 was cyanoacrylate glue, 1 was sand, 7 was soot and 1 was awn of grain/maize.

Of the 10 cases who had FB in both the eyes, 4 cases had metal particle, 4 cases had soot, 1 case had sand and 1 case had cyanoacrylate glue.

Among 450 cases, 253 cases were industrial workers (grinding, welding, cutting) accounting for 56.22%, 74 cases were farmers accounting for 16.44%, as shown in Table 3.

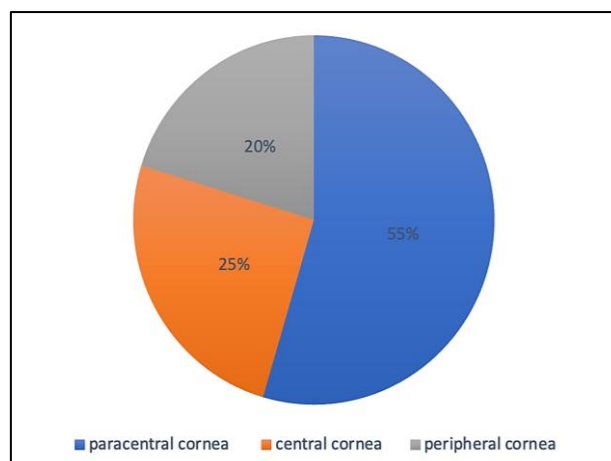


Figure 1: Location of Foreign Bodies on Cornea

Table 3: Occupation Based Findings

Occupation	Number	Percentage
Industrial worker	253	56.22
Farmer	74	16.44
Student	83	18.44
Housewife	21	4.67
Banker	6	1.3
Teacher	2	0.4
Not specified	5	1.11
Vendor	3	0.67
Businessman	1	0.22
Railway officer	1	0.22
Government officer	1	0.22
Total	450	100

Table 4: Presenting Visual Acuity

Presenting Visual acuity	Number of eyes	Percentage (%)
6/18 or better	415	90.21
<6/18-6/60	34	7.39
<6/60-3/60	3	0.65
<3/60	3	0.65
CSM (Central Steady Maintained)	5	1.08
Total	460	100%

Of the total cases, 322 [71.56%] were from various districts of eastern Nepal while 128 [28.44%] were from the neighboring country, India.

Of all the cases, 4.89% visited the hospital on the same day of injury, 84.44% visited within 1 week, 9.56% visited within 2 weeks and 1.11% visited after 2 weeks. The mean time of hospital visit from the day of injury was 4.15 days (1 day to 25days).

Presenting visual acuity (VA) was 6/18 or better in 90.21% of the patients, as shown in Table 4.

Among the industrial worker 58.89% [149] used PEW. None of the farmers or cases with other occupation used any kind of PEW.

Discussion

In our study, the annual incidence of OSFB is 1.56% which is like the studies- which showed annual incidence of 1.25% and 1.05% (4, 20).

Majority of cases were male i.e. 87.33% with male: female ratio being 6.9:1 which is like most of the studies done on OSFBs (4, 8). The males being more affected than female could be because of greater involvement of males in industrial work, outdoor work and riding of two-wheelers without helmet.

The mean age affected was 33.41 years which was similar to study done by Sharma *et al.* which

showed mean age of 31.15 years (7), Reddy *et al.* which showed mean age to be 35 years (4), Ozkurt *et al.* with mean age 32.46 years (9) and Muhammad Luqman Ali Bahoo *et al.* who showed mean age of 38.58 years (19). As young people are involved in the industrial work, agriculture and outdoor work the OSFB is likely to affect the young population.

The most common OSFB seen in our study was metal particle which constituted 57.11%. This could be because of the greater number of metal and industrial worker in the study place. The second most common OSFB is Caterpillar hair accounting for 11.11% which is much higher than 1.58% in an earlier study (5). This could be because of larger number of people working in agriculture.

The most common location of OSFB in our study was cornea accounting for 72.44% which was like other studies (4, 9, 29).

Among conjunctival foreign bodies 68.09% was seen in upper palpebral conjunctiva at sulcus subtarsalis. Bilateral involvement was seen in 2.22% in our study while it was seen in 5% of cases in study done by Voon L and 2% in the past study (8).

56.22% of patients were industrial workers while 16.44% were farmers. Hence 77.33% accounted for work related injuries. Our study thus explains the occupational hazard and lack of occupational safety like many past studies (4, 9, 10, 18–20, 24, 25, 27–30).

4.89% of the cases visited the hospital on the same day of injury with mean time of 4.15 days.

The most common location of the corneal foreign body was paracentral 54.60% which was like other studies (5, 7).

Only 33.11% of the cases used PEW, which were used exclusively by industrial workers. The PEW used seems to provide suboptimal protection to the eyes (7, 8, 26, 30).

Conclusion

Ocular Surface foreign body is a common cause of ocular trauma with annual incidence of 1.56%. It predominantly affects young males. Metallic particle is the most common OSFB followed by caterpillar hair. The industrial and agricultural workers are prone to ocular surface foreign body injury. These injuries are mostly superficial

without much visual impairment, but it causes loss of economy and working days.

Use of protective eyewear is uncommon among industrial or agricultural workers. As most of these OSFB injuries could have been prevented using preventive measures-PEW, workplaces with high risk should be identified and workers should be educated about such eye injuries and steps should be taken to initiate public awareness program. Also, the law should be reinforced for the protection of the workers with the provision of optimal eye protective devices in high-risk workplaces.

Abbreviations

CP: Caterpillar, CSM: Central Steady Maintained, FB: Foreign body, IL: Interleukin, OPD: Outpatient Department, OSFB: Ocular Surface Foreign Body, PEW: Protective Eye Wear, TNF: Tumor necrosis factor, VA: Visual Acuity.

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Author Contributions

Anima Deshar: conceived the study wrote the manuscript, Anima Deshar, Kripa Lopchan, Isha Shrestha: collected the data, Subash Pokharel, Nischal Ghimire: reviewed the final manuscript.

Conflict of Interest

The author(s) declare that there are no potential conflicts of interest.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Artificial Intelligence (AI) Assistance

AI tools were used only for minor language editing. All research content is the authors' own.

Ethics Approval

The ethical approval reference number is 33/082/083 dated 16 September 2025 from local ethical committee of Ramlal Golchha Eye Hospital Foundation under the Management of Nepal Eye

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References

- Thylefors B. Epidemiological patterns of ocular trauma. *Aust N Z J Ophthalmol.* 1992;20(2):95-8. doi: 10.1111/j.1442-9071.1992.tb00718.x
- Brilliant LB, Pokhrel RP, Grasset NC, *et al.* Epidemiology of blindness in Nepal. *Bull World Health Organ.* 1985;63(2):375-86. <https://pubmed.ncbi.nlm.nih.gov/3874717/>
- Voon LW, See J, Wong TY. The epidemiology of ocular trauma in Singapore: Perspective from the emergency service of a large tertiary hospital. *Eye.* 2001;15(1):75-81. doi: 10.1038/eye.2001.18
- Reddy PS, Nirmala K, Radhika S, *et al.* Incidence of ocular surface foreign body and its correlation with specific occupation and preventive measures. *GJRA-Global Journal for Research Analysis.* 2016;5(12). <https://www.doi.org/10.36106/gjra>
- Gupta L, Gupta C, Verma S, *et al.* Incidence and types of ocular surface foreign bodies: correlation with location in the eye and occupation. *International Journal of Academic Medicine and Pharmacy.* 2024;6(1):561-5. doi:10.47009/jamp.2024.6.1.11
- Gotekar R. A clinical study of extra ocular foreign bodies in prakash institute of medical sciences and research, Urun-Islampur, Maharashtra. *International Journal of Current Medical And Applied Sciences.* 2017; 15(1):52-56. ISSN:2321-9327
- Sharma S, Khadka D, Shrestha A, *et al.* Epidemiological pattern of corneal foreign bodies and utilization of protective eye devices: a hospital-based cross-sectional study. *Int J Occup Saf Health.* 2023;13(1):87-96. doi: 10.3126/ijosh.v13i1.45153
- Bahoo MLA, Jamil AZ. Types of ocular surface foreign bodies and their correlation with location in the eye. *Pakistan Journal of Ophthalmology.* 2018;34(1):25-9. <https://www.researchgate.net/publication/326847850>
- Ozkurt ZG, Yuksel H, Saka G, *et al.* Metallic corneal foreign bodies: An occupational health hazard. *Arq Bras Oftalmol.* 2014;77(2):81-3. doi: 10.5935/0004-2749.20140020
- Maurya RP, Srivastav T, Singh VP *et al.* The epidemiology of ocular trauma in Northern India: A teaching hospital study. *Oman Journal of Ophthalmology.* 2019;12(2):78-83. doi: 10.4103/ojo.OJO_149_2018
- Garcia RAG, Garcia DP, Martinez FE, *et al.* The Cuban ocular trauma registry. *J Clin Exp Ophthalmol.* 2013;04(02). doi: 10.4172/2155-9570.1000276
- Quirke M, Mullarkey C, Askorum S, Coffey N, Binchy J. A prospective observational study of techniques to remove corneal foreign body in the emergency department. *Emergency Medicine Journal.* 2014;31(6):463-6. doi: 10.1136/emmermed-2012-201447
- Négrel AD, Thylefors B. The global impact of eye injuries. *Ophthalmic Epidemiol.* 1998;5(3):143-169. doi: 10.1076/oep.5.3.143.8364
- McCarty CA, Fu CL, Taylor HR. Epidemiology of ocular trauma in Australia. *Ophthalmology.* 1999;106(9):1847-52. [https://doi.org/10.1016/s0161-6420\(99\)90361-5](https://doi.org/10.1016/s0161-6420(99)90361-5)
- Kuhn F, Morris R, Witherspoon CD, Mann L. Epidemiology of blinding trauma in the United States eye injury registry. *Ophthalmic Epidemiology.* 2006;13(3):209-216. doi: 10.1080/09286580600665886
- Desai P, MacEwen CJ, Baines P, *et al.* Incidence of cases of ocular trauma admitted to hospital and incidence of blinding outcome. *British Journal of Ophthalmology.* 1996;80(7):592-596. doi: 10.1136/bjo.80.7.592
- Jahangir T, Hafeez Butt N, Hamza U, *et al.* Pattern of presentation and factors leading to ocular trauma. *Pak J Ophthalmol.* 2011;27(2):96-102. <https://www.researchgate.net/publication/351513198>
- Ho CK, Yen YL, Chang CH, Chiang HC, Shen YY, Chang PY. Epidemiologic study on work-related eye injuries in Kaohsiung, Taiwan. *Kaohsiung Journal of Medical Sciences.* 2007;23(9):463-9. doi: 10.1016/S1607-551X(08)70054-8
- Bahoo MLA, Jamil AZ, Khalid MS. Ocular surface foreign bodies and their association with profession. *Pakistan Journal of Medical and Health Science.* 2001;12(2):498-501. doi: 10.1038/eye.2001.18
- Dass RI, Gohel DJ. Ocular Surface Foreign Body: its incidence and correlation with specific occupations. *GCSMC J Med Sci.* 2013;2(2):42-5. <https://gcsmc.org/assets/pdf/journal/journal-1222/original-article/ocular-surface-foreign-body-its-incidence-and-correlation-with-specific201810051723230321260.pdf>
- Beyer H, Cherkas D. Corneal foreign body removal using a bent needle tip. *Am J Emerg Med.* 2012;30(3):489-90. doi: 10.1016/j.ajem.2010.12.038
- Fiebai B, Awoyesuku EA. Ocular injuries among industrial welders in Port Harcourt, Nigeria. *Clinical Ophthalmology.* 2011;5(1):1261-3. doi: 10.2147/opth.s20297
- Upadhyay MP, Karmacharya PC, Koirala S, *et al.* Epidemiologic characteristics, predisposing factors and etiologic diagnosis of corneal ulceration in Nepal. *Am J Ophthalmol.* 1991;111(1):92-9. doi: 10.1016/S0002-9394(14)76903-X
- Saari KM, Aine E. Eye injuries in agriculture. *Acta Ophthalmol.* 1984;62(161):42-51. doi: 10.1111/j.1755-3768.1984.tb06783.x
- Abraham DI, Vitale SI, West SI, *et al.* Epidemiology of eye injuries in rural Tanzania. *Ophthalmic Epidemiol.* 1999;6(2):85-94. doi: 10.1076/oep.6.2.85.1560
- Godar ST, Kaini KR, Amatya P, *et al.* Magnitude of ocular trauma in a tertiary care hospital of western

- Nepal. Nepal Journal of Medical Sciences. 2013;2(2):140-3.
doi:10.3126/njms.v2i2.8964
27. Yigit O, Yuruktumen A, Arslan S. Foreign body traumas of the eye managed in an emergency department of a single-institution. *Ulus Travma Acil Cerrahi Derg.* 2012;18(1):75-9.
doi: 10.5505/tjtes.2012.49354
28. Cai M, Zhang J. Epidemiological characteristics of work-related ocular trauma in southwest region of China. *Int J Environ Res Public Health.* 2015;12(8):9864-75.
doi: 10.3390/ijerph120809864
29. Fong LP, Taouk Y. The role of eye protection in work-related eye injuries. *Aust N Z J Ophthalmol.* 1995; 23(2):101-06.
doi: 10.1111/j.1442-9071.1995.tb00137.x
30. Ballal SG. Ocular trauma in an iron forging industry in the Eastern Province, Saudi Arabia. *Occup Med (Chic Ill).* 1997;47(2):77-80.
doi: 10.1093/occmed/47.2.77

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