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RESEARCH ARTICLE
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CLINICAL PROFILE AND VISUAL OUTCOME OF WORK-RELATED TRAUMATIC EYE INJURIES: A LONGITUDINAL STUDY

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ABSTRACT

Background: This study evaluates the prevalence, clinical profile, and visual outcomes of work-related traumatic eye injuries in patients attending the Ophthalmology OPD, Emergency, and IPD of a tertiary care center.

Methods: Over a 12-month period, 80 patients who sustained work-related eye injuries were assessed. Data was collected from medical records, including demographics, occupational factors, injury details, and clinical characteristics. Detailed examinations and follow-up were conducted to monitor visual outcomes and complications.

Results: The prevalence of work-related eye injuries was 4.38%. The majority of patients were male (91.3%) and aged 18-25 years (50%). Most common occupations included welders (38.8%) and construction workers (31.3%). The primary causes of injury were welding particles (38.8%), cement slabs (13.8%), and glass particles (11.3%). A striking 98.7% of patients lacked protective eye gear. Clinical examination revealed that 38.8% had superficial foreign bodies. Corneal lacerations, iris prolapse, and corneal tears were also common. At presentation, 27.6% had a visual acuity of 6/60 or worse, with 35% showing improvement in visual acuity during follow-up.

Conclusion: This study emphasizes the need for improved safety protocols, protective eye gear, and training in high-risk industries. Early intervention and multidisciplinary treatment are critical for managing work-related ocular trauma. Future research should focus on long-term outcomes, psychosocial impacts, and evaluating the effectiveness of safety measures in reducing workplace eye injuries.

Key words: Work related eye injuries, Prevalence, Protective eye wear, Ocular trauma, Visual Outcomes

INTRODUCTION

One aim of The World Health Organization's (WHO) "Right to Sight Vision 20/20" is to prevent vision loss caused by modifiable risk factors before 2020.[1] Ocular injury is a major cause of

monocular blindness and visual impairment in the world. It is one of the common reasons for extended hospitalization of ophthalmic patients in industrialized nations [2]. A significant portion of ocular injuries occur in the workplace. The United States National Safety Council estimated that job related injuries account for 1/3rd of all eye injuries [3]. The WHO reported in 2007 that low- and middle-income countries had particularly high rates of occupational eye injuries, especially in agriculture and in cottage and unregulated industries [4]. A higher proportion of work-related eye injuries were reported from lower income countries, especially those that are rapidly industrializing: 56% in India, 56% in Singapore, and 44% in Malaysia.[5-8] In developing countries like India where the study is based out of, a special focus on cost effective measures is critically essential. Preventing work related eye trauma requires a systematic approach which includes determining risk factors, epidemiology and working towards effective prevention strategies. Ocular trauma in developing countries is still under-reported. The impact of ocular injuries is enormous, not only to the affected individual, also to the healthcare system and society [9].

Although no one is free from risk of injury, higher risk depends on nature of the job. Moreover, majority of ocular injury are seen in working age group and are preventable. These injuries may lead to permanent disability from loss of eyesight and loss of productivity which have economic impact on the country[10]. The United States Bureau of Labor Statistics (US BLS) provides detailed characteristics of days away from work due to nonfatal work-related eye injuries [11]. The BLS reported a total of 23,730 days away from work for nonfatal occupational eye injuries the private, state, and local government sectors, with the incidence rate of 2.2. per 10,000 full-time workers.[12]

The majority, if not all, work-related eye injuries can be thought of as preventable, so it is necessary and important to develop enhanced preventive measures that are more stringent since they could have a relevant influence. [13,14] The development of novel and more effective preventive interventions will greatly benefit from an improved and current understanding of the epidemiology of work-related eye injuries.

In the context of this study, Work - related ocular injury was defined as any injury or foreign body to eye as well as ocular adnexa which occurred at work. Work, in turn, was defined as any activity conducted for pay, either monetary or non-monetary (such as in exchange for specific goods or services).

When compared to the developed countries, the incidence and severity of work related eye injuries is higher in developing countries. This may be attributed to lower level of priority assigned for occupational health and workplace safety.[15]

According to recent studies, public health interventions targeted towards improving access to and quality of protective equipment in primary and secondary sectors of industry might be the most cost effective measure to reduce impact of work related ocular trauma. [16]

Till date, developing countries, especially India are lacking in data regarding work related ocular injuries. This study aims to present the profile of work-related ocular injuries in a hospital setting, identifying types of injury as well as to assess the visual outcomes.

AIMS & OBJECTIVES

Aim

1. To study the prevalence of Work related traumatic eye injuries in patients attending Ophthalmology OPD, Emergency, and IPD patients.
2. To study the clinical profile and visual outcomes of work related eye injuries

Primary objectives

To describe clinical and etiological profile of work related traumatic eye injuries in a tertiary care centre.

Secondary objectives

To identify risk factors in work related traumatic eye injuries

MATERIALS AND METHODS

The current study was conducted in Ophthalmology OPD, Emergency and IPD patients of Tertiary Care Centre for a period of 12 months on Patients attending Ophthalmology OPD, Emergency, and IPD patients.

Inclusion Criteria

1. Patients aged 20 to 70 years presenting to Ophthalmology OPD /Ward / Casualty with work related traumatic eye injury
2. Patients giving consent for the study

Methodology

Study data obtained from patients with work related traumatic eye injuries who fit the inclusion criteria was entered in initial injury report, which included history, systemic examination and detailed ocular examination including vision charting, anterior segment evaluation on torch light , slit lamp evaluation, intraocular pressure measurement and posterior segment evaluation using direct and indirect ophthalmoscopy and B scan if needed . It also included advice regarding initial treatment, hospital admission and any additional investigations including radiological imaging felt necessary.
Work - related ocular injury was defined as any injury or foreign body to eye as well as ocular adnexa which occurred at work. Work was defined as any activity conducted for pay, either monetary or non-monetary (such as in exchange for specific goods or services).
All the patients were followed up for a period of 3 months for 5 consecutive visits wherein detailed examination of visual acuity by help of Snellen's charts, near vision charts, anterior segment examination on slit-lamp bio-microscopy and posterior segment by Indirect Ophthalmoscopy, B scan ultrasonography was undertaken.

Sample Size Calculation

The main objective of the present study was to find the prevalence of work related eye injuries; hence we took prevalence of work related eye injuries, which was 27.5%. (Ref: Nina J et al. Prevalence and risk factors associated with work-related eye injuries in Bosnia and Herzegovina. International Journal of Occupational and Environmental Health, 2016), with 95% Confidence limits, sample size was calculated using the formula,
Sample Size = $[Z (1-\alpha)]2 * p * q$
$(d)2$
$= (1.96)2 * 27.5 * 72.5 / (7)2$
α is the level of significance
Z is the Standard Normal Variate for 95% of Confidence Interval = 1.96 Q = 100-p
P =27.5%
d = absolute Precision = 10%
Accordingly, sample size calculated was 77 rounded off to 80 . Hence 80 study subjects will be taken for the study.

Statistical Analysis

Data was analysed using SPSS V 20.0 package (Statistical package for social sciences, version 20.0). Data was given as mean + SD for continuous data. Student unpaired t test was applied to compare between means. Pearson correlation test was performed to find relation between two variables. All tests were two tailed. Alpha level significance was taken as $p < 0.05$.

RESULTS

Prevalence of Work Related Traumatic Ocular Injuries

$$\text{Prevalence} = \frac{\text{Total patients having work related traumatic ocular injuries}}{\text{Total number of patients seen in OPD, IPD, Emergency during study period}}$$

= 80 / 1826 x100
= 4.38%
Therefore, in our study, Prevalence of Work related traumatic Ocular Injuries was found to be 4.38%

Age (Years)	**No.**	**Percent**
18-25	40	50.0
26-35	21	26.3
>35	19	23.8
Mean (SD)	28.64 (8.70)	
Range	18-46	

Table 1: Distribution of Study Subjects according to the Age (N=80)

Gender	**No.**	**Percent**
Male	73	91.3
Female	7	8.8

Table 2: Distribution of Study Subjects according to the Gender (N = 80)

Occupation	**No.**	**Percent**
Welder	31	38.8
Construction Worker	25	31.3
Glass Cutter	9	11.3
Housemaid	6	7.5
Farmer	3	3.8
Labourer	3	3.8
Factory Worker	1	1.3
Painter	1	1.3
Auto Driver	1	1.3

Table 3: Distribution of Study Subjects according to the Occupation (N=80)

Object	**No.**	**Percent**
Welding Particle	31	38.8
Cement Slab	11	13.8
Glass Particle	9	11.3
Metal Part	6	7.6
Iron Rod	5	6.3
Hot Oil	4	5.0
Wooden Splinter	4	5.0
Hot Water	2	2.5
Cement Stone	1	1.3
Construction Worker	1	1.3
Falling Brick	1	1.3
Paint Can Lid	1	1.3
Rice Grain	1	1.3
Wall Plaster	1	1.3
Bull's Horn	1	1.3
Windshield Glass	1	1.3

Table 4: Distribution of Study Subjects according to the Object Causing Injury (N=80)

Alcohol	No.	Percent
Yes	14	17.5
No	66	82.5

Table 5: Distribution of Study Subjects according to the Alcohol/Drug Abuse (N=80)

Eye Involved	No.	Percent
Left	37	46.3
Right	43	53.8

Table 6: Distribution of Study Subjects according to the Eye Involved (N=80)

Type of Injury	No.	Percent
Closed Globe, Superficial FB	31	38.8
Open Globe, Penetration	18	22.5
Closed Globe, Contusion	17	21.3
Closed Globe, Lamellar Laceration	14	15.6

Table 7: Distribution of Study Subjects according to the Type of Injury (N=80)

Zone of Injury	No.	Percent
Anterior Segment	5	6.3
Cornea & Limbus	15	18.8
External, Conjunctiva	6	7.5
External, Cornea	37	46.3
External, Eyelids	12	15.0
Limbus to Sclera	3	3.8

Table 8: Distribution of Study Subjects according to the Zone of Injury (N=80)

Age of Injury (hours)	No.	Percent
1-3	18	22.5
4-6	24	30.0
7-12	9	11.3
13-24	13	16.3
>24	16	20.0
Mean (SD)	20.83 (28.94)	
Median	6.00	
Range	1-168	

Table 9: Distribution of Study Subjects according to the Age of Injury (N=80)

Protection	No.	Percent
Protective Goggles	1	1.3
None	79	98.7

Table 10: Distribution of Study Subjects according to the Protection (N=80)

Vision	No.	Percent
6/6	30	37.5
6/9	12	15.0
6/12	9	11.3
6/18	3	3.8
6/24	3	3.8
6/36	1	1.3
6/60	3	3.8

FC 1M	6	7.5
FC 2M	1	1.3
FCCF	6	7.5
HMCF, PM+, PR inaccurate	6	7.5

Table 11: Distribution of Study Subjects according to the Vision with pinhole (N=80)

Anterior Segment Findings	**No.**	**Percent**
Corneal Laceration	1	1.3
Iris Prolapse	14	17.5
CC	18	22.5
Corneal Ulcer with hypopyon	2	2.5
Corneal epithelial defect	6	7.5
Corneal tear	11	13.8
Hyphaema	5	6.3
Conjunctival Tear	6	7.5
FB	31	38.8
SCH	12	15.0
Scleral Tear	5	6.3
Ecchymosis	15	18.8
UL+LL Edema	18	22.5

Table 12: Distribution of Study Subjects according to the Anterior Segment Findings (N=80)

Findings	**No.**	**Percent**
DNV	2	2.5
Dull Reddish Glow	4	5.0
Hazy Glow	2	2.5
Hazy Disc	1	1.3
Red Glow	2	2.5
NAD	69	86.3

Table 13: Distribution of Study Subjects according to the Posterior Segment Findings (N=80)

Findings	**No.**	**Percent**
Metallic FB	5	6.3
Soft tissue swelling	13	16.3
Lens subluxation	1	1.3
Vitreous Haemorrhage	10	12.6
NAD	14	17.5
Not Done	31	38.8

Table 14: Distribution of Study Subjects according to the CT/MRI Findings (N=80)

BCVA	**No.**	**Percent**
Same	52	65.0
Improved	28	35.0

Table 15: Distribution of Study Subjects according to the Visual Outcomes on Follow-up (N = 80)

DISCUSSION

The Findings of this study are consistent with the broader body of literature on work-related eye

injuries, particularly in terms of the demographic and occupational characteristics of affected individuals. For example, a study by Négrel and Thylefors (1998) similarly found that males in physically demanding occupations were at the highest risk of sustaining eye injuries(17). This pattern is evident across various global contexts, suggesting that gender and occupation are universal risk factors for ocular trauma.

In terms of injury types, the high prevalence of lacerations and foreign body incidents in this study aligns with previous research. For instance, a study conducted by Yu et al. (2004) in Hong Kong reported that lacerations and foreign body injuries were the most common forms of ocular trauma among workers[18]. The consistency of these findings across different settings underscores the need for targeted interventions in high-risk occupations to reduce the incidence of these specific types of injuries.

The gap in protective equipment usage identified in this study echoes the findings of other studies, such as those by Sundar and Tan (2017) and Harrison et al. (2021), which have highlighted the critical role of protective eyewear in preventing work-related eye injuries. These studies also emphasize the challenges associated with ensuring proper usage of protective equipment, particularly in settings where workers may not be adequately trained or where safety protocols are not strictly enforced[19,20].

The clinical outcomes reported in this study, particularly severe visual impairment at presentation, are also consistent with the literature. A study by McGwin et al. (2018) in the United States found similar rates of severe visual impairment among patients with work-related eye injuries, underscoring the need for early and effective treatment[21]. The variability in follow-up outcomes observed in this study is also reflective of the findings of other research, which has noted that recovery from ocular trauma is influenced by a range of factors, including the initial severity of the injury, the type of treatment received, and the patient's overall health and access to care.

The follow-up data showed that 35% of patients experienced some improvement in visual acuity over time. This variability in outcomes highlights the complex nature of ocular trauma and the factors that influence recovery, including the severity of the injury, the timeliness of treatment, and the patient's adherence to follow-up care. Depending on the patient presentation, prompt medical and surgical management as indicated, is crucial for optimizing outcomes of treatment.

This study contributes to the growing body of evidence that highlights the need for comprehensive, coordinated care to achieve the best possible outcomes for patients with work-related eye injuries.

CONCLUSION

In conclusion, this study provides valuable insights into the epidemiology, clinical profile and visual outcomes after work related trauma. The findings highlight the critical need for improved safety protocols, timely and effective treatment, and ongoing support for injured workers. However, several limitations must be acknowledged, including the study's single-center design, potential selection bias, reliance on self-reported data, limited follow-up period, lack of a control group, and incomplete assessment of psychological outcomes. Addressing these limitations in future research will help to build a more comprehensive understanding of work-related eye injuries and inform the development of targeted interventions to reduce their incidence and impact.

Based on the findings of this study, several recommendations can be made to improve clinical practice and policy development. There is an urgent need to enhance safety protocols and training programs in high-risk industries. Employers should prioritize the provision of appropriate protective equipment and ensure that workers are adequately trained in its proper use. Regular safety audits and compliance checks should be implemented to reinforce these practices and reduce the incidence of eye injuries.

Healthcare providers should be prepared to offer prompt and effective treatment for work-related eye injuries. This includes establishing rapid referral systems to specialized ophthalmic care, especially in settings where such services may not be readily available. A multidisciplinary approach, involving both medical and surgical interventions, should be standard practice in the management of severe ocular trauma to optimize patient outcomes.

Policymakers should consider the broader socio-economic impact of work-related eye injuries and

implement measures to support injured workers and their families. This could include financial assistance, rehabilitation programs, and initiatives to facilitate the reintegration of injured workers into the workforce. Additionally, public awareness campaigns that emphasize the importance of eye safety and the use of protective equipment could help reduce the incidence of these injuries.

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