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Original Article

A STUDY TO EVALUATE THE DEMOGRAPHIC PATTERN OF THE INJURY CAUSED BY METALLIC CORNEAL FOREIGN BODY AND ITS OUTCOME AFTER TREATMENT

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ABSTRACT

Objective: This study aims to investigate the demographic characteristics, occupational background, and injury management of patients presenting with ocular trauma involving metallic corneal foreign bodies (FBs).

Methods: A cross-sectional study was conducted at the outpatient clinic of Ophthalmology at Pt JLNGMC, Chamba. Data were collected from consecutive patients over three months. Demographic data, including age, gender, and education level, were analyzed alongside occupational background, injury context, and protective measures. Statistical analysis was performed using SPSS version 17.0, with descriptive statistics utilized to present the results.

Results: The study revealed a predominance of young males (66%) in the 14-29 age group, with the metalwork industry (47%) being the primary sector where injuries occurred, mainly during metal grinding activities (53%). Lack of protective measures, such as temporary removal of eyewear (39%), contributed to the injuries. Notably, 54% of patients did not attempt self-removal of FBs. Superficial corneal FBs accounted for 45% of cases, indicating significant potential for severe injury.

Conclusion: The findings underscore the urgent need for enhanced safety education, rigorous enforcement of protective eyewear usage, and targeted interventions in high-risk occupational sectors to mitigate the prevalence and severity of corneal FB injuries. Addressing these challenges is crucial for preserving vision, reducing healthcare costs, and improving occupational health and safety standards.

Keywords: Ocular trauma, Corneal foreign bodies, Occupational hazards, Protective eyewear, Injury management

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INTRODUCTION

Ocular trauma is a pivotal concern in the realm of ophthalmology, particularly as it is a leading cause of visual impairment among the youthful segment of the population. A notable proportion of these injuries are attributable to workplace accidents, where superficial corneal foreign bodies (FBs) emerge as the most frequent and, crucially, the most preventable form of eye injury [1]. These injuries are characterized by their diverse etiology, occurring not only in occupational settings but also at home, during sporting activities, or inadvertently in outdoor environments, particularly on windy days. The cornea's anterior positioning makes it especially susceptible to encounters with foreign materials such as glass shards, metal slivers, grains of sand, plastic fragments, or wooden splinters. Among these, metallic corneal FBs are a common occupational hazard for those employed within the construction and metalworking industries [2].

The protocol for addressing corneal FBs typically involves their removal in clinical settings, ranging from outpatient offices to emergency departments. The symptomatic presentation of such injuries includes, but is not limited to, the sensation of a foreign object in the eye, accompanied by pain, excessive tearing, heightened sensitivity to light, and diminished visual acuity [3]. The long-term consequences of these foreign bodies extend beyond immediate discomfort, harboring the potential to significantly impair vision by inducing corneal scarring directly along the visual axis and precipitating secondary infections from keratitis to the more severe endophthalmitis. Furthermore, the financial implications of managing corneal FB injuries contribute to the broader economic burden on healthcare systems [4].

The imperative for preventing FB accidents cannot be overstated, given their serious repercussions on ocular health and economic resources. Empirical evidence suggests that the adoption of protective eyewear can avert approximately two-thirds of such incidents, underscoring the critical role of personal protective equipment in mitigating risk. Beyond individual protective measures, there is a pressing need to elevate safety protocols within workplaces and enforce stringent standards. Comprehensive training programs for employees and supervisors alike are essential in cultivating a safety-first culture [5]. These collective efforts aim not only at minimizing the incidence of corneal FB injuries but also at preserving the vision and well-being of individuals, thereby addressing a significant public health challenge [6].

MATERIALS AND METHODS

Study design

This research is structured as an institutional-based cross-sectional study.

Setting

The study will encompass all consecutive patients across various age groups presenting to the outpatient clinic of Ophthalmology at Pt JLNGMC, Chamba, who have experienced ocular trauma involving metallic corneal foreign bodies.

Sample size

The research will include all consecutive patients meeting the study criteria who visit the outpatient clinic of Ophthalmology at Pt JLNGMC, Chamba, over a period of three months.

Study duration

The investigation will span three months, subsequent to receiving approval from the institutional protocol review board and the institutional ethics committee.

Inclusion criteria

1. Patients presenting with ocular trauma due to metallic corneal foreign bodies.

2. Individuals of any age group and gender are eligible.

Exclusion criteria

1. Patients or their guardians unwilling to provide informed consent.

2. Cases involving ocular trauma with non-metallic foreign bodies.

3. Traumas affecting eye parts other than the cornea.

Data entry and analysis

Statistical analysis will be conducted using SPSS version 17.0. The data will be analyzed descriptively, with results presented in terms of means, medians, and proportions.

Ethical considerations

This study will adhere to ethical guidelines as outlined by the ICMR (1994) and the modified Helsinki Declaration (2000). Key ethical considerations will include:

1. Ensuring all participants are fully informed about the study's purpose, procedures, potential benefits, and risks.

2. Guaranteeing the confidentiality of patient information and minimizing any potential impact on participants' physical and mental well-being.

3. Providing participants and their guardians the autonomy to withdraw from the study at any point without any negative consequences.

4. Implementing measures throughout the research to minimize risks and avoid any irreversible adverse effects, ensuring that participants can derive benefits from the study.

5. Obtaining written informed consent from all study participants or their guardians.

RESULTS

The study presents an in-depth analysis of the demographic characteristics, occupational background, and injury management among patients presenting with occupational corneal foreign bodies. The demographic distribution revealed a predominant age group of 14-29 y, accounting for 66% of the cases, followed by 30-44 y at 30%, with a minimal occurrence in individuals aged 45-60 y (4%), and no cases above 60 y. The gender demographic was exclusively male (100%), reflecting the occupational risk exposure. Educational levels varied, with 43% having secondary education, 28% were illiterate, 24% had primary education, and a smaller fraction (5%) had higher education.

Occupationally, the metalwork industry emerged as the primary sector where injuries occurred (47%), followed by the construction industry (27%). Lesser incidences were reported among electricians (4%) and carpenters (6%), with other sectors comprising 17%. The majority of injuries were sustained during metal grinding activities (53%), with welding (14%) and other activities (23%) also contributing to the injury rates. The presenting vision at the time of injury was predominantly 6/6-6/9 (81%), with lesser cases of 6/12-6/18 (14%) and less than 6/24 vision (5%).

Table 1: Demographic characteristics of patients

Demographic feature	Distribution
Age group	
14-29 y	66%
30-44 y	30%
45-60 y	4%
>60 y	0%
Gender	
Male	100%
Education level	
Illiterate	28%
Primary Education (1-5)	24%
Secondary Education (6-10)	43%
Higher Education (>10)	5%

Regarding protective measures and injury management, 39% reported temporary removal of protection as the reason for their injury, while discomfort (24%) and forgetfulness (13%) were other notable reasons. A significant number of patients (54%) did not attempt self-removal of the foreign body, whereas 24% used tap water and 13% used cloth for self-removal. The depth of the corneal foreign bodies was superficial in 45% of the cases and deep in 55%, indicating a considerable risk of severe injury.

These findings underscore the critical need for improved safety education, enforcement of protective eyewear usage, and targeted interventions in high-risk occupational sectors to mitigate the prevalence and severity of corneal foreign body injuries.

Table 2: Occupational background and injury context

Aspect	Percentage
Business sector	
Metalwork Industry	47%
Construction Industry	27%
Electrician	4%
Carpenter	6%
Other Sectors	17%
Activity at Injury	
Metal Grinding	53%
Welding	14%
Cement Work	5%
Wood Cutting	5%
Other Activities	23%
Presenting vision	
6/6-6/9	81%
6/12-6/18	14%
<6/24	5%

Table 3: Protective measures and injury management

Category	Percentage
Reasons for Not Wearing Protection	
Temporary Removal	39%
Forgot to Wear	13%
Discomfort	24%
Other Reasons	24%
Self-removal Attempt	
No Attempt	54%
Tap Water	24%
Cloth	13%
Currency Note	5%
Paper	4%
Depth of Corneal FB	
Superficial	45%
Deep	55%

DISCUSSION

Our study highlights the critical issue of ocular trauma due to metallic corneal foreign bodies (FBs), underscoring its prevalence among workers in high-risk occupational sectors such as metalwork and construction. The demographic findings of our research resonate with existing literature, such as the studies by MacEwen *et al.* (1999) and Ozkurt *et al.* (2014), which identify young male workers as the most susceptible group to ocular injuries, particularly those involving metallic FBs. This demographic trend is alarming, given the potential for these injuries to result in significant visual impairment if not appropriately managed [7, 8].

The occupational background and activities leading to injuries in our study-predominantly metal grinding and welding-reiterate the occupational hazards reported in previous research, including studies by Gumus *et al.* (2007) and Radha and Devdatta (2013). These activities, without adequate eye protection, expose workers to a high risk of ocular trauma, emphasizing the need for rigorous safety protocols and protective eyewear usage [9, 10].

The economic implications of ocular injuries, highlighted by Wittenborn *et al.* (2013), are further validated by our findings, which show a significant portion of injuries resulting from a lack of protective measures, such as safety eyewear. The reasons for not wearing

protective eyewear-ranging from temporary removal to discomfort-point to a larger issue of occupational health and safety culture, as well as the availability and quality of protective equipment [11].

Furthermore, our findings regarding the depth of corneal FBs and the attempts at self-removal without professional medical intervention raise concerns about the potential for secondary complications, such as infections and corneal scarring. This is consistent with the observations by Pranali Shah and V. H. Karambelkar (2020) and Dahal and Byenju (2014), who noted the risk of serious visual impairment and the importance of prompt, professional treatment [12, 13].

The study underscores the urgent need for enhanced workplace safety education, as supported by Abdalla *et al.* (2017), and the implementation of comprehensive protective measures to prevent ocular injuries. Moreover, the effectiveness of eye patching, as explored by Daugherty (2002), and other immediate interventions post-injury require further attention to mitigate the short-term and long-term impacts of ocular trauma [14].

Overall, our research aligns with existing studies in identifying the significant risks associated with occupational ocular trauma, particularly from metallic FBs. It calls for a multipronged approach involving the improvement of workplace safety standards, the promotion of protective eyewear usage, and the education of workers and employers on the risks of ocular injuries. Addressing these challenges is crucial for reducing the incidence of preventable ocular trauma and safeguarding the vision and well-being of workers in high-risk occupations.

CONCLUSION

In conclusion, ocular trauma, especially from metallic corneal foreign bodies (FBs), presents significant challenges in ophthalmic care. This study underscores the prevalence of such injuries, particularly among young males in high-risk occupational sectors like metalwork and construction; lack of protective measures and improper management exacerbate the severity of these injuries, emphasizing the urgent need for comprehensive safety education and enforcement strategies. Preventive measures, including the consistent use of protective eyewear, are crucial in mitigating the burden of corneal FB injuries, not only preserving vision but also alleviating the economic strain on healthcare systems. This research serves as a clarion call for concerted efforts to address this pressing public health issue.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICTS OF INTERESTS

Declared none

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