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RESEARCH ARTICLE

OCULAR TRAUMA PROFILE IN PATIENTS AT TERTIARY CARE CENTRE

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Abstract

Background: Ocular trauma remains a major preventable cause of visual morbidity and monocular blindness worldwide, particularly among young adults in developing countries. Understanding the demographic and clinical profile of ocular injuries is essential for developing effective preventive strategies and optimizing management

Methods: This prospective cross-sectional study was conducted in the Department of Ophthalmology, M.L.B. Medical College and Associated Hospital, Jhansi, from December 2024 to November 2025. A total of 100 patients presenting with ocular trauma were enrolled. Detailed demographic information, mode and cause of injury, and clinical findings were recorded. Comprehensive ophthalmic examinations were performed, and data were analyzed using SPSS version 26.0. Descriptive statistics were used to evaluate the distribution and characteristics of ocular trauma.

Results: Among the 100 patients studied, males constituted 83% of cases, while females accounted for 17%. The most affected age group was 20–30 years (23%), followed by the pediatric age group ≤16 years (16%). Road traffic accidents were the leading cause of ocular trauma, accounting for 54% of injuries, followed by wood-related injuries (13%), stick injuries (6%), stone injuries (6%), and self-fall (5%). Adnexal injuries were the most common type of ocular trauma (34%), followed by lamellar lacerations (20%), contusions (18%), penetrating injuries (16%), globe rupture (6%), and chemical and thermal injuries (3% each). The majority of injuries were preventable and were associated with occupational exposure and road traffic incidents.

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Conclusion: Ocular trauma predominantly affects young adult males and is largely attributable to road traffic accidents and occupational hazards. Strengthening road safety measures, promoting protective eyewear, and increasing public awareness may substantially reduce the burden of ocular morbidity and prevent avoidable visual impairment.

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Introduction:-

Ocular trauma is a significant yet preventable cause of visual morbidity and blindness across all age groups worldwide. The World Health Organization (WHO) estimates approximately 55 million eye injuries occur globally each year, of which roughly 750,000 require hospitalization, making it one of the foremost causes of acquired ocular disability [1]. It is recognized as the leading cause of monocular blindness and a major contributor to ophthalmic morbidity in developing nations, where occupational hazards, poor road safety infrastructure, and limited access to timely ophthalmic care amplify the burden [2]. Epidemiological data suggest that approximately one in every twenty patients presenting to an ophthalmology unit does so with an ocular injury, illustrating the frequency with which eye trauma is encountered in routine clinical practice [3]. Ocular injuries are broadly classified into mechanical and non-mechanical categories. Mechanical injuries, further subdivided into open-globe (penetrating, perforating, and intraocular foreign body injuries) and closed-globe (contusion and lamellar laceration) injuries as per the Birmingham Eye Trauma Terminology (BETT) system, constitute the majority of cases encountered at tertiary centres [4,5]. Non-mechanical injuries encompass chemical burns, thermal injuries, and radiation-induced damage. Road traffic accidents (RTAs) are consistently reported as the single most common cause of ocular trauma in Indian studies, followed by occupational injuries, assault, and domestic accidents [6,7].

The high velocity and unpredictable nature of RTA-related ocular injuries renders them particularly severe, frequently involving the anterior segment, adnexa, and occasionally the posterior segment. Epidemiologically, young adult males aged 20–40 years constitute the predominant affected demographic, a pattern attributed to greater outdoor exposure, riskier occupational profiles, and lower compliance with protective eyewear [8,9]. Pediatric ocular trauma also represents a substantial subgroup, occurring largely through play-related accidents and household injuries, and carries significant long-term implications including amblyopia and permanent visual impairment [10]. Despite advances in microsurgical techniques, vitreoretinal surgery, and corneal transplantation, the visual prognosis following severe ocular trauma remains guarded, especially in the context of delayed presentation or inadequate primary management [11]. The Ocular Trauma Score (OTS), introduced by Kuhn et al., remains the most widely used validated tool for predicting post-injury visual acuity outcomes in open-globe injuries, and has been adopted globally in prognostic studies [12]. Early and appropriate surgical intervention, prophylactic antimicrobial therapy, and structured rehabilitation are the cornerstones of effective trauma management.

Preventive strategies — including road safety legislation, mandatory use of helmets and seatbelts, and occupational eye protection programmes — have been shown to significantly reduce the incidence and severity of ocular injuries in populations where they are consistently enforced [13]. While national-level data from India provide a broad overview of ocular trauma epidemiology, region-specific studies remain scarce, particularly from the Bundelkhand region of Uttar Pradesh. M.L.B Medical College and Hospital, Jhansi, serves as the primary tertiary referral centre for a vast rural and semi-urban catchment population with its own distinct occupational, agricultural, and traffic-related risk profile. A detailed study of the local epidemiology and clinical spectrum of ocular trauma is therefore essential for designing targeted, context-specific preventive and management strategies. The present prospective cross-sectional study was undertaken to characterize the demographic profile, etiological distribution, injury types, and clinical presentations of patients with ocular trauma presenting to this institution over a period of six months

Aim and Objectives:-**Aim:-**

To evaluate the epidemiological and clinical profile of ocular trauma cases presenting to a tertiary care center in Jhansi.

Objectives:-

- To analyze the demographic characteristics of patients with ocular trauma.
- To assess the pattern and types of ocular injuries.
- To identify the etiological factors responsible for ocular trauma.
- To study the distribution of ocular trauma cases attending a tertiary care hospital.
- To provide evidence for preventive strategies and early intervention measures aimed at reducing ocular morbidity.

Methods:-

Research Design:-

This prospective cross-sectional study was conducted in the Department of Ophthalmology, M.L.B. Medical College and Associated Hospital, Jhansi, over a period of one year from December 2024 to November 2025. A total of 100 patients presenting with ocular trauma, including both mechanical and non-mechanical injuries, were enrolled. Patients of all age groups and both sexes attending the outpatient department or requiring admission were included. Clinical and demographic data were recorded, and detailed ophthalmic examinations were performed to assess the pattern and causes of ocular trauma.

Inclusion Criteria:-

- Patients presenting with ocular trauma, including both mechanical and non-mechanical injuries.
- Patients of all age groups and either sex.
- Patients attending the Ophthalmology Outpatient Department (OPD) or admitted to the hospital for management of ocular trauma.
- Patients willing to participate and provide informed consent.

Exclusion Criteria:-

- Patients with pre-existing ocular diseases or visual impairment unrelated to trauma.
- Follow-up cases presenting only for review of a previous ocular injury.
- Patients unwilling to participate in the study or provide consent.
- Cases with incomplete clinical records or inadequate examination findings.

Methodology:-

After obtaining informed consent, all eligible patients presenting with ocular trauma to the Department of Ophthalmology, M.L.B. Medical College and Associated Hospital, Jhansi, during the study period were enrolled. A detailed history regarding age, sex, residence, mode and cause of injury, and time elapsed since trauma was recorded. Comprehensive ophthalmic evaluation, including visual acuity assessment, slit-lamp examination, and posterior segment examination, was performed. Relevant investigations were carried out whenever indicated. Clinical findings were documented in a predesigned proforma, and the collected data were analyzed to determine the demographic profile, pattern, and causes of ocular trauma.

Data Management and Statistical Analysis:-

The collected data were entered in Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) software version 26.0. Data were checked for completeness and accuracy before analysis. Descriptive statistics were used to summarize the findings, with categorical variables expressed as frequencies and percentages, and continuous variables presented as mean and standard deviation. Associations between demographic factors and types of ocular trauma were assessed using the Chi-square test or Fisher's exact test, wherever applicable. A p-value of <0.05 was considered statistically significant. The results were presented in the form of tables, charts, and graphs for appropriate interpretation.

Results:-

In the study population was predominantly caused by road traffic accidents (54%), followed by wood-related injuries (13%) and other less common causes, highlighting the significant contribution of preventable external factors to eye injuries [Figure 1]. Adnexal injuries were the most frequent type of ocular trauma (34%), followed by lamellar lacerations (20%), contusions (18%), and penetrating injuries (16%), indicating that blunt and mechanical trauma constituted the majority of cases [Figure 2]. Furthermore, ocular trauma was markedly more common among males and was most prevalent in the 20–30-year age group, suggesting that young, economically active men are at greater risk due to increased occupational exposure, outdoor activities, and involvement in road traffic accidents [Figure 3]. Overall, the findings emphasize the need for strengthened road safety measures, occupational eye protection, and targeted preventive strategies to reduce ocular morbidity.

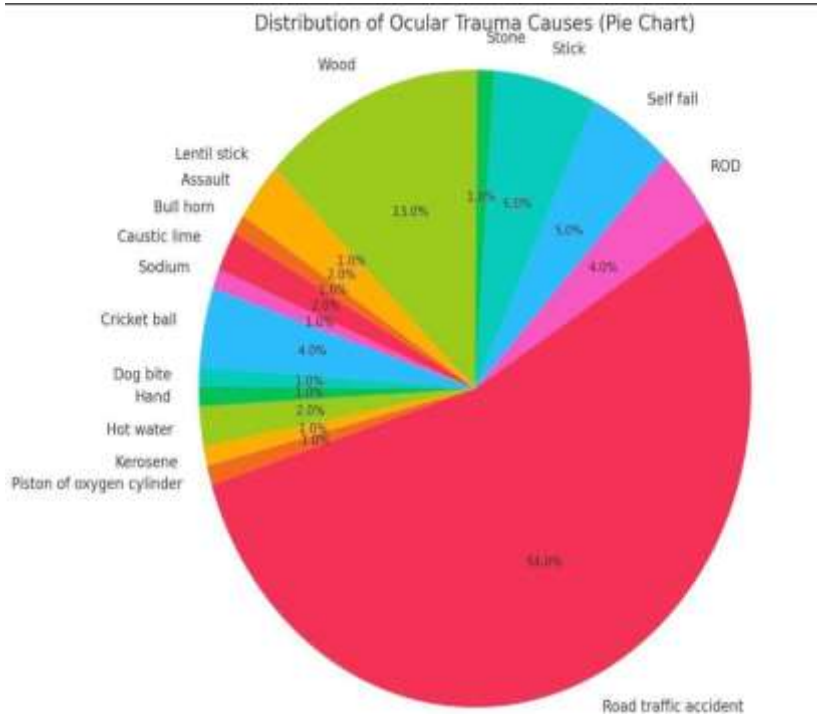


Figure 1: Distribution of Causes of Ocular Trauma Among Study Participants (n = 100)

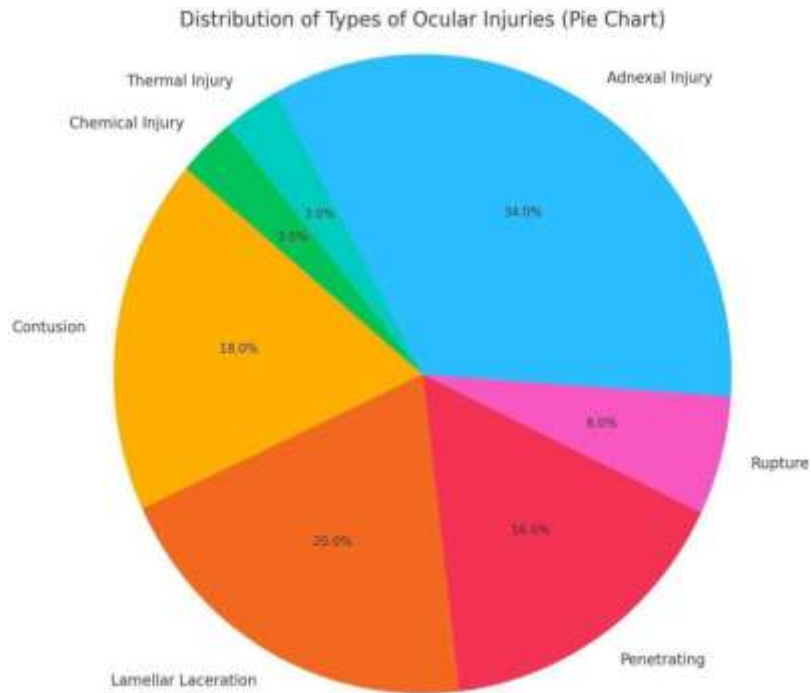


Figure 2: Distribution type of ocular injuries

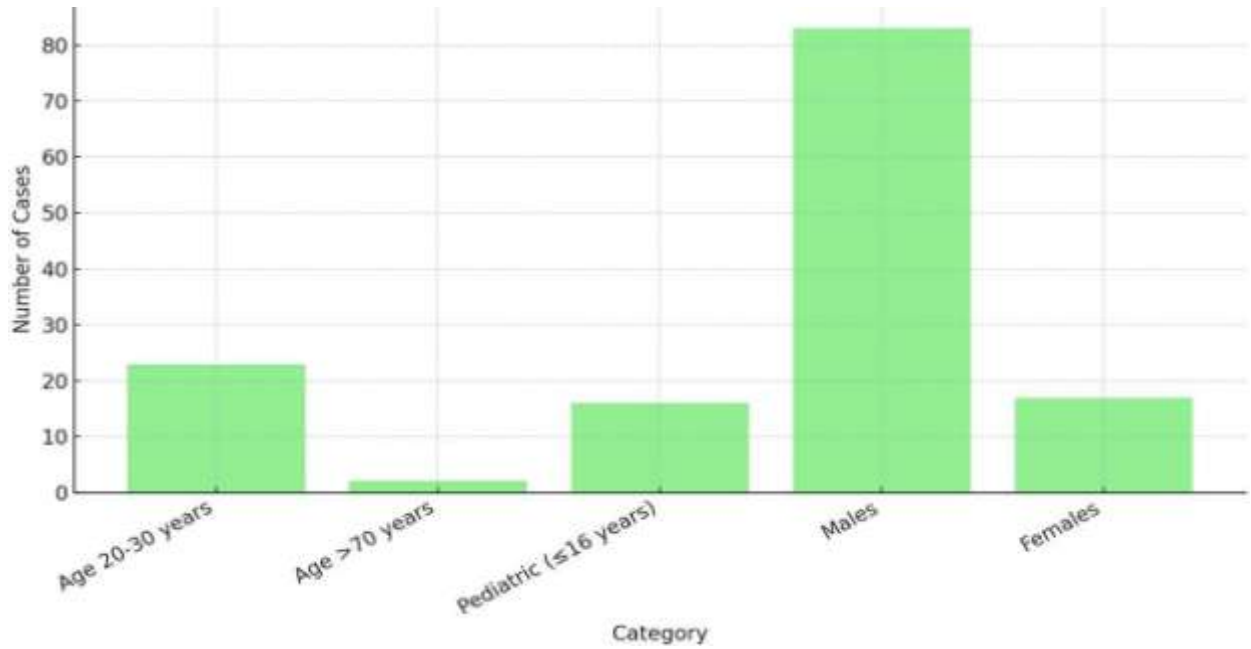


Figure 3: Distribution of ocular trauma by age and gender



Figure 4: Lid and adnexa lacerations repaired in our institution



Figure 5: Corneal tear repair



Figure 6: Corneal scraping done in a patient with incense stick exposure



Figure 7: Lid laceration repair



Figure 8: Full Chamber hyphema



Figure 9: Periorbital swelling with subconjunctival haemorrhage



Figure 10: Foreign body

Discussion:-

The present study enrolled 100 patients with ocular trauma over a six-month period at a tertiary care centre in Jhansi. The findings reflect both global and India-specific trends in ocular trauma epidemiology, while offering regional insights pertinent to the Bundelkhand belt.

Gender Distribution:-

A marked male preponderance was observed in our study, with 83% of patients being male and 17% female. This finding is consistent with the published literature from India and globally, where male-to-female ratios ranging from 3:1 to 5:1 have been consistently reported [8,14]. The greater vulnerability of males to ocular trauma is attributed to higher occupational exposure in fields such as construction, agriculture, and transportation, greater participation in outdoor activities, and a higher propensity for risk-taking behaviour. Vats et al., in their study from Delhi, reported 76.4% male patients, while Krishnaiah et al. from southern India noted a similar male predominance of approximately 80% [9,15]. Our figure of 83% is in concordance with these findings and underlines the need to target male workers in preventive eye-care programmes.

Age Distribution:-

The 20–30 year age group was the most commonly affected, accounting for approximately 23% of all cases, followed by the pediatric age group (≤ 16 years) which constituted 16% of patients. The elderly population (≥ 70 years) was the least affected, representing only 2% of cases. This age distribution is consistent with multiple Indian studies, which report the highest incidence of ocular trauma in the economically active age group of 15–45 years [10,16]. Young adults engaged in outdoor occupations and commuting are at the greatest risk of RTA-related and occupational eye injuries. The significant proportion of pediatric cases highlights the vulnerability of children to play-related and household ocular injuries, and reinforces the importance of age-specific preventive counselling. Shukla et al. reported a similar peak in the 21–30 year age group in their landmark Indian study [10].

Etiology and Mechanism of Injury:-

Road traffic accidents (RTAs) were by far the most common cause of ocular trauma in our study, accounting for 54% of all cases. This was followed by wood-related injuries (13%), stone injuries (6%), self-fall (5%), stick injuries (6%), rod injuries (4%), cricket ball injuries (4%), and a variety of other agents including bull horn, caustic lime,

sodium, assault, lentil stick, hot water, kerosene, hand injury, dog bite, and piston injury, each contributing 1–2% individually. This overwhelming predominance of RTAs as the leading etiology is consistent with studies from across India. Saxena et al. from Delhi and Shukla et al. from Varanasi both identified RTAs as the leading cause of ocular trauma, particularly in the urban and peri-urban settings [6,7]. The finding that agricultural and rural implements (wood, stick, bull horn) collectively constitute the second major group of causative agents is particularly relevant to Jhansi, which lies in the predominantly agrarian Bundelkhand region. This emphasizes the dual burden of road traffic and agriculture-related eye injuries in this geography. The presence of chemical injuries (caustic lime, sodium, kerosene) further underscores the need for chemical safety training and protective eyewear in domestic and occupational settings.

Type of Ocular Injury:-

Among the types of injuries recorded, adnexal injuries were the most frequent, constituting 34% of cases, followed by lamellar lacerations (20%), contusions (18%), penetrating injuries (16%), globe rupture (6%), chemical injuries (3%), and thermal injuries (3%). The predominance of adnexal injuries (comprising lid lacerations and periorbital trauma) is in keeping with the blunt and high-energy mechanisms of RTA-related trauma, where shattered windshields, dashboards, and airbags frequently impact the periorbital region [17]. Lid and adnexal lacerations were repaired in our institution, as illustrated in the clinical photographs, with good functional and cosmetic outcomes. Penetrating injuries, constituting 16% of cases, are of particular clinical significance given their risk of intraocular infection, sympathetic ophthalmia, and permanent visual loss. Globe rupture, observed in 6% of patients, represents the most severe form of closed-globe injury and typically requires urgent surgical exploration. The 3% incidence of chemical injuries, though seemingly low, is noteworthy as chemical burns — particularly alkali injuries — are ocular emergencies that can cause devastating and irreversible visual loss if not managed with immediate and copious irrigation [18]. Clinical cases of corneal tears repaired surgically, corneal scraping for incense-stick injuries, full-chamber hyphema, and periorbital swelling with subconjunctival haemorrhage were documented in this series, reflecting the diverse and sometimes severe clinical spectrum of ocular trauma at this institution.

Clinical Implications and Preventive Strategies:-

The findings of this study have important clinical and public health implications. The predominance of RTA-related injuries calls for stricter enforcement of road safety legislation, mandatory helmet and seatbelt use, and targeted eye-safety awareness campaigns for road users. Agricultural workers in the Bundelkhand region should be educated on the risks of ocular trauma from farming implements and provided with appropriate protective eyewear. The significant proportion of pediatric cases necessitates school-based eye safety education and parental awareness programmes. Early presentation and prompt ophthalmic intervention — including timely wound closure, prophylactic antibiotics, and, where indicated, vitreoretinal surgery — are critical to optimising visual outcomes. The functional results of surgical interventions performed at our institution, including corneal repair and lid laceration repair, were satisfactory, consistent with the outcomes reported by comparable tertiary centres [19,20]. Limitations This study has certain limitations. Being a single-centre prospective study with a relatively small sample size of 100 patients over six months, the findings may not be fully representative of the broader regional or national picture. Visual outcome data and long-term follow-up were not included in the current analysis, limiting assessment of functional prognosis. A larger multi-centre study with extended follow-up and validated outcome measures such as the Ocular Trauma Score would provide more robust data for policy formulation.

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