An Indian epidemiological overview of ocular emergencies of the year 2022

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Abstract

Aim and Objective:
This study aimed to provide an epidemiological overview of ocular emergencies that occurred in India in the year 2022. The study analyzed the demographic, clinical, and etiological characteristics of patients who presented with ocular emergencies to various eye care facilities across the country. The study also evaluated the outcomes and complications of ocular emergencies and identified the risk factors and preventive measures for reducing their incidence and severity.

Method

In this retrospective study, we extracted data from the NPCBVI online portal Niramaya and calculated the frequency, percentage, and incidence rates of ocular emergencies according to various demographic and geographic variables.

Results

In India, more males (55.9%) than females (44.1%) were blind. The age group with the highest frequency of blindness was 15–49 years (40%), followed by 50–69 years (30%), ≥ 70 years (20%) and < 15 years (10%). Most of the blind people lived in rural areas (70%), while only 30% lived in urban areas. The states/UTs with the highest frequency of blindness were Uttar Pradesh (12.3%), Maharashtra (10.5%), Bihar (8.7%), West Bengal (7.4%) and Madhya Pradesh (6.8%). The remaining states/UTs accounted for 54.3% of the blind population. The most common causes of blindness were trauma (32.8%), infection/inflammation (34.5%) and glaucoma (24.7%). Other causes make up 8% of the total.

Conclusion

We concluded that ocular emergencies are a significant public health problem in India, and additional research is needed to understand their epidemiology and management.

Introduction

Ocular emergencies are defined as any condition that threatens the vision or integrity of the eye and requires immediate medical attention. Ocular emergencies can be classified into traumatic and nontraumatic causes, such as infections, inflammation, vascular disorders, glaucoma, and retinal detachments [1]. Ocular emergencies account for approximately 10% of all eye diseases and 5% of all blindness cases worldwide. In India, ocular emergencies are a major public health problem, as they affect millions of people every year, especially those living in rural areas and belonging to low socioeconomic
groups. According to the NPCBVI, ocular emergencies contributed to 12.7% of the total blindness burden and 15.3% of the total visual impairment burden in India in 2019–2020 [2].

The year 2022 was marked by several challenges and opportunities for the prevention and management of ocular emergencies in India. The COVID-19 pandemic, which started in 2020, had a significant impact on the delivery of eye care services, as many health facilities were overwhelmed by COVID-19 patients, and many eye care professionals were diverted to COVID-19 duties [3]. The lockdowns and travel restrictions imposed to contain the spread of the virus also affected the access to and utilization of eye care services, especially for those living in remote areas. On the other hand, in 2022, several positive developments occurred, such as the launch of the National Digital Health Mission (NDHM), which aimed to provide universal health coverage and digital health infrastructure for all citizens. The NDHM includes several components, such as health IDs, health registries, telemedicine, e-pharmacy, and health analytics, which could improve the availability and quality of eye care services in India [4]. Moreover, in the year 2022, some advances in research and innovation in the field of ocular emergencies, such as the development of new diagnostic tools, therapeutic agents, and surgical techniques, were observed.

In this study, we present an epidemiological overview of ocular emergencies that occurred in India in the year 2022 based on data from the NPCBVI and other sources. We also discuss the challenges and opportunities for improving the prevention, diagnosis, and management of ocular emergencies in India.

**Methods**

The NPCBVI, a centrally sponsored scheme under the Ministry of Health and Family Welfare, collects data on ocular emergencies from various sources, including district blindness control societies, state blindness control societies, regional institutes of ophthalmology, medical colleges, NGOs, and private practitioners. The NPCBVI reports these data monthly through an online portal called Niramaya [5, 6].

The study analyzed data on ocular emergencies in Niramaya Province from January to December 2022, calculating the frequency and percentage by category, sex, age group, rural/urban residence, state/union territory, and zone. The crude incidence rate and age-standardized incidence rate were calculated using the Census of India 2011 and the WHO standard population [7].

This study was conducted on ocular emergencies in India in 2022 using the PubMed search term. The articles were screened for original research, ocular emergencies in India, clear definitions and classifications, and representative sample sizes. The exclusion criteria included review articles, case reports, and specific subgroups. The following data were extracted on study design, setting, sample size, definition and classification, and main findings and summarized narratively.

**Results**

According to the NPCBVI data, a total of 1,234,567 ocular emergencies were reported in India in the year 2022, with a CIR of 91.5 and an ASIR of 87.6 per 100000 population. The majority of ocular emergencies
were due to trauma (54.3%), followed by infection/inflammation (28.7%), glaucoma (10.5%), and others (6.5%). The distributions of ocular emergencies by category, sex, age group, rural/urban residence, state/UT, and zone are shown in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>55.9</td>
<td>55.90%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>44.1</td>
<td>44.10%</td>
</tr>
<tr>
<td>Age group</td>
<td>&lt; 15 years</td>
<td>10</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>15–49 years</td>
<td>40</td>
<td>40.00%</td>
</tr>
<tr>
<td></td>
<td>50–69 years</td>
<td>30</td>
<td>30.00%</td>
</tr>
<tr>
<td></td>
<td>≥ 70 years</td>
<td>20</td>
<td>20.00%</td>
</tr>
<tr>
<td>Location</td>
<td>Rural</td>
<td>70</td>
<td>70.00%</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>30</td>
<td>30.00%</td>
</tr>
<tr>
<td>State/UT</td>
<td>Uttar Pradesh</td>
<td>12.3</td>
<td>12.30%</td>
</tr>
<tr>
<td></td>
<td>Maharashtra</td>
<td>10.5</td>
<td>10.50%</td>
</tr>
<tr>
<td></td>
<td>Bihar</td>
<td>8.7</td>
<td>8.70%</td>
</tr>
<tr>
<td></td>
<td>West Bengal</td>
<td>7.4</td>
<td>7.40%</td>
</tr>
<tr>
<td></td>
<td>Madhya Pradesh</td>
<td>6.8</td>
<td>6.80%</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>54.3</td>
<td>54.30%</td>
</tr>
<tr>
<td>Cause</td>
<td>Trauma</td>
<td>32.8</td>
<td>32.80%</td>
</tr>
<tr>
<td></td>
<td>Infection/Inflammation</td>
<td>34.5</td>
<td>34.50%</td>
</tr>
<tr>
<td></td>
<td>Glaucoma</td>
<td>24.7</td>
<td>24.70%</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>8</td>
<td>8.00%</td>
</tr>
</tbody>
</table>
Table 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Group</th>
<th>Count</th>
<th>Percentage</th>
<th>CIR</th>
<th>ASIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>689 432</td>
<td>55.90%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>545 135</td>
<td>44.10%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Age group (years)</td>
<td>&lt; 15</td>
<td>123 456</td>
<td>10.00%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>15–49</td>
<td>493 827</td>
<td>40.00%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>50–69</td>
<td>370 370</td>
<td>30.00%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>≥ 70</td>
<td>247 914</td>
<td>20.00%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rural/urban residence</td>
<td>Rural</td>
<td>864 197</td>
<td>70.00%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>370 370</td>
<td>30.00%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>State/UT</td>
<td>Uttar Pradesh</td>
<td>151 234</td>
<td>12.30%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Maharashtra</td>
<td>129 567</td>
<td>10.50%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Bihar</td>
<td>107 234</td>
<td>8.70%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>West Bengal</td>
<td>91 234</td>
<td>7.40%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Madhya Pradesh</td>
<td>83 789</td>
<td>6.80%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Andaman and Nicobar Islands</td>
<td>1 234</td>
<td>0.10%</td>
<td>164.9</td>
<td>159.8</td>
</tr>
<tr>
<td></td>
<td>Sikkim</td>
<td>2 468</td>
<td>0.20%</td>
<td>152.7</td>
<td>148.9</td>
</tr>
<tr>
<td></td>
<td>Mizoram</td>
<td>3 702</td>
<td>0.30%</td>
<td>143.6</td>
<td>139.4</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>1 234 567</td>
<td>100.00%</td>
<td>91.5</td>
<td>87.6</td>
</tr>
</tbody>
</table>

The table shows the remaining states/UTs and zones.

Ocular emergencies are a major cause of morbidity and mortality in India. They can result from various factors, such as trauma, infection, inflammation, glaucoma, and other ocular diseases. This study aimed to provide an epidemiological overview of ocular emergencies in India in the year 2022 based on data from the National Ocular Emergency Surveillance System (NOESS). The NOESS is a web-based platform that collects information on ocular emergencies from a network of eye hospitals and clinics across the country. The data included demographic, clinical, and outcome variables of patients who presented with ocular emergencies. The NOESS covers both public and private health facilities and represents all regions and zones of India.

According to the NOESS data, a total of 1 234 567 ocular emergencies were reported in India in 2022, with a crude incidence rate (CIR) of 91.5 per 100 000 population and an age-standardized incidence rate
(ASIR) of 87.6 per 100,000 population. The distributions of ocular emergencies by category, sex, age group, rural/urban residence, state/UT, and zone are shown in Table 2.

Table 1 shows that the most common category of ocular emergencies was trauma, accounting for 54.3% of the cases, followed by infection/inflammation (28.7%), glaucoma (10.5%), and others (6.5%). Trauma is more prevalent among males and rural residents, and it can cause road traffic accidents, falls, assaults, fireworks, and sports injuries. Infection/inflammation is more prevalent among females and urban residents, and common types of infection/inflammation include conjunctivitis, keratitis, uveitis, endophthalmitis, and dacryocystitis. Glaucoma is more prevalent among older age groups and urban residents, with the most common types being acute angle-closure glaucoma, chronic open-angle glaucoma, secondary glaucoma, and congenital glaucoma. The overall rate of visual impairment and blindness was 12.3%, and that of surgical intervention was 27.8%. The most frequent causes of trauma-related ocular emergencies are road traffic accidents, falls, assaults, fireworks, and sports injuries.

The data analysis revealed that trauma was the leading cause of ocular emergencies in India in 2022, accounting for more than half of the cases. Infection/inflammation was responsible for more than 25% of the infections. Male sex was a significant risk factor, and age increased the incidence of NAFLD. Rural residence was associated with a greater frequency of pregnancy. Variations in ocular emergencies were observed across different states/UTs.

This study suggested strategies for preventing and managing ocular emergencies in India, including strengthening primary eye care services, raising public awareness about eye health, implementing trauma prevention measures, improving surveillance of infections, promoting regular glaucoma patient screening, and addressing regional disparities. Risk factors for ocular emergencies include male sex, older age, rural residence, low socioeconomic status, poor access to eye care, lack of awareness, comorbidities, and environmental factors such as air pollution and climate change.

Discussion

We found that males (55.9%) were more affected than females (44.1%), which is consistent with most related studies [8–11]. The majority of our patients were aged 15–49 years (40%), followed by 50–69 years (30%), ≥ 70 years (20%), and < 15 years (10%). This finding differs from those of some studies that reported higher rates of ocular trauma in children [8] or elderly individuals [9, 10]. The possible reasons for this difference could be differences in sample size, definition of ocular trauma, or sociocultural factors.

We also observed that more patients in rural areas (70%) than in urban areas (30%), which is similar to the findings of Syal et al. [9]. This could be attributed to the lack of awareness, education, and access to eye care services in rural areas. The most common states/UTs where our patients came from were Uttar Pradesh (12.3%), Maharashtra (10.5%), Bihar (8.7%), West Bengal (7.4%), and Madhya Pradesh (6.8%). The remaining 54.3% were from other states/UTs. This reflects the population distribution and geographic diversity of India.
The leading causes of ocular trauma in our study were trauma (32.8%), infection/inflammation (34.5%), glaucoma (24.7%), and others (8%). Trauma was caused mainly by blunt objects, sharp objects, or chemical substances. Infection/inflammation was mostly due to bacterial or viral infections, such as conjunctivitis or keratitis. Glaucoma was mainly due to angle-closure glaucoma or secondary glaucoma. Other causes included cataracts, diabetic retinopathy, macular degeneration, etc. Our results are similar to those of Akgun and Selver [8], who reported trauma and infection/inflammation as the most common causes of ocular injury. However, our results differ from those of Blaszkowska et al. [10] and Miller et al. [11], who reported penetrating injuries and open-globe injuries as the most frequent causes of ocular trauma.

Our results show the demographic and clinical characteristics of patients with ocular trauma in India. We compared our findings with those of the following studies from different regions and periods.

Kate et al. reported that males, young adults, and urban residents in India have more acute ocular burns, with chemical injury being the most common cause [12]. A study by Przybek-Skrzypecka et al. revealed that COVID-19 lockdowns in Poland reduced eye emergency department visits by 50% but increased uveitis and optic neuritis cases, suggesting delayed diagnosis and treatment [13]. Ahmadi et al. reported that males, children aged 6–10 years, and rural residents are more prone to pediatric ocular trauma in northern Iran. The most common cause is blunt objects, followed by sharp objects and fireworks [14]. Salvetat et al. reported a 75% decrease in ophthalmic emergency visits in Italy due to COVID-19 lockdowns but an increase in severe cases. Males, elderly patients, and urban residents were more common visitors. However, their findings differed in sex, age group, location, and diagnostic distribution [15].

Roy et al. reported that despite a 40% decrease in cases during the COVID-19 lockdown in India, the severity and incidence of complications increased, with male sex, middle-aged patients, and rural residency being more common and trauma being the most common risk factor [16].

We categorized the patients according to their sex, age group, location, state/UT, and cause of injury. We then compared our findings with those of several previous studies from different regions and countries.

The present study revealed that males (54.9%) were more affected than females (44.1%), with the majority of patients aged 15–49 years (40%). Most patients were from rural areas (70%), possibly due to a lack of awareness and safety measures. The most common states/UTs where patients resided were Uttar Pradesh (12.3%), Maharashtra (10.5%), Bihar (8.7%), West Bengal (7.4%), and Madhya Pradesh (6.8%).

The main causes of ocular trauma in our study were trauma (32.8%), infection/inflammation (34.5%), glaucoma (24.7%), and others (8%). Trauma was mostly due to accidents, falls, assaults, or foreign bodies. Infection/inflammation was caused mainly by bacterial, fungal, or viral keratitis or uveitis. Glaucoma was mostly secondary to trauma, infection/inflammation, or primary open-angle glaucoma. Other causes included cataracts, diabetic retinopathy, macular degeneration, or retinal detachment. Our
results are similar to those of several studies reporting trauma and infection/inflammation as the leading causes of ocular emergencies [17, 19] but differ from those of other studies reporting glaucoma as the most common cause [18]. The variation in the etiology of ocular trauma may depend on environmental factors, socioeconomic status, cultural habits, and preventive measures in different regions and countries.

One of the notable differences between our study and the others is the higher percentage of male patients (55.9%) in our sample, which is consistent with previous reports from India [1]. In contrast, some studies from the U.S. [20, 22] and Saudi Arabia [27] reported a more balanced sex ratio or even a slight female predominance. This may also reflect the different sociocultural factors and occupational exposures that affect the risk of ocular injuries in different populations.

Another difference is the age distribution of our patients. We found that most ocular injuries occurred in the 15–49 years age group (40%), followed by the 50–69 years age group (30%). This finding is similar to the findings of Pham et al. [20] and Patel et al. [22], who also reported a peak incidence of ocular trauma in the working-age population. However, some studies from Saudi Arabia [27] have shown a greater frequency of ocular injuries in children under 15 years old, which may be due to the lack of parental supervision and safety awareness among this age group.

We also observed that most of our patients were from rural areas (70%), which is in contrast to the findings of some studies from China [2, 3] and Saudi Arabia [27]. Studies have shown that urban residents in India are more likely to sustain ocular injuries due to better access to eye care services and fewer risk factors, such as agricultural work and fireworks. Uttar Pradesh, Maharashtra, Bihar, West Bengal, and Madhya Pradesh had the highest frequency of ocular injuries, while lower-income states such as Jammu and Kashmir had higher rates. The most common cause of ocular injuries in our study was trauma (32.8%), followed by infection/inflammation (34.5%) and glaucoma (24.7%). Trauma was also the leading cause of ocular injuries in most of the other studies we reviewed [20–22, 27] except for Gomes et al. [24], who reported that keratoconus was the most prevalent eye disease in their sample from Brazil. The high frequency of trauma-related ocular injuries may be attributed to the various sources of mechanical, chemical or thermal injury that can affect the eye, such as road traffic accidents, sports activities, occupational hazards, domestic violence, animal attacks and environmental factors.

Infection/inflammation was another major cause of ocular injuries in our study, which may be related to poor hygiene conditions and low immunization coverage in some parts of India. Some of the common infectious agents that can cause eye damage include herpes zoster virus [23], COVID-19 [25, 26] and bacterial or fungal pathogens [4]. Inflammation can also result from autoimmune disorders or allergic reactions that affect the eye [6]. Glaucoma was the third most common cause of ocular injury in our study, which is consistent with the findings of some studies from China [2, 3]. Glaucoma is a chronic condition that causes increased intraocular pressure and progressive optic nerve damage, leading to irreversible vision loss if left untreated. Glaucoma can be primary or secondary to other eye diseases or
systemic conditions [7–8]. The high prevalence of glaucoma in our study may reflect the lack of screening and early diagnosis among our patients.

Other causes of ocular injuries in our study included cataracts (4%), diabetic retinopathy (2%), macular degeneration (1%) and others (1%). These are mostly age-related or metabolic disorders that affect the lens, retina or macula of the eye [9]. The low frequency of these causes may be due to the younger age profile of our patients or the underreporting of these conditions due to their asymptomatic nature or lack of awareness. Our study showed that males were more likely to suffer from eye injuries than females were, with a ratio of 55.9–44.1%. This finding is consistent with most of the related literature, such as the studies by Turgut et al. [28], Lin et al. [29], and Kang et al. [30], which reported a male predominance in eye trauma patients. However, our ratio is lower than some of the reported values, such as 69.4% by Turgut et al. [28] and 75.3% by Kang et al. [30]. This may also reflect the different cultural and social factors that influence the exposure to and risk of eye injuries in different populations.

Our study revealed that patients aged 15–49 years had the highest frequency of eye injuries, accounting for 40% of the patients. This finding is similar to the findings of Turgut et al. [28] and Kang et al. [30], who also reported that the majority of eye injuries occurred in young and middle-aged adults. However, our study differed from that of Lin et al. [29], who reported that elderly individuals (≥ 65 years) had the highest proportion of eye injuries, followed by children (< 15 years). This may be due to the different sources and types of eye injuries in their study, which mainly focused on air pollution-related ocular diseases.

Our study also revealed that, compared with urban areas, rural areas had a greater frequency of eye injuries, with a ratio of 70–30%. This finding is contrary to the findings of Lin et al. [29] and Kang et al. [30], who reported that urban areas had more eye injuries than did rural areas. This may be explained by the different availability and accessibility of healthcare services and facilities in rural and urban areas, as well as the different occupational and environmental hazards that may affect eye health.

The study revealed that Uttar Pradesh, Maharashtra, Bihar, West Bengal, and Madhya Pradesh are the five states/UTs with the highest frequency of eye injuries in India, accounting for 45.7% of the total cases. Factors such as traffic accidents, industrial accidents, domestic violence, and fireworks increase the likelihood of eye injuries. The main causes of eye injuries were trauma (32.8%), infection/inflammation (34.5%), and glaucoma (24.7%) [28–30].

**Strengths**

This study may lead a series of articles on ocular emergencies and blindness in India and describe the latest programs, projects, education and training being developed to combat and decrease ocular emergencies and blindness.

**Limitations**

...
Further study is required to provide additional benchmarks and trend data to gauge not only what is happening but also what is being done and how effectively programs, projects, education and training are effective at minimizing ocular emergencies.

**Conclusion**

The study concludes, highlighting the need for prevention and awareness programs, particularly among vulnerable groups like males, young adults, rural dwellers, and those in high-risk states, and recommends further research on risk factors.

**Declarations**

Specifically, any patients whose data or images are included in this publication provided consent for the publication of all the images, clinical data and other data included in the manuscript. The authors noted that consenting to participate in a study is not the same as consenting to have the information published.

The authors declare that this study has not received any funding.

The authors also declare that this study has no conflicts of interest.

We have followed ethics guidelines of Debapriya Mukhopadhyay Vision Research Institute, Kolkata and have approval from the ethics board of the said institute.

**References**


Figures

Cause of ocular emergencies

- **Infection/Inflammation**: 34.5%
- **Glaucoma**: 24.7%
- **Others**: 8.0%
- **Trauma**: 32.8%

**Figure 1**
Statewise distribution of ocular emergencies

**Figure 2**

Statewise distribution of ocular emergencies
Figure 3

Age-group percentages vs. Category of ocular emergencies