

# Advocacy in action: preventing eye injuries in India

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## Abstract

*Purpose:* To summarise key areas of ophthalmic trauma in India and propose prevention measures.

*Study design:* Descriptive review and expert opinion.

*Methods:* Key data presented by members and office bearers of the Ocular Trauma Society of India (OTSI), All India Ophthalmological Society, and Asia-Pacific Ophthalmic Trauma Society (APOTS) at a meeting of the National Human Rights Commission India on September 21, 2022 are summarised in this review. To study the incidence of eye injuries in India, the International Globe and Adnexal Trauma Epidemiology Study (IGATES) registry (a global web-based database platform for ophthalmic trauma developed by APOTS in collaboration with OTSI) was employed. IGATES makes use of cloud computing to collect and store data regarding ocular trauma worldwide.

*Results:* Eye injuries remain the leading cause of preventable monocular vision loss in India. In this study, 2,528 Indian patients presented with ocular trauma, 1,980 of which (78.3%) were males and 548 were females (21.7%). The mean age of the patients was 31.1 ± 17.4 years. Of all the cases, 281 (11.2%) were due to road traffic accidents (RTA), 70 (2.77%) were chemical injuries, and 43 (1.70%) were fireworks-re-

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lated. There is an association between the use of eye protection and final best corrected visual acuity ( $p = 0.04$ ). In light of this, several strategies are suggested to prevent the incidence or reduce the severity of eye injuries.

*Conclusion:* Given the high prevalence of RTA-related cases and the wide use of fireworks in many festive celebrations such as Diwali, it is paramount to look into ways to reduce the incidence of such injuries.

*Keywords:* eye injury, India, injury prevention, vision loss

## Tindakan advokasi: pencegahan kecederaan mata di India

### Abstrak

*Tujuan:* bagi merumuskan bidang utama dalam trauma oftalmik dan mencadangkan langkah-langkah pencegahan.

*Bentuk kajian:* Ulasan deskriptif dan pendapat pakar.

*Keputusan:* Kecederaan mata masih menjadi penyebab utama kehilangan penglihatan monocular yang boleh dicegah. Dalam kajian ini, seramai 2,528 pesakit dari negara India terlibat dalam trauma ocular, 1,980 (78.3%) adalah lelaki dan 548 (21.7%) adalah perempuan. Umur purata mereka adalah  $31.1 \pm 17.4$  tahun. Dari keseluruhan kes ini, 281 (11.2%) adalah akibat dari kemalangan jalan raya (RTA), 70 (2.77%) adalah kecederaan akibat bahan kimia dan 43 (1.70%) adalah disebabkan kecederaan akibat mercun. Terdapat hubungkait yang signifikan diantara penggunaan pelindung mata dan ketajaman penglihatan selepas rawatan ( $p = 0.04$ ). Berdasarkan dapatan ini, beberapa strategi telah dicadangkan bagi mengurangkan insiden dan juga keterukkan kecederaan mata di India.

*Kesimpulan:* Dengan kecederaan mata yang tinggi akibat RTA dan penggunaan mercun secara meluas terutama semasa musim perayaan seperti Diwali adalah amat disarankan supaya langkah terbaik diperincikan bagi mengurangkan insiden kecederaan mata.

*Kata kunci:* kecederaan mata, kehilangan penglihatan, India, pencegahan kecederaan

## Introduction

Eye injuries in India remain a leading cause of monocular vision loss and result in significant social, economic, psychological, and personal consequences.<sup>1-3</sup> The Ocular Trauma Society of India (OTSI), chaired by Dr. Ashok Grover, and its members have made significant progress in understanding the causes of these injuries and improving management and access to care across India. The OTSI along with the Asia-Pacific Ophthalmic Trauma society (APOTS) are significant contributors to the activities in research, advocacy, and education in the field of ophthalmic trauma.

The social, economic, and psychological impact on the victims and their families is significant.<sup>2-7</sup> The primary causes of eye injuries in India include road accidents, sports and recreation, occupation related, domestic accidents, and games such as “tir-kamaan”, bow and arrows, and “gulli-danda”. The global burden of eye injury internationally is significant, with 6 million blind, 2.3 million visually impaired bilaterally, and 1.9 million having unilateral vision loss.<sup>8</sup>

The eyes are an important part of overall health. With 7% of all injuries affecting eyes, this emphasises the scale of the problem. Further, 5% of blind deaths are due to an eye injury, acknowledging that it is also a preventable cause of death. Ocular trauma impacts not only physical and mental health, but employment and livelihood. A regulatory framework with a pragmatic approach is needed.

At least 5% of Indians have ocular trauma at least once in their lifetime and 55% of the victims are below the age of 25 years. In 2008, the prevalence of eye injury in Delhi was 2.4%, and out of these, 11.4% were blind. Paediatric ocular trauma presents specific challenges, such as difficulty in assessment of visual acuity, amblyopia, and comorbidities, amongst others.

Up to 90% of eye injuries are preventable; thus, strategies for avoidance are critical.<sup>9</sup> On September 21, 2022, office bearers and members of OTSI, APOTS, and the All India Ophthalmological Society (AIOS) attended a meeting with the National Human Rights Commission of India (NHRC) to discuss modalities to prevent, minimise, and mitigate ophthalmic trauma in India. The meeting was chaired by NHRC's Justice Shri Arun Mishra, Honorable Chairperson, and was attended by all members of the NHRC and the joint secretary Shri H.C. Chaudhary. The aim of this paper is to summarise the discussions and outcomes from the meeting, which served to highlight the impact of ocular trauma and provide an action plan for prevention in India.

## Methods

Representatives from AIOS, OTSI, and APOTS gave commentary on the scale of eye injuries in India, supported in particular by the data of the International Globe and Adnexal Trauma Epidemiological Study (IGATES). The methods associated with IGATES have been published.<sup>10</sup> IGATES ([www.igates.oculartrauma.com](http://www.igates.oculartrauma.com)) has undertaken effective data collection through their web-based encrypted uniform platform.<sup>4,11-13</sup>

## Results

A total of 2,527 eye injuries were identified from 15 sites in India. The distribution of eye injuries by age demonstrated 2 peak age groups for ophthalmic trauma, 2–30 and 30–40 years of age (23.7% and 23.3%, respectively). The majority of injuries occurred in the home (51.2%), with the workplace (20.8%) and then road traffic accidents (11.6%) the next largest contributors. Sharp (41.3%) and blunt (42.3%) were the leading mechanisms of injury, and metal (30.2%) and other (30.0%) the leading objects of injury.

A total of 30 patients were identified to be wearing some form of eye protection at the time of injury, which included safety spectacles (43.2%) as well as helmets and goggles (26.7% each). A total of 761 injuries were open globe injuries, with 606 (79.3%) of these resulting in best-corrected visual acuity (BCVA) of < 6/60. From a total of 1,433 closed globe injuries, 251 (17.5%) had a BCVA of < 6/60.

## Discussion

Implementation requires a multidimensional approach that should include:

- Education and awareness at primary, secondary, and tertiary level of formal education.
- Regular updating of safety guidelines.
- Regular public outreach awareness programs via media such as television, radio, social media, and print.
- Warnings on chemicals.
- Proper packaging, moderate use, or ban on firecrackers.
- Higher road safety compliance,
- Availability and accessibility to early and appropriate treatment.

Every year 3% GDP is lost due to ocular trauma. This loss of vision not only affects the individual but leads to the cost of the need of rehabilitation, impacts their education and employability, loss of livelihood, social and economic impact on the family and larger community, and the emotional impact of suffering from mental

illnesses such as depression and stress.

Accurate data plays an important role in the development of prevention strategies for agencies, such as the National Programme for Control of Blindness and Visual Impairment (NPCBVI), ministries, institutions/hospitals, and community ophthalmology departments. The use of an eye injury prevention model comprising the 5 steps of Elimination, Substitution, Engineering Controls, Administration Controls, and Personal Protective Equipment, as well as the role of education, standards, policies, laws, and rules are all important elements in eye injury prevention.

Chemical agents are one of the most prevalent causes of eye injury in India, including from bursting firecrackers. Awareness from policymakers to teachers and children is key to prevention. Campaigns about safe packaging, safe handling of chemicals, and prevention of chemical injuries in the workplace must be initiated to educate policymakers, factory owners, teachers, and children to prevent chemical injuries. Regulatory measures such as double packaging of household chemicals, *e.g.*, Chuna lime and bleaching agents, should be developed in order to prevent chemical injuries. A checklist containing the 'dos' and don'ts' relating to the use of chemicals could be developed in order to successfully prevent eye injuries. Teaching awareness regarding the lethal effects of chemicals can be a first step, followed by a framework and measures for safety.

Standards for eye protection in occupational environments should be formulated and enforced, along with ensuring accessibility of personal protective equipment for workers. Social media can be utilized to disseminate information pertaining to prevention of ocular trauma, with a National Trauma Day around an appropriate theme every year to educate and create awareness on prevention and management of ocular trauma. The formation of an expert group to formulate standardised guidelines for management of ophthalmic trauma must be considered.

Road traffic accidents on highways account for 40% and the total loss of Indian GDP due to road accidents is 3%. It is important to address the gaps in regulations, mandatory vision certificates, and continuous review of passenger transport safety rules. A multipronged strategy should be adopted in order to combat ocular trauma by prioritising road safety and strict enforcement of laws and regulations, along with infrastructure and access to quality emergency care. Road accidents caused by drivers being either colourblind or having uncorrected visual acuity, sometimes even to the extent of monocular individuals driving, have been a significant factor. Equal importance to educational awareness, the need for sunglasses or protective glasses to protect the eyes from UV rays while driving, and wearing helmets and seatbelts in our respective vehicles should be highlighted.

Another common cause of ocular injuries in India is from industry. A program to successfully prevent such ocular injuries through raising awareness is needed. Meaningful slogans and QR codes containing key information and prevention measures could be employed. Eye protection should be readily accessible in industrial settings.

The eye-threatening and devastating nature of warfare has led to recommendation of deploying the National Disaster Response Force and emergency medical units in all vulnerable districts.

Agriculture-related eye injuries are often associated with environmental pollution, extreme temperatures, grinding work, and hammer work, amongst others. As per statistics, ocular foreign bodies account for the highest percentage of incidences in farming and rice-grain injuries account for the second highest percentage of incidences. Experts suggested avoiding facial exposure before opening containers or spraying chemicals such as pesticides and fertilisers. In addition to this, experts recommended careful handling of sharp instruments, frequent hand washing, and enhancing public awareness.

One of the key concerns identified is the delay in treatment due to a lack of ophthalmologists in many settings. An IGATES scorecard that can be made available in every clinic could be adopted as an efficient practice for diagnosing and treating eye injuries. A memorandum of understanding for the use of IGATES as a national database platform for ocular trauma has been signed with the AIOS and the OTSI.

## **Conclusion**

Eye injuries are preventable causes of blindness with a potential to cause profoundly negative social, psychological, and economic impact to the various stakeholders. In India, chemical injuries, road traffic accident-related injuries, and fireworks-related eye injuries are commonplace. With the implementation of suitable strategies, a positive impact can be reaped by individuals, their families, and society at large.

## **Declarations**

### **Ethics approval and consent to participate**

Not applicable.

### **Competing interests**

None to declare.

### **Funding**

None to declare.

### **Acknowledgements**

The authors wish to thank the NHRC officials and representatives from Indian ministries and government officials who joined the meeting:

#### National Human Rights Commission of India Officials

1. Justice Shri Arun Mishra, Hon'ble Chairperson
2. Justice Shri M.M. Kumar, Hon'ble Member
3. Dr. D.M. Mulay, Hon'ble Member
4. Shri Rajiv Jain, Hon'ble Member
5. Shri Manoj Yadav, Director General (I)
6. Shri D.K Singh, Secretary General
7. Shri Surajit Dey, Registrar (Law)
8. Shri H.C. Chaudhary, Joint Secretary
9. Smt. Anita Sinha, Joint Secretary
10. Ms. Aakanksha Sharma, Junior Research Consultant
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12. Ms. Srija, Junior Research Consultant
13. Ms. Prabhnoor Kaur, Junior Research Consultant
14. Ms. Architi Batra, Junior Research Consultant
15. Ms. Tejaswini, Junior Research Consultant

#### Representatives from the Union Ministries/Government Bodies

1. Mr. Rajesh Hans, Additional Director General, Ministry of Health and Family Welfare, Government of India
2. Mr. Himanshu Das, Director, Department of Social Justice and Empowerment, Ministry of Social Welfare, Government of India
3. Rd. Sandip Kumar, HoD, Ophthalmology, Ministry of Labour and Employment, Government of India
4. Rd. Rajeev Nayyar, Member, Federation of Indian Chambers of Commerce and Industry, Director, Medical Operations, Fortis Group of Hospitals
5. Rd. Shubnum Singh, Principal Advisor, Health, Confederation of Indian Industry
6. Mr. Shri H Kam Suanthang, Director, Department of Chemicals and Petrochemicals, Ministry of Chemical and Fertilisers, Government of India
7. Mr. P. C. Arya, Chief General Manager, National Highways Authority of India

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## Appendix 1

### Ocular trauma: measures to prevent, minimise, and mitigate its effects

1. Better implementation strategies and practices at primary, secondary and tertiary level that should include intervention in commonly identified places of injuries. Posting of Ocular Trauma Treatment Centres in the industrial areas and a better equipped 24-hour service of an ophthalmologist for emergency cases.
2. Paid low-vision development. The educational reservation and other reservations for blind individuals and those with low vision should be done and various government schemes must be devised in their favour. In order to gather data, help from the ICDS workers and teachers may be taken. Training programs for low-vision people.
3. Ministry of Labour and Employment emphasized that measures should be taken by people in the immediate vicinity to prevent the irreversible damage of the trauma from happening. Putting up screens with videos being played on loop in the hazardous locations so that people can see the course of action that has to be taken in case of an accident. Training to non-ophthalmologists should also be given on how to take care and what to do in preliminary stage in the situation of ocular trauma so that the basic care is provided to the victim/patient immediately.
4. The National Highway Authorities of India (NHAI) was set up in 1995 by the Act of Parliament and made functional in 1996. The main work of NHAI is maintenance of the NHAI network. NHAI is also responsible for construction of 2 to 4 lanes, reduce accidents, improve highway roads (short term and long term), construct over bridges, and traffic management, among others. Three days of eye testing camp was organized by NHAI in which several stakeholders such as NGOs and social entrepreneurs participated. In this camp, education and promotion was done regarding wearing of helmets, proper eye wear, seat belts, and reacting to hazards.
5. Loss of care in the 'golden hour' leads to preventable and non-preventable problems. Thus, time is extremely crucial in such cases and 24-hour emergency services should be set up to address such cases. Spreading awareness amongst the public about the need to go to a specialist and not a general physician in case of worry is extremely important. Regulatory mechanisms to prevent firecracker injuries by educating people not to use firecrackers in the crowded and residential areas.
6. The Confederation of Indian Industry (CII) drew attention towards the efforts of CII in this direction and highlighted the requirement of aid of other ministries and laid emphasis on dissemination of information. Further, the CII highlighted the multi-stakeholder initiative to tackle public health by Rd. Ran Deep Gulleria, Chairman, CII, Public Health Council and Director, All

India Institute of Medical Sciences. The CII recommended the need to reach out to children primarily in order to sensitise them as they are the carriers of information to their family. This will result in spreading awareness amongst people regarding ocular trauma.

7. Corporate social responsibility funds with companies which can be requested to be utilized towards helping this cause.

## Appendix 2

### Ocular trauma: key prevention recommendations

- i. A standardised proforma or online registry to register all cases of ocular trauma.
- ii. A regulatory authority or a regulatory framework for risk factor identification of firecrackers, especially in terms of quality and safety for the public.
- iii. Regulations with respect to safe dual packaging for use of household chemicals, as well as risk management and safety norms at workplace must be formulated in order to prevent chemical injuries from *chuna* packets.
- iv. Personal protective equipment must be made available to workers, sports persons, and drivers at risk.
- v. Low-cost eye protection such as goggles, spectacles, face shields, and helmets as well as proper washing areas must be ensured for industrial workers.
- vi. Access to quality emergency care for ocular trauma must be ensured.
- vii. Awareness campaigns such as slogans and QR code for information.
- viii. Re-emphasising public education through media, including social media.
- ix. Providing specialized fellowships on ocular trauma to train medical students.
- x. Road safety measures must be strictly enforced. Safety standardisation certificate along with the driving license may be issued. Regular eye check-ups, e.g., after every 2 years must be made mandatory for all driving license holders.
- xi. Training to non-ophthalmologists regarding first aid in cases of ocular trauma must also be given so that the basic care is provided to the victim/patient immediately.
- xii. Ocular Trauma Treatment Centres in industrial areas may be established with a 24-hour service of an ophthalmologist for emergency cases.
- xiii. Assistive technology for rehabilitation and public education.
- xiv. Adjustment training programmes for low-vision individuals must be made mandatory.
- xv. Inclusive as well as special schools for low-vision individuals may also be developed along with schools for the blind and/or visually impaired.