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Original Research Article

Comprehensive study on the incidence and impact of ophthalmological manifestations in head injuries in western India

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ABSTRACT

Aim: This study investigates ophthalmological manifestations in head injuries, emphasizing the diagnostic importance of ocular findings. It aims to identify factors mitigating severe ocular injuries and underscores the critical role of immediate NCCT BRAIN+ORBIT/MRI BRAIN+ORBIT imaging post-head injury for early diagnosis and management of both brain and ocular injuries.

Materials and Methods: One hundred fifty patients with head injuries and ocular manifestations were recruited at Civil Hospital, Ahmedabad, with informed consent obtained. Visual acuity was assessed, and thorough eye examinations were conducted, including radiological imaging when necessary. Follow-ups were performed post-injury. Inclusion criteria encompassed all ages and sexes with such injuries, while those unable or unwilling to participate were excluded.

Results: Incidence of ocular manifestations in our study were Periorbital Echymosis(36.34%), Subconjunctival Hemorrhage(10.34%), Conjunctival Chemosis(4.67%), Laceration of Upper Eyelid(2%), Hyphema (1.34%), EOM restricted (1.34%), Laceration of Lower Eyelid(1%), Proptosis(1%), Traumatic Iridodialysis(1%), Traumatic Cataract(0.67%), Globe Rupture(0.34%), Traumatic Third Nerve Palsy(0.34%).

Conclusion: From July 2020 to July 2022, 900 patients presented with head injuries at the trauma center, with 150 showing ocular manifestations. Protective gear like Helmets and Seatbelts has notably reduced Road Traffic Accident (RTA) casualties, and using radiological investigations such as CT BRAIN WITH ORBIT, X-RAY, MRI BRAIN WITH ORBIT aids in identifying ocular issues promptly, crucial for early management often missed in isolated clinical examinations.

1. Introduction

Head injuries, affecting 200-300 individuals per 100,000 annually, often present with ocular manifestations, significantly contributing to global visual disability.[1] Ocular trauma stands out as a leading cause of blindness, impacting over half a million individuals worldwide, with a notable prevalence in developing nations. The demographic most affected by these injuries are children and young adults, amplifying the socioeconomic implications associated with such incidents. Common ophthalmic findings in head injury cases include periorbital ecchymosis, subconjunctival hemorrhage, pupillary abnormalities, and retinal detachments, among others.[2] Unfortunately, these ocular signs are sometimes overlooked initially, leading to delayed ophthalmic evaluation and potential complications. Early recognition and correlation of these findings are crucial for accurately localizing the injury site, ongoing assessment, and determining patient prognosis.[3] The implementation of helmets and other protective measures

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within communities has shown a significant reduction in road traffic accidents, subsequently lowering the incidence of head injuries and the associated visual morbidity.[4,5] This preventive approach highlights the importance of injury prevention strategies in safeguarding individuals from the devastating consequences of head trauma on ocular health.

2. Materials and Methods

The study was conducted in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) and was approved by Local Ethics Committee of the institute. One hundred fifty patients presenting with head injuries associated with ocular manifestations were recruited at our trauma center, Civil Hospital, Ahmedabad. Written and informed consent was obtained from the patient or their relative. Visual acuity was assessed using methods such as counting fingers or, where possible, Snellen chart examination. The anterior segment was examined using a torchlight, with slit lamp examination conducted if feasible. Evaluation of the posterior segment was carried out using direct and indirect ophthalmoscopy or ultrasonography as required. Radiological imaging (CT scan/MRI) was utilized as needed and correlated with clinical findings. Detailed documentation of all findings was performed for both eyes. Follow-up assessments were conducted on day 3, day 7, and at 1 month post-injury to monitor patient progress.

2.1. Inclusion criteria

Patients with head injury of all age and sex having ocular manifestations.

2.2. Exclusion criteria

Patient who cannot give consent for participation in this study or unwilling for examination.

Data was analysed and compared by using appropriate statistical test SPSS 20.0 Recorded information was entered in the Microsoft excel worksheet.

3. Observation and Results

150 patients of Head Injury with ocular manifestations were included in our study after taking written and informed consent.

Age of patients ranged from 2 to 72 years with a mean of 32.79 years (+-14.55 years). Young Adult males (11-30 years) were the major group who sustained head injury. i.e., 71 of the 150 of head injury cases. (Table 1) The incidence of head injury was less during childhood, peaked in the third decades of life, and thereafter declined.

Out of 150 cases of head injury, 126 cases (84%) were Male and 24(16%) were Female.(Figure 1) The vulnerability of the young males is due to the increased association with outdoor activities.

Table 1: Age group distribution

	Frequency	Percent
1-10	7	4.67
11-20	23	15.33
21-30	48	32.00
31-40	27	18.00
41-50	31	20.67
51-60	7	4.67
61-70	6	4.00
71-80	1	0.67
Total	150	100.0

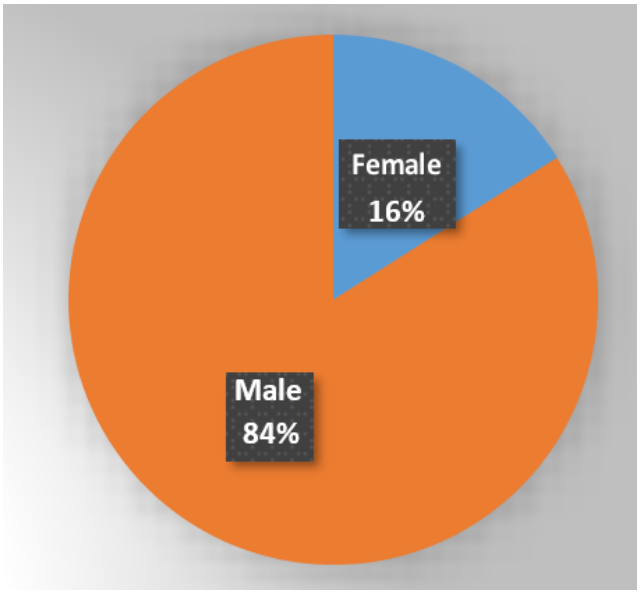

Figure 1: Gender distribution

Table 2: Mode of injury

Mode of Injury	Frequency	Percent
Assault	15	13.39
Fall down	18	16.07
RTA	117	78.0
Total	150	100.0

Road Traffic Accidents (RTA) was the most common cause of head injury in 117 cases (78%) followed by Fall down in 18 cases (16.07%). In remaining 15 patients cause of head injury is Assault (13.39%). (Table 2 and Figure 2)

Table 3: History of LOC present or not

H/O Loss of Consciousness (LOC)	Frequency	Percent
No	72	48.0
Yes	78	52.0
Total	150	100.0

This study highlights the low prevalence of helmet and seatbelt use and documents the potential reduction in the

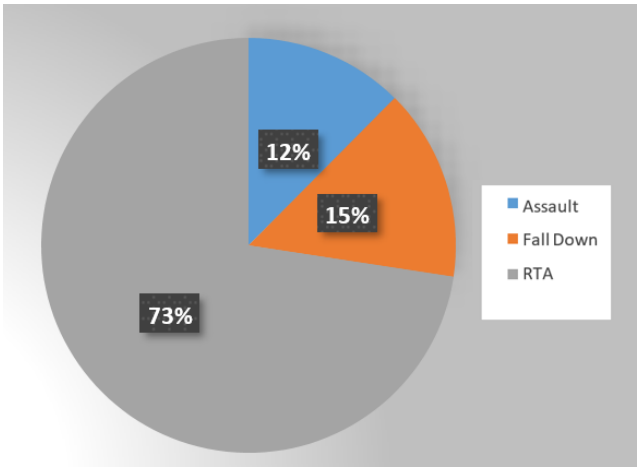

Figure 2: Mode of injury

Table 4: Use of protective measures or not

Use of protective measures	Frequency	Percent
No	114	75.33
Yes (Helmet)	32	21.33
Yes (Seatbelt)	4	2.67
Total	150	100.0

risk of head injuries if this risk factor was addressed. Out of 150 cases 36 cases (24%) used protective gears.(Table 4)

Incidence of ocular manifestations in our study is periorbital Echymosis (36.34%), Sub-conjunctival hemorrhage (10.34%), Conjunctival chemosis (4.67%), Laceration of Upper eyelid (2%), Hyphema (1.34%), EOM restricted (1.34%), Laceration of lower eyelid (1%), Proptosis (1%), Traumatic iridodialysis (1%), Traumatic cataract (0.67%), Globe rupture (0.34%), Traumatic third nerve palsy (0.34%).

Out of 150 patients of head injury only 32 patients had history of usage of protective gears and out of them 31 cases having good visual outcome (Table 9).

4. Discussion

Head injuries are defined as cases involving brain involvement evidenced by loss of consciousness, post-traumatic amnesia, neurological signs, or skull fractures. These injuries often affect the eyes, leading to neuro-ophthalmic deficits. While ophthalmologists typically focus on obvious ocular issues like contusions and lacerations, subtle manifestations can be equally crucial yet may be overlooked, especially in patients with reduced consciousness or concurrent injuries.[6]

This study examines ocular findings during the acute phase of head injury, including physical ocular trauma, orbital fractures, and neuro-ophthalmic issues. A comprehensive ocular assessment significantly contributes to understanding the injury's severity, prognosis, and ocular motor involvement, which are vital for effective rehabilitation.[7]

Pupillary signs play a critical role in indicating injury site and severity, as well as predicting prognosis. They help localize supratentorial injuries, hemorrhages, and pontine lesions, with Hutchison's pupillary signs signaling the need for urgent intervention.[8] Early identification of these signs could logically reduce subsequent morbidity and mortality rates.

In our study age of patients ranged from 2 to 72 years with a mean of 32.79 years (+-14.55 years). Young Adult males (16-30 years) were the major group who sustained head injury. i.e., 71 of the 150 of head injury cases. The incidence of head injury was less during childhood, peaked in the third decades of life, and thereafter declined. Out of 150 cases of head injury, 126 cases (84%) were male and 24(16%) were female. These findings align with those of other studies. For instance, Kulkarni et al.[3] demonstrated that young adult males aged 21–30 are particularly vulnerable, while Odebode et al. identified a peak occurrence during the third decade of life (21–30 years).[9]

Sharma et al. observed a peak vulnerability among individuals aged 21–40 years. This heightened risk among young people is attributed to their increased engagement in outdoor activities.[4]

Road Traffic Accidents (RTA) was the most common cause of head injury in 117 cases (78%) followed by Fall down in 18 cases (16.07%). In remaining 15 patients cause of head injury is Assault (13.39%) other studies also showed almost similar observations. Raju et al reported 47.5% of cases because of RTA and 32.5% of cases due to fall from height.[10]

Incidence of ocular manifestations in our study is Periorbital Echymosis (36.34%), Sub-conjunctival Hemorrhage (10.34%), Conjunctival Chemosis (4.67%), Laceration of Upper Eyelid (2%), Hyphema (1.34%), EOM restricted (1.34%), Laceration of Lower Eyelid (1%), Proptosis (1%), Traumatic Iridodialysis (1%), Traumatic Cataract(0.67%), Globe Rupture (0.34%), Traumatic Third Nerve Palsy (0.34%). Periorbital ecchymosis was 22%-27% in other studies. The incidence of subconjunctival haemorrhage was 10.58%. Pupillary abnormalities were found in 7.95% as in other studies.[11]

Rehabilitation of the head injury patient is much more difficult if the visual system is not efficient. Head injury patients may be difficult to examine because of cognitive and communication disorders. A complete assessment may include evaluation of the eye, refraction, and examination of ocular motility, accommodation, vergence, stereopsis, visual perception, and visual fields.[12,13]

This study highlights the low prevalence of helmet use and documents the potential reduction in the risk of head

Table 5: TLE/SLE on first presentation

Ocular findings	Unilateral		Bilateral		Total
	Number of Patients	% of Total Patients	Number of Patients	% of Total Patients	
Echymosis	47	27.33	62	48.44	109
Sub-Conjuctival hemorrhage	27	15.70	4	3.13	31
Conjuctival chemosis	8	4.66	6	4.69	14
Aswnl	62	36.05	56	43.75	118
Extraocular movements restricted	4	2.33	0	0	4
Globe rupture	1	0.59	0	0	1
Hyphema	4	2.33	0	0	4
Laceration of lower eyelid	3	1.75	0	0	3
Laceration of upper eyelid	6	3.51	0	0	6
Proptosis	4	2.33	0	0	4
Traumatic iridodialysis	3	1.75	0	0	3
Traumatic third nerve Palsy	1	0.59	0	0	1
Traumatic cataract	2	1.17	0	0	2
Total	172		128		300

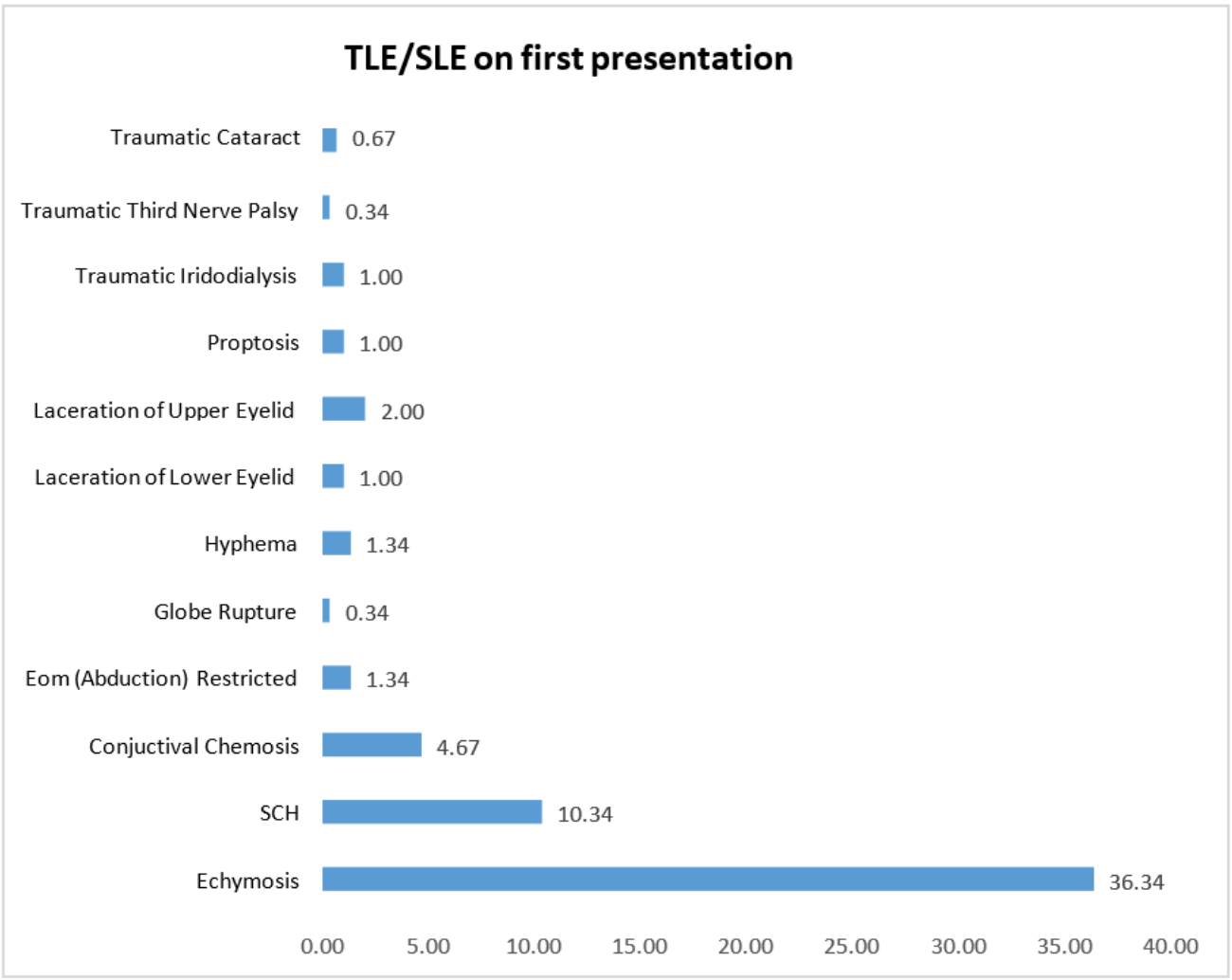

Figure 3: TLE/SLE on first presentation

Table 6: Pupillary reaction on first presentation

Ocular Findings	Unilateral		Bilateral		Total
	No. of Patients	% of Patients	No. of Patients	% of Patients	
DNS	2	3.33	0	0	2
IRR/S/S/NR- L	1	1.67	0	0	1
N/S/S/R-L	30	50	238	99.17	268
RAPD	13	21.67	0	0	13
SD/NR-L	13	21.67	2	0.83	15
MIOSIS	1	1.67	0	0	1
Total	60	20	240	80	300

Table 7: Posterior segment assessment on first presentation

Ocular Findings	Unilateral		Bilateral		Total
	No. of Patients	% of Patients	No. of Patients	% of Patients	
Berlin's Edema	5	5.69	4	1.89	9
Papilloedema	0	0	10	4.72	10
WNL	43	48.87	198	93.4	241
Choroidal Rupture	2	2.28	0	0	2
Details Not Seen	5	5.69	0	0	5
Optic Nerve Avulsion	2	2.28	0	0	2
Retinal Hemorrhage	3	3.41	0	0	3
Retinal Tear	1	1.14	0	0	1
Traumatic Macular Hole	1	1.14	0	0	1
Traumatic Optic Neuropathy	10	11.37	0	0	10
Retinal Detachment	3	3.42	0	0	3
Vitreous Hemorrhage	10	11.37	0	0	10
Terson's Syndrome	2	2.28	0	0	2
Total	88	29.33	212	70.67	300

Table 8: Showing visual acuity on presentation, day -3, day-7 and at 1 month

Visual Acuity	At presentation	At 3& 7th day	At 1 month
RE			
6/6-6/9		101	110
6/12-6/18			7
6/24-6/60		4	15
CF1M- HM+PL+PR+4	107	28	15
No PL	1	2	2
Uncooperative	42	15	1
LE			
6/6-6/9		119	132
6/12-6/18			4
6/24-6/60		4	4
CF1M- HM+PL+PR+4	107	11	6
No PL	1	1	3
Uncooperative	42	15	1

Table 9: Impact of usage of protective measure on visual outcome

		Visual Acuity		Total
		>=6/60	<6/60	
Use of Protective Measure	Yes	31	1	32
	No	94	24	118
Total		125	25	150

Chi square: 5.371; p value=0.020

injuries if this risk factor was addressed.

Out of 150 cases only 36 cases (24%) used protective gears. (Helmet and Seatbelt). Use of Protective measure led to better visual outcome in comparison with those who had not use any protective measures.

The passage of a traffic amendment bill showed negligible impact on helmet use. This highlights the need for a multi-faceted strategy that includes media campaigns and widespread enforcement in addition to legislative change for improving helmet use.[14]

Specific tests of optic nerve function such as contrast sensitivity, colour vision, optic nerve head morphology, field testing and visually evoked potential could not be carried out in the acute setting of this study; hence subtle optic neuropathy, especially in cases with normal or near normal Snellen acuity, could have been missed.[15]

5. Conclusion

From July 2020 to July 2022, 900 patients with head injuries presented at the trauma center, with 150 exhibiting ocular manifestations. The incidence of specific ocular conditions included periorbital ecchymosis (36.34%), subconjunctival hemorrhage (10.34%), traumatic optic neuropathy (11.37%), and others in varying frequencies. The use of protective gear, such as helmets and seatbelts, has significantly reduced road traffic accident casualties. Radiological investigations like CT and MRI scans are essential for identifying ocular conditions like optic nerve avulsion and globe rupture, which may be missed in clinical examinations. These imaging techniques facilitate rapid diagnosis and earlier management of ocular injuries.

6. Source of Funding

None.

7. Conflic of Interest

None.

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