ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 09 | September - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

OCULAR MANIFESTATIONSIN HEAD INJURY.

Neurosurgery

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ABSTRACT

Aims: To study a variety of ocular manifestations in cases of head injury admitted in a tertiary care hospital of Uttarakhand **Materials and Methods:** The present study was conducted on 352 patients admitted for head injury who were systematically screened for ocular manifestation. All patients underwent proper clinical evaluation including Glasgow Coma Scale (GCS), and Ocular Trauma Score (OTS). Out of 352 patients studied, 113 presented with Ocular findings while 239 did not exhibit any ophthalmic association. Those with Ocular Manifestations were further analysed for their distribution to look for any associated risk factor. **Results:** Out of 113 patients of head injury, 88(77.88%) were males, and 25 were females (22.12%) with the mean age found to be 35.19 ± 15.5 years. Most common mode of injury was found to be road traffic accident (RTA) in 89(78.76%) cases, followed by assault (12.39%), fall from height (7.96%) and sport (0.88%). Ocular findings included Lid edema +ecchymosis (68.14%), hyphema (2.65%), subconjunctival haemorrhage (38.94%), chemosis (13.27%), corneal edema (4.42%), rupture (3.54%), foreign body (2.65%), traumatic cataract (2.65%), vitreous haemorrhage (6.19%) and fracture lateral wall of the orbit (17.70%). OTS showed no significant association with mode of injury (P=0.081) and type of injury (P=0.591). **Conclusion:** In patients with head injury, many types of ocular manifestations can occur, leading to visual impairment at presentation. Young males presenting with fractures, Extra Dural Haemorrhage (EDH) and lower GCS scores are at a significantly higher risk of ocular morbidities.

KEYWORDS

Head injury, Ocular injury, GCS, OTS.

INTRODUCTION

Proximity of the human eye to the brain leads to a close association of ocular morbidities after head injury,[1-4]which include periorbital ecchymosis, subconjunctival abnormal pupillary reflexes, orbital margin fractures, corneoscleral rupture to posterior segment pathologies like retinal detachment and traumatic optic neuropathy.[5-10] In relation to head injury, early localization, and diagnosis of the ophthalmic manifestations becomes essential for better management and visual prognosis of the patients.[11]

Though, studies have been carried out in the southern and central parts of the of the Indian subcontinent,[12-14] but in the state of Uttarakhand, North India, such studies have been seldom done. The present study holds relevance as it has been conducted in a tertiary care hospital which is also a superspecality and polytrauma centre. The study helps to determine the ophthalmic manifestations and their risk factors associated with head injury.

METHODS

The study was conducted from May 2021 to December 2022 after clearance from the institutes ethical committee. Patients presenting with head injuries resulting from Road traffic accidents, Physical assault including gunshot and stick injuries, fall from height and sport injuries, with ocular manifestations were included in the study. Those with head trauma with no ocular complaints, isolated head injuries, polytrauma without head injury and facio-maxillary trauma were excluded from the study

Sample size

The study of Pradeep N et al[10]was taken as a base study for sample size calculation where it was observed that 102 patients (68%) out of 150 patients (with head injury) had ocular manifestations. Taking this value as reference, the minimum required sample size with 9% margin of error and 5% level of significance is 104 patients. To reduce margin of error, total sample size taken was 113.Consecutive enrolment of the patients was done after providing them the information about the study and obtaining a written informed consent. Ethical clearance was taken before initiating the study.

All patients went through detailed history, general and ocular examination including demography, mode of head injury, level of consciousness, and graded as per Glasgow Coma Score (GCS).[15]

The ophthalmic evaluation was done on torch light, and slit lamp (Haag streit model 360) to look for ocular manifestations and then graded as per Ocular Trauma Scale (OTS).

Visual Acuity (Va), Colour Vision, Visual Field, Extra Ocular movement, were assessed where possible. Anterior segment evaluation with emphasis on pupillary examination was done meticulously.

Dilated fundus examination was done using Direct Ophthalmoscopy/ Indirect Ophthalmoscopy or 90D lens for the posterior segment including the vitreous, retina and the optic nerve and was documented with Fundus Photography, and Visual Evoked Potential (VEP) where it could have been feasible.

Imaging in the form of X-rays, CT, was done wherever it was considered mandatory.

For assessing the severity of ocular injury, Ocular trauma score (OTS) was assessed. (Supplementary file) For the prediction of final vision outcome world trauma group has made an ocular trauma score system, which considers initial vision at first examination, +/- Rupture, +/- Endophthalmitis, +/- Perforating Injury, +/- RD, +/- RAPD.[16]

The outcome measures were: association of OTS with mode of injury, with type of injury, and risk factors of ocular injury following head trauma.

Statistical Analysis

The data presentation was done after complete analysis through Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago USA, version 25.0. Frequencies are displayed as number and percentage and quantitative data is represented as Mean ± SD and median with interquartile rage of 25-75 percentile. Specific tests used were Fisher's exact test and univariate logistic regression for determining risk factors for ocular injury.

For statistical significance, p value of less than 0.05 was considered statistically significant.

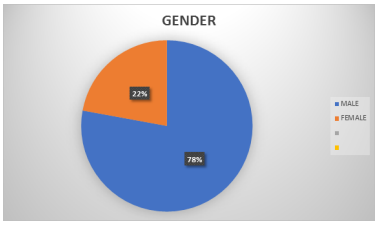
RESULTS

The study was done on 113 subjects of head injury who presented with ophthalmic manifestations, out of a total of 352 patients of head injury who presented to the hospital.

The mean age of the was found to be 35.19 ± 15.5 years.

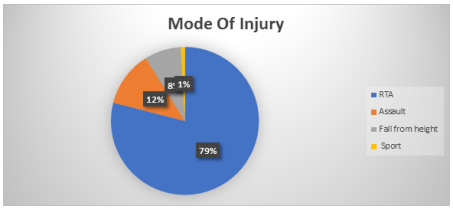
Out of 113 subjects, 88(77.88%) were male and 25 (22.12%) were females.

Table 1



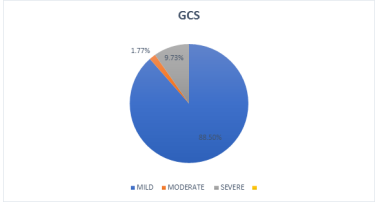
The mode of injury was road traffic accident in 89(78.76%), followed by assault (12.39%), fall from height (7.96%) and sport (0.88%).

Table 2



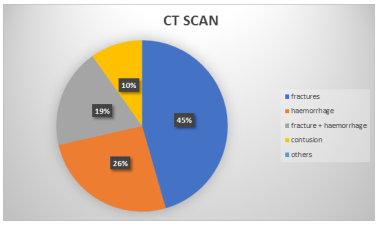
The mean GCS on admission was 13.89 ± 3.19with 100 (88.5%) patients having mild GCS score (13-15); 2(1.77%) having moderate GCS score (9-12) and 11(9.73%) having severe GCS score (<=8).

Table 3



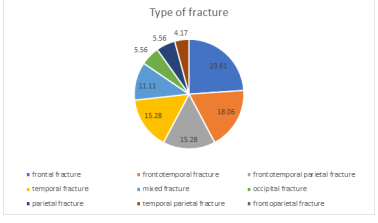
CT scan showed fracture in majority of patients (45.13%), hemorrhage in 25.66%, fracture + haemorrhage in 18.58%, contusion in 9.73%, and others in 1 patient

(Table 4).



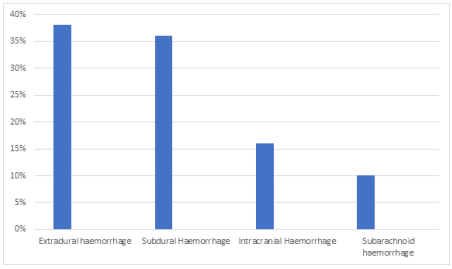
In majority (23.61%) of cases, type of fracture was frontal fracture followed by frontotemporal fracture (18.06%), frontotemporal parietal fracture (15.28%), temporal fracture (15.28%), mixed fracture (11.11%), occipital fracture (5.56%), parietal fracture (5.56%), temporal parietal fracture (4.17%), and frontoparietal fracture in only 1(1.39%) patient

(Table 5)



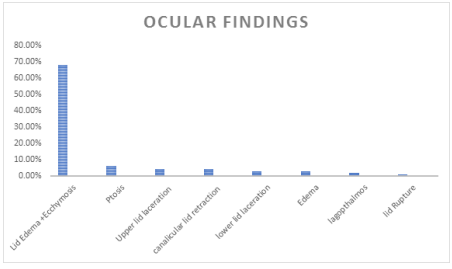
Most of the study subjects presented with extradural haemorrhage (38%) followed by subdural haemorrhage (36%), intracranial haemorrhage (16%), and subarachnoid haemorrhage in 10% patients

(Table 6)



Both eyes were involved in 58(51.33%) cases, only right eye was involved in 32(28.32%) cases and only Left eye was involved in 23 out of 113 cases (20.35%).

The ocular findings included lid edema +ecchymosis (68.14%), ptosis (6.19%), upper lid laceration (4.42%), canalicular lid laceration (4.42%), lower lid laceration (2.65%), edema (2.65%), lagophthalmos (1.77%), and lid rupture (0.88%). (Table 7)



Anterior chamber showed hyphema (2.65%), rupture (1.77%) and Foreign body (0.88%) presence. Majority (38.94%) of patients had subconjunctival haemorrhage followed by chemosis (13.27%), and tear (1.77%).

Corneal examination showed edema (4.42%), rupture (3.54%) and foreign body (2.65%) cases, Some representative case images are shown as Figure 3-7.

Lens showed traumatic cataract (2.65%) no view (1.77%), and dislocation and subluxation in 1 (0.88%) patient. Dilated fundus showed vitreous haemorrhage (6.19%), no view (5.31%), disc edema (5.31%), traumatic optic neuropath (5.31%), berlins edema (2.65%), retinal detachment (2.65%), and macular edema in 2(1.77%) patients.
X ray orbit showed fracture lateral wall (17.70%), fracture roof orbit (17.70%), mixed fracture (10.62%), fracture floor orbit (7.08%) and fracture medial wall (4.42%). Few cases of cranial nerve palsy were seen, among which third nerve palsy, i.e. oculomotor nerve palsy was seen in 7(6.19%) cases, followed by optic nerve palsy in 6(5.31%) cases, facial nerve palsy in 2(1.77%) cases, and Trochlear nerve palsy in 1(0.88%) case. (Table 2)

Ocular trauma score was assessed in 103/113 cases (since 10 cases were unconscious) and the value was 5 in 68 cases, 4 in 14 cases, 3 in 10 cases, 2 in 7 cases, and 1 in 4 cases.

When comparing the OTS across various modes of injury it was observed that in cases of road traffic accidents 2 out 80 patients (2.50%) had a scoring of 1,5 out of 80 patients (6.25%) had score of 2,6 out of 80(7.50%) had score of 3, 9/80 (11.25%) had score of 2 and 58/80(72.50%) had a score of 1(P=0.081).

In terms of the type of head trauma when being compared to the OTS, it was found that 1 out of 50 subjects (2%) and 4 out 50 patients (8%) had an OTS score of 1 and 2 respectively, subjects with OTS of 3,4 and 5 were 6 (12%),6 (12%) and 33 (66%) out of a total 50 patients if they suffered from a fracture to the cranial vault. However for the cases with the findings of a fractured skull and a haemorrhage, it was found that the ocular trauma score was 1 in 3 out of 18 cases (16.67%), 2 in 1 out of 18 cases (5.56%), 4 in 4 out of 18 patients and 5 in 10 out of 18 patients, none of the cases in this category had an ocular trauma score of 3 . Similarly it was observed that out of 23 cases of isolated cranial haemorrhages, 2 cases (8.70%) had an OTS score of 2 and no patient was scored 1 on the ocular trauma scale. None of the cases with contusions had an ocular trauma score of 1 or 2. (P=0.591). (Table 3)

On performing univariate regression, age>40 years and GCS of moderate category carried significantly lower odds with OR 0.252 (95% CI 0.125 to 0.508) and 0.044(0.09 to 0.204) while male gender, RTA, Fractures and EDH carried higher odds for ocular injuries with OR of 2.5(1.499 to 4.17), 6.617(3.464 to 12.641), 5.543(3.414 to 8.999) and 2.209(1.127 to 4.33) respectively. (Table 4)

DISCUSSION

The study holds importance in diversifying the data of patients enduring ocular injury following head injury. We found that out of a total 352 cases of head injury,113 (32.10%) cases had ocular manifestations. In comparison, studies have reported a higher proportion of ocular injury after head injury ranging from 68.7%-83.5%.[3,5,13]This might be because a different selection of case criteria in our study, that is, exclusion of poly trauma patients, patients of age<18 years and patients of head injury with facio-maxillary trauma.

We observed that the age group of 18 to 40 years was predominantly affected for ocular manifestations (48.67%), with lower age carrying significantly higher odds of ocular manifestations with odds ratio of 0.143 (P<001). This is consistently supported in previous studies[5,13,17,18]which might be because individuals in 20-40 years are more prone to road traffic accidents due to fast speed, outdoor activities and use of bikes.[17]

As for the gender distribution, males carried higher risk of 3.744 (P<001). Studies[5,17,18] corroborate with this male gender risk which might be attributed to the fact that males are more involved in outdoor activities, higher tendency of risk-taking behaviour, alcohol consumption and driving roughly.[19] This was brought out in evidence as the commonest mode of injury was RTA (89/113 cases) with OR of 5.727 (P<001) for causing ocular injuries.

Moreover, the commonest CT findings were fractures (frontal bone) and haemorrhage (EDH) which carried higher odds of ocular injury with OR of 5.543 and 2.209 signifying that such presentations must be thoroughly investigated for ocular injuries. An association between facial fractures and ocular injuries has been documented in previous studies as well.[5,17,19]

While we enrolled all the patients of head injury, we assessed the Glasgow Comma scale of all the patients. We found that a lower Glasgow Comma score on admission carried a significantly higher odds ratio of causing ocular injury with odds ratio of 2.480 (p=0.04). In corroboration, Masila F et al[5] reported a positive correlation between severe head injury (GCS <8) and occurrence of ocular signs (p = 0.05) Kulkarni et al[13] also found a positive correlation between GCS and ocular manifestations – thereby signifying the intricate association of head injury status and ophthalmic manifestations.

For the severity of ocular injury, we assessed the ocular trauma score. Although OTS is an outcome indicator of ocular trauma, when we compared the ocular trauma score in relation to type of injury and mode of injury, we found no significant association between the two (p>0.05), though it was clearly observed that head injury due to assault and a mixed presentation of a haemorrhage and a cranial fracture are more commonly calculated into the category of 1 or 2 based on the OTS pointing towards a much severe ocular injury and poor prognostic outcome in the future.Till date, no study has compared such association and this needs further research. Also, the present study may not be powered enough to determine such association with different ocular trauma scores and different modes of injury.

Limitations

The evaluation of ocular motility was not possible among participants who were in coma as some signs, such as third nerve misdirection, only appear after some time has passed after a head injury. These limitations might affect study's final results. Due to the patients' level of consciousness, a thorough assessment of the head injury patients was not possible. Some components of the eye examination, like visual acuity test, diplopia test, nystagmus test, and strabismus evaluation were not performed on patients with significantly decreased levels of consciousness. Another limitation was the inability of ophthalmic evaluation of patients who could not speak due to facial trauma and also poor eye opening as lid edema and ecchymosis hindered ocular examination.

CONCLUSION

To conclude, in patients with head injury, many types of ocular injury can occur, which can cause several Degree of visual impairment. In our study, young males with head injury were the most affected with lower age carrying significantly higher odds of ocular manifestations. The most common type of fracture skull associated with ocular injury was frontal fracture ad majority of cases with extradural haemorrhage were at a higher risk for ocular damage The most common modes of injury were road traffic accident and assault. It is recommended that every patient with head injury should be thoroughly evaluated for ocular injury, giving special attention to pupillary reactions as well as visual acuity. Evaluation may help to decrease the incidence of ocular morbidity as well as blindness.

Acknowledgement: None
Conflicts of interest: None
Financial support: None

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