Analysis of Fatal Cranio-Cerebral Injuries in Central Gujarat Region

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ABSTRACT

Background: Cranio cerebral injuries are one of the most common causes of death and analysis of these injuries can be helpful to improve the moratality statistics. **Method:** The study of pattern of cranio-cerebral injuries was carried out during the one year period from January 2015 to December 2015 in a tertiary health center of the Central Gujarat. A total 320 cases, which fulfilled the criteria of fatal head injuries were prospectively studied. **Results:** In the present study, the most vulnerable age group was Males (86.56%) who were in the age group of 21-30 years (25.93 %) and died due to fatal head injury in RTA. The laceration of scalp was the most common type of exteranly visible injury (29.06%), and linear/fissured fracture of the calvaria was the commonest fracture accounting for 38.75% cases with temporal bone being commonly involved**.** A combination of subdural and subarachnoid haemorrhage was the commonest type (51.87%) of intracranial haemorrhage leading to death. **Conclusion:** The types and pattern of fatal cranio-cerebral injuries are more or less similar to the studies conducted in other geographical areas of India however the study may be helpful in developing strategies to reduce the morbidity and mortality due to craneo-cerebral injuries.

Key-words: Head-injury, Cranio-cerebral injury, Accident, Unnatural death, Autopsy.

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INTRODUCTION

Head injury or cranio-cerebral injury defined by the National Advisory Neurological and Stroke Council is a morbid state resulting from gross or subtle structural changes in the scalp, skull and/or the contents of the skull produced by mechanical forces, restricted to those forces applied externally to the head, thus excluding surgical ablations and internally acting forces such as raised intracranial tension resulting from oedema, hydrocephalus or intracranial space occupying lesions.[1] Some reasons for dominance of head injuries are-Head is the target of choice in great majority of assaults involving blunt trauma. When the victim is pushed or knocked to the ground, he/she often strikes his/her head. The brain and its coverings are vulnerable to degrees of blunt trauma that would rarely be lethal if applied to other areas.[2]Traumatic injury, in which severe head injury plays a major role in over 50% of cases, remains the leading cause of death in person below 45 years of age and overall the third leading cause of death responsible for 8% of all deaths, followed by cardio cerebral vascular disease and cancer and it is the chief cause of death among persons aged 15-24 years.[3]

The present study was conducted in the Department of Forensic Medicine of SSG Hospital & Medical College, Baroda, which is a tertiary health care center of central Gujarat. We are conducting around 2300-2400 medicolegal autopsies every year and majority of them including the deaths due to fatal cranio-cerebral injuries. This study was conducted with the aim to analyze the types and pattern of fatal cranio-cerebral injuries in this area of world and to compare with other studies.[4,5]

MATERIAL & METHOD

This prospective and observational study was conducted in the Department of Forensic Medicine at SSG Hospital & Medical College, Baroda during the one year period from January 2015 to December 2015. The due permission was taken from the Institutional Ethical Committee before comencement of this study. All the cases of head injury, which came to us for autopsy examination were included in this study, except the cases where bodies were in advanced state of decomposition. Informed concent was taken from the relatives of the deceased. A detailed history regarding the circumstances of death was also taken from the relatives, concerning police person, inquest papers and clinical papers. External injuries over scalp were examined and its type and site were noted with pattern of fractures of the skull. Further note was made of type of intracranial hemorrhage and their pattern with injuries over brain. Data analysis and tabulation were done with Epi Info 3.5 software and the results were compared with studies of other authors.

RESULTS

The vulnerable age group was including younger age people of 21-30 years (25.93%) followed by age group of 31-40 years (23.44%). The obvious reason being that they form the work group and hence prone to injuries due to road traffic accidents, falls, assaults, etc. Out of total, 277 cases (86.56%) were males, since they are more into outdoor activities like driving vehicles, working outdoors hence more prone to accidents whereas females succumbed mainly to either accidental falls at their residence or due to RTA, they being pillion riders without head gear.

Table-1: Age and Sex pattern of the cases

Age	Male	Female	No.	%
0-10	6	4	10	3.13%
11-20	28	3	31	9.69%
21-30	**78**	**5**	**83**	**25.93%**
31-40	**67**	**8**	**75**	**23.44%**
41-50	41	9	50	15.63%
51-60	31	7	38	11.87%
61-70	22	5	27	8.44%
>70	4	2	6	1.87%
Total	**277 (86.56%)**	**43 (13.44%)**	**320**	**100%**

Out of the total 320 cases, in 236 cases (73.75%) death due to craneo-cerebral injury was a result of RTA followed by fall from height in 39 cases (12.19%), railway accidents in 24 cases (7.5%) and assault injuries in 7 cases (2.19%). In 14 cases (4.37%), the death was due to fatal head injury as a result of other causes like industrial accidents, gunshot injuries and electrocution.

Table-2: Different Injury Mechanisms Associated with cases

Mechanism of trauma	No. of cases	%
RTA	**236**	**73.75%**
Fall	39	12.19%
Railways	24	7.5 %
Assault	7	2.19 %
Others	14	4.37 %
Total	**320**	**100**

Table-3 shows the types of scalp trauma and we observed that external injury to the scalp was present only in 184 cases (57.5%) while in 136 cases (42.5%), there was no externaly visible scalp injury. These scalp injuries were more commonly seen ovserved over the parietal and temporal regions. Laceration was the most common type of scalp injury accounting for 101 cases (31.56%), followed by contusion in 25 cases (7.85%) and abrasion in 14 cases (4.38%). Among lacerations, split laceration was the commonest while graze abrasions were commonest amongst abrasions. Lacerations were more commonly seen over the bony prominences in the parietal and frontal areas.

Table-3: Types of Scalp Trauma:

Type of Injury	No. of cases	%
Abrasion	14	4.38%
Contusion	25	7.81%
Laceration	**101**	**31.56%**
Chop Wound	1	0.31%
Punctured wound	1	0.31%
Incised Wound	1	0.31%
Abrasion + Contusion	2	0.63%
+ Laceration		
No injury	**136**	**42.5%**
Surgical Sutured Wound	34	10.63%
CRUSHED	5	1.56%

In our study, cranial vault and base of skull bones were commonly found fractured in 249 cases (77.81%) while in the remaining 71 cases (22.19%) there was no fracture found. Among fractures of the calvaria, fissured/linear fracture was the commonest accounting for 124 cases (38.75%) followed by comminuted and depressed fracture together which was present in 31 cases (9.68%) followed by comminuted fracture alone, which was present in 20 cases (6.25%). Craniotomy was observed in 35 cases (10.94%).

Table-4: Types of Fractures of calvaria

Type of fracture	No. of cases	%
Fissured/Linear	**124**	**38.75%**
Sutural	8	2.5%
Comminuted	**20**	**6.25%**
Depressed	9	2.81%
Crushed	10	3.13%
Craniotomy	**35**	**0.94%**
Fissured + Comminuted	2	0.63%
Fissured + Depressed	1	0.31%
Sutural + Comminuted	1	0.31%
Comminuted + Depressed	31	9.68%
Fissure+ Sutural	4	1.25%
Fissure+ Sutural + Depressed	1	0.31%
Fissured + Depressed + Comminuted	3	0.94%
No Fracture	**71**	**22.19%**
Total	320	100%

In our study, intracranial haemorrhages were present in 302 cases (94.38%) and in the remaining 18 cases (5.62%) type of hemorrhage could not be ascertained due to crushing of the brain. The common intracranial haemorrhage in the current study was a combination of subdural and subarachnoid haemorrhage in 166 cases (51.87%) followed by subarachnoid haemorrhage alone in 58 cases (18.13 %).

Table-5: Different types of Intracranial haemorrhage :

Type of Intracranial Haemorrhage	No. of cases	%
EDH	2	0.63%
SDH	27	8.44%
SAH	**58**	**18.13%**
Crushed	5	1.56%
Expelled Out	13	4.05%
EDH + SDH	6	1.87%
EDH + SAH	4	1.25%
SDH + SAH	**166**	**51.87%**
SDH + IVH	2	0.63%
SAH + IVH	2	0.63%
EDH + SDH + SAH	21	6.56%
SDH + SAH + IVH	9	2.81%
EDH + SDH + SAH + IVH	2	0.63%
EDH + SDH + SAH + ICH	3	0.94%
Total	320	100%

Table-6: Types of Brain Trauma

Brain injury	No. of cases	%
Contusion	**26**	8.13%
Laceration	11	3.44%
Oedema	**103**	32.18
Crushed / Extruded Ou	17	5.31%
tContusion + Oedema	13	4.06%
Contusion + Laceration	9	2.81%
Laceration + Oedema	5	1.57%
Contusion + Laceration + Oedema	7	2.19
No Particular	**129**	40.31%
TOTAL	320	100%

In this study, we observed that there was no particular brain injury in 129 cases (40.31%). Brain oedema was common, which was present in 103 cases (32.18%) followed by brain contusions in 26 cases (8.13%) and brain lacerations in 11 cases (3.44%), while contusions & oedema was noticed in 13 cases (4.06%). In 17 cases (5.31%) complete extrusion of the brain matter was found.

DISCUSSION

The results of the present study are more or less similar with the results of the other studies. In the present study, majority of the victims of fatal cranio-cerebral injuries were Males (86.56%) of younger age group e.g. 21-30 years (25.93%) followed by the age group of 31-40 years (23.44%), which is almost similar to the observations of other authors.[6,7] Of the total 320 cases, 236 cases (64.1%) were due to RTA and 12.19% cases were due to fall from height. Ganveer and Tiwari[8] have observed increased incidence of head injuries due to RTA cases, which constituted 66% cases and also comparable to the study done on pattern of fatal head injuries in Aligarh (UP) which had also shown maximum of RTA cases (45%).[8] In this study, laceration was the most common type of scalp injury accounting for 31.56% cases followed by contusion in 7.85% cases and abrasion in 4.38% cases. In a study done by Sharma et al,[7] scalp laceration was noticed in 28.34% cases followed by scalp abrasion in 15.26% cases. Menon and Nagesh have observed external injury to the face & scalp in 82 % of the victims of head injuries.[9]

The cranial vault and base of skull bones were commonly found fractured in 77.81% cases in this study and fissured / linear fracture was the commonest accounting for 38.75% cases followed by comminuted and depressed fracture together in 9.68% cases, which is almost similar to the findings of Eqbal & Rizvi.[10] Menon and Nagesh had also observed fracture of skull in 62 % of the cases studied and fissured fracture was the most common in 57% cases whereas the comminuted fracture, diastic fracture and depressed fracture were seen in 18%, 16% and 9% respectively.[9] The study done by Shivendra Jha et al,[11] shows the higher incidences (93.9 %) of the fractures of vault of the skull amongst which about half (45.2%) of the fractures were comminuted fractures followed by depressed and linear fractures. Gupta, Roychowdhury, Deb, Moitra and Chhetri[12] have noted in their study on the cranio-cerebral injuries that fracture of skull was present in 66% of the cases and fissure fracture was the most common type followed by depressed comminuted fracture.

In our study, intracranial haemorrhages were present in 94.38% cases while in the remaining 5.62% cases we could not ascertained type of hemorrhage either due to crushing of the brain or due to crushing and expulsion of the brain from the cranial cavity. The common intracranial haemorrhage in the current study was a combination of subdural and subarachnoid haemorrhage in 51.87% cases followed by subarachnoid haemorrhage alone in 18.13% cases. This was in contrast with the study done by

Yadav, Kohli and Aggarwal who found the subdural haemorrhage (62%) in majority of the cases followed by subarachnoid haemorrhage (23%) and extradural haemorrhage in 16%.[13] In a retrospective study done by Goel, Singh, Agarwal and Niranjan,[14] subdural haemorrhage (45%) was observed most commonly followed by subarachnoid haemorrhage (31%), where as the extradural and intracerebral haemorrhages were found in comparatively less number of cases viz, 14% and 8% respectively. Combination of all haemorrhages was seen only in 2 % of cases.[14] The study of Gupta, Roychowdhury, Deb, Moitra and Chhetri shows that the commonest type of intracranial haemorrhage was subdural haemorrhage (68%) followed by extradural haemorrhage (28%) and intracerebral haemorrhage (8%).[12]

In this study, we observed that there was no particular brain injury in 40.31% cases while the brain oedema was common in 32.18% cases followed by brain contusions in 8.13% cases and brain lacerations in 3.44% cases, while contusions & oedema was noticed in 4.06% cases. In 4.36% cases, complete extrusion of the brain matter was found. The study done by Ganveer and Tiwari[8] shows that cerebral contusions are more common (56.1%) followed by cerebral oedema in 32.8% cases. In contrast, Gupta, Roychowdhury, Deb, Moitra and Chhetri in their study observed that contusion of brain was present in 7% of the cases and laceration of the brain was present in 9% of the cases.[12]

CONCLUSION

The types and pattern of fatal cranio-cerebral injuries are more or less similar to the studies conducted in other geographical areas of India however the study may be helpful in developing strategies to reduce the morbidity and mortality due to craneo-cerebral injuries.

Conflicts of Interest: None.

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