January - June 2023 Volume 32 Issue 1
PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW

Official Publication of Medicolegal Association of Maharashtra

MULTISPECIALITY, MULTIDISCIPLINARY, NATIONAL
PEER REVIEWED, OPEN ACCESS, MLAM (SOCIETY) JOURNAL
Indexed with Scopus (Elsevier) & Index Copernicus (Poland)

Editorial Office Address
Department of Forensic Medicine & Toxicology, Third Floor, Library Building, Seth G S Medical College & KEM Hospital, Parel, Mumbai, Maharashtra, India. Pin-400 012. Email id: mlameditor@gmail.com Phone: 022-24107620 Mobile No. +91-9423016325.

JOURNAL OF FORENSIC MEDICINE SCIENCE AND LAW
(Official Publication of Medicolegal Association of Maharashtra)
Email.id: mlameditor@gmail.com

PRINT ISSN: 2277-1867
ONLINE ISSN: 2277-8853

Original Research Article

Evaluation of Fatal Craniocerebral Injuries: An Autopsy Based Study in Rural Medical College in Central India

Ashish Salankar[a], Rahul Ramteke[b*], Pankaj N Murkey[c], Sumeet Shende[d], Nitin Barmate[e]

[a]Medical Officer, Rural Hospital, Dhamangaon Rly, Amaravati, Maharashtra, India. [b]Assistant Professor; [e]Professor, FMT, Shri Shankaracharya Institute of Medical Sciences, Junwani, Bhilai, Chhattisgarh, India. [c]Professor, FMT, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha, Maharshtra, India. [d]Professor, FMT, RKDF Medical College, Hospital and RC, Bhopal (MP), India.

Article Info

Received on: 30.01.2023
Accepted on: 25.06.2023

Key words
Head Injury,
Fatal,
Fracture of Skull,
Intracranial
Haemorrhage.

Abstract

Background: Head Injury 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. Trauma is one of the leading preventable causes of death in developing countries, and is a major health and social problem. **Material and Methods:** The study has been conducted during the period 1st August 2013 to 31st August 2015. During this period, total 146 cases of fatal head injuries with intracranial traumas were studied. **Results:** In the present study, out of 146 cases of fatal head injury, 118 were male and 28 were female. Male, female sex ratio is 4.21:1. Of which 100 cases were of RTA (68.49%), followed by Railway accidents 26 cases (17.80%). **Conclusion:** Fracture of vault of skull (n= 83; 56.84%); was maximum as compared to base of skull in 36 (24.65%) cases. Subgaleal Haemorrhage was observed in 131 (89.73%) cases. Subarachnoid Haemorrhage in 115 cases (78.77%) was most commonly intracranial Haemorrhage. **Recommendations:** Fatal head injuries can be prevented by implementing sufficient road safety measures, working at heights while wearing safety equipment. Using safety gates and childproofing your home will prevent children from accessing dangerous areas like stairs.

1. Introduction

Head Injury 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. The application of blunt trauma to the head may result in injury to the contents of the skull, either alone or with fracture of skull.[1] Trauma is one of the leading preventable causes of death in developing countries, and is a major health and social problem. Since prehistoric times, head had been looked upon as one of the most vulnerable regions of the body and injuries involving it have always been considered very serious.

In low- and middle-income countries trauma related mortality before 70 years of age is more frequent than higher income countries.[2]

How to cite this article: Salankar A, Ramteke R, Murkey PN, Shende S, Barmate N. Evaluation of Fatal Craniocerebral Injuries. J For Med Sci Law 2023;32(1):20-24.

Corresponding author: Dr. Rahul Ramteke, Assistant Professor, Shri Shankaracharya Institute of Medical Sciences, Junwani, Bhilai, Chhattisgarh, India. Email ID: dr.rahoul0633@gmail.com (M): +91-9404014748.

Present study is being carried out in Central India, to study the pattern of craniocerebral injuries caused due to various etiology.

2. Materials and Methods:

This study was undertaken in the Department of Forensic Medicine and Toxicology of Mahatma Gandhi Institute of Medical Sciences, Sevagram. The study has been conducted during the period 1st August 2013 to 31st August 2015. During this period, total 146 cases of fatal head injuries with intracranial traumas (on gross autopsy) were studied. Information was collected, compiled, tabulated and analysed from the police, inquest report, hospital records, and information provided by the relatives and post-mortem findings. The cases without any findings of intracranial trauma and the cases with findings of intracranial disease pathology on gross autopsy were excluded from the study.

3. Observations and Results:

Out of 146 fatal head injury cases 24 cases were brought directly to mortuary and 3 head injury cases were died immediately in casualty which are also involved in study. Victims from age group of 21-30 years were maximum (53.42%), out of which (n=67; 45.89%) were male and (n=11; 7.53%) were female followed by 31-40 age group (19.86%) out of which (n=25; 17.12%) were male and (n=04; 2.74%) were female .The victims of age group more than 71 are least affected by head injuries (01.37%) (**Table no. 1**).

Out of 146 fatal cases, 100 (68.49%) were of RTA, in which 79 (54.11%) were male and 21 (14.38%) were female, followed by Train or Railway accidents 26 (17.80%) cases out of which 20 (6.14%) were male and 6 (4.10%) were female, followed by assault or homicide were 10 (6.85%) cases reported and all of them were male (**Graph no. 1**).

Table No. 1: Age Wise and Gender Wise Distribution Of Fatal Cases (N=146)

Age Group (Yrs)	Male	Female	Total	p value
0-10	1(0.68%)	3(2.05%)	4(2.74%)	0.062
11-20	10(6.85%)	5(3.42%)	15(10.27%)	
21-30	67(45.89%)	11(7.53%)	78(53.42%)	
31-40	25(17.12%)	4(2.74 %)	29(19.86%)	
41-50	7(4.79%)	3(2.05%)	10(6.85 %)	
51-60	4(2.74%)	1(0.68 %)	5(3.42%)	
61-70	2(1.37%)	1(0.68%)	3(2.05%)	
>71	2(1.37%)	0(0.00%)	2(1.37%)	
Total	**118 (80.82%)**	**28 (**19.18%)	**146** (100%)	

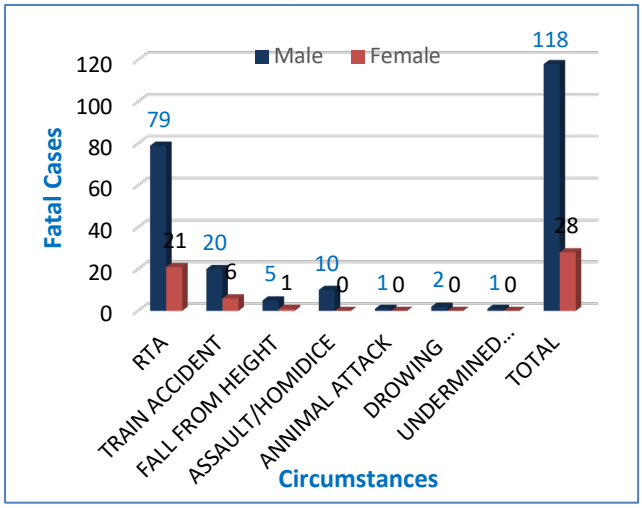
Table No. 2: Distribution based on under scalp h emorrhage in fatal cases (N=146)

Haemorrhages under the scalp	No. of Cases	Percentage (%)	p-value
Present	131	89.73	0.001
Absent	15	10.27	
Total	146	100	

p value calculated by chi square test.

It was observed that among all 146 cases, in 131(89.01%) cases Haemorrhage under the scalp was appreciated, while in 15(10.27%) cases that was absent. The difference among observed head injury cases having intracranial Haemorrhage was statistically significant (p=< 0.05) (**Table no. 2**).

Graph no. 1: Fatal cases according to circumstances and manner of causation of injuries or events



Fracture of skull was present in 101 (69.18%) cases awhile skull was intact in 45 (30.82%) cases. Out of total skull fracture cases (n=101) of, skull vault was involved in 83 cases, while base was fractured in 36 cases. The difference among observed head injury fatal cases having fracture skull was statistically significant (p=< 0.05) (**Table no. 3**).

Table no. 3: Distribution based on presence of fracture of skull

Fracture Skull	No. of cases	Percentage Out of 146	p value
Fracture of vault of skull	65	64.36(%)	0.001
Fracture of base of skull	18	17.82(%)	
Fracture of both vault and base of skull	18	17.82(%)	
Total	101	100(%)	

As per the pattern of intracranial traumas are concerned, from this table it had been shown that, Intracranial Haemorrhage was the commonest finding and seen in 139 cases (95.20%), followed by Oedema or swelling of brain in 110 cases (75.34%). In 42.47% cases, brain showed contusion only, in 3.42%

laceration only, in 4.79%, combined contusion and laceration. Injury to brain stem was in 1 case (0.68%), and shifting of midline could be detected in 7 cases (4. 79%). In 5 cases, there were either crush injury to brain or brain liquefaction and in 4 cases, neurosurgical intervention was done (**Graph no. 2**).

Graph no. 2: Distribution According To Type Of Injury To Brain Matter In Fatal Cases.

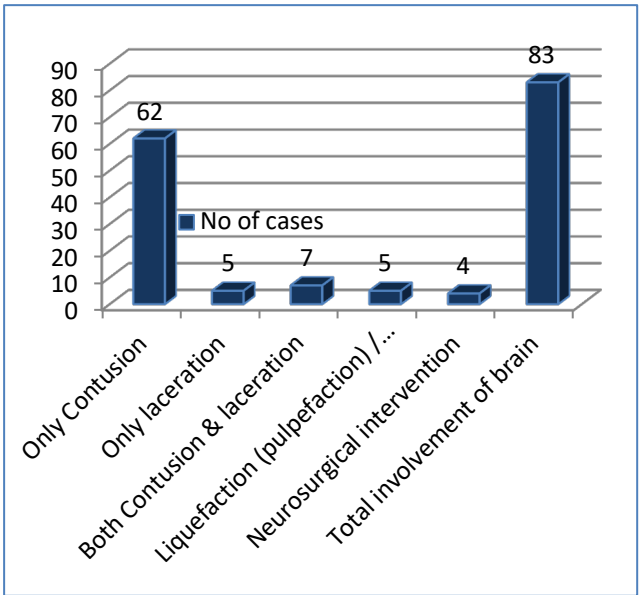


Table No. 4: Types and Percentage of Intracranial Haemorrhage (n=146).

Type Of Haemorrhage	No. Of Cases	Percentage (%)
Extradural Haemorrhage (EDH)	56	38.36
Subdural Haemorrhage (SDH)	100	68.49
Subarachnoid Haemorrhage (SAH)	115	78.77
Intracerebral Haemorrhage (ICH)	30	20.55
Intraventricular Haemorrhage (IVH)	38	26.03
SDH+SAH	84	57.53
EDH+SDH+SAH	39	26.71
EDH+SDH+SAH+ICH	9	6.16
EDH+SDH+SAH+ICH+IVH	7	4.79

Intracranial Haemorrhage was observed in139 cases, of which Subarachnoid Haemorrhage was most commonly observed in 115 cases (78.77%) followed by Subdural Haemorrhage (n=100; 68.49%) and Extradural Haemorrhage (n=56; 38. 36%). Intraventricular Haemorrhage was seen in 38 cases (26.03%) while Intracerebral Haemorrhage was found in 30 cases (20.55%). If the Haemorrhage were considered in combination, then combined subdural and subarachnoid Haemorrhage (SDH+SAH) was most common (57.53%) followed by EDH+SDH+SAH (26.71%), EDH+SDH+SAH+ICH (6.16%) and EDH+SDH+SAH+ICH+IVH (4.79%) (**Table no. 4**).

Out of 146 cases, injury to brain matter was observed in 83 (56.85%) cases. Among these 83 cases, only contusions of brain were present in 62 (42.47%) cases, only lacerations in 5 (3.42%) cases, while combination of contusions and lacerations in 7 (4.79%%) cases.

4. Discussion:

The present study was undertaken in order to find out the scenario of fatal head injury cases in this area and their Forensic point of view evaluation. With the obvious aims of finding some pathway to avoid such type of incidences, this study also presents a motto to fetch a newer perspective of representation of evidence to judiciaries that may help in disbursement of justice.

In the present study, out of 146 cases of fatal head injury, 118 were male and 28 were female. Male to female sex ratio was 4.21:1

Present study was in accordance with Tirpude et al[3], Gupta et al[4], Pathak & Desania[5], Govekar et al[6], Murkey et al[7], Bandu Ramteke et al, [8] Sidramappa Gouda et al [9] and conclude that preponderance of male victim was higher over females. High preponderance of males in fatal head injury cases may be because males are bread earners, for which they have to go outside more than that of females. Such bulk of activities and assignments make them more prone to high risk factors leading to head injuries. No age is immune for head injury to occur.

In the present study Victims from age group of 21-30 years were maximum (53.42%), followed by 31-40 age group (19.86%). Our findings were in accordance with Tirpude et al[3], Gupta et al[4], Murkey et al[7], Bandu Ramteke et al[8] and Seikh et al.[10] Study was not in accordance with Eqabal et al[11] who observed that the maximum number of casualties occurred in age group of 0-10 years, both in male and female. The maximum number of cases of head injury in the age group of 21-30 years can be explained by the fact that this age group is supposed to be the most active group to move out of house for day-to-day activities. The fewer incidences at above 70-year age group were probably explained by the Indian rural scenario of habit of avoiding outside activities and to enjoy a sedentary retired lifestyle. Out of 146 fatal cases, 100 (68.49%) were of RTA, in which 79

(54.11%) were male and 21 (14.38%) were female, followed by Train or Railway accidents 26 (17.80%) cases out of which 20 (6.14%) were male and 6 (4.10%) were female. Study findings was in consistent with Pathak et al[5], Goyal et al[12] and Dash et al[13], these studies show that fatal craniocerebral injuries are commonly caused by Road traffic accidents. And was not in accordance with Eqabal et al[11] who observed that the fall from height were commonest circumstance.

Haemorrhages under the scalp-

In present study of fatal head injury cases, evidence of Subgaleal Haemorrhage has been observed in 131(89.73%) cases. Our findings were in accordance with Sangeet Dhillon et al[14], Sanjeeva et al.[15]

Fracture of skull-

Fracture of skull was present in 101 (69.18%) cases awhile skull was intact in 45 (30.82%) cases. Out of total skull fracture cases (n=101) of, skull vault was involved in 83 cases, while base was fractured in 36 cases. These findings were in accordance with following studies Anand Menon et al,[16]Akhilesh Pathak et al,[5] Tirpude B.H. and Naik R.S,[3] Kumar et al.[17]

In the present study, linear vertex fracture was the commonest type because in an accident, head strikes by the forcible contact with broad resisting surface like ground especially in a moving condition and it leads to fracture.

Intracranial Haemorrhage-

It had been observed that Subarachnoid Haemorrhage (n =115 cases (78.77%)) was most commonly intracranial Haemorrhage followed by Subdural Haemorrhage (68.49%) and Extradural Haemorrhage (38.36%). Present study findings were consistent with J. Chandra et al.[18]

Tirpude BH, Naik RS, in their autopsy study of craniocerebral injuries on 80 victims of RTA observed that commonest was EDH (20.37%), followed by SDH (14.81%) SAH was 7.40%. ICH-3.70%. While combination haemorrhage was 12.96%. Tirpude et al.[3] B R Sharma et al,[19] found that the commonest intracranial haemorrhage was subdural haemorrhage (62%), followed by subarachnoid (23%) and extradural haemorrhage (16%).

A severe intracranial Haemorrhage may be caused by application of even moderate force to the head. The Extradural or Epidural Haemorrhage was caused almost exclusively by trauma. The bleeding may be arterial (Middle Meningeal artery), venous (Diploic veins) or combined. This is the least common type of meningeal bleeding. Subdural Haemorrhage is generally caused by rupture of bridging veins at subdural space, while the Subarachnoid Haemorrhage is caused by rupture of bridging veins, rupture of Berry aneurysms or contusion and laceration of brain. Subarachnoid Haemorrhage is supposed to be the commonest type of intracranial Haemorrhage of traumatic origin.[1]

Involvement of brain matter (Injury to brain)-

Out of 146 cases, injury to brain matter was observed in 83 (56.85%) cases. Among these 83 cases, only contusions of brain were present in 62 (42.47%) cases, only lacerations in 5 (3.42%) cases, while combination of contusions and lacerations in 7 (4.79%%) cases. Present study was in accordance with the Tirpude et al,[3] Gupta et al,[4] and Sharma et al.[19]

Contusions and lacerations are two degrees of the same process. Contusions may occur on surface of cortex or deeper down. There is no actual tearing of tissues, and may occur even without injury to the skull. Cerebral contusions are often seen associated with Subarachnoid Haemorrhage.

5. Summary and Conclusion:

In the present study, out of 146 cases of fatal head injury, 118 were male and 28 were female. Male, female sex ratio is 4.21:1.The total 146 autopsies were conducted out of those 100 cases were of RTA (68.49%), followed by Train or Railway accidents 26 cases (17.80%). Fracture of vault of skull (n= 83; 56.84%); was maximum as compared to base of skull (n= 36; 24.65%). Subgaleal Haemorrhage was observed in 131(89.73%) cases. Subarachnoid Haemorrhage (n =115 cases (78.77%)) was most commonly intracranial Haemorrhage followed by Subdural Haemorrhage (68.49%). Most commonly observed injury to brain matter was contusions of brain and seen in 62 (42.47%) cases.

6. Recommendations:

Fatal head injuries probable preventive measures can be handled by providing adequate road safety measures while engaged in activities such as cycling, skateboarding, rollerblading or any other sport or recreational activity that poses a risk of head injury. Use seat belts and make sure seat belts are properly adjusted and secure. Using safety

equipment (e.g., safety harnesses) when working at heights. Childproofing such as secure heavy furniture and appliances to the walls, pad sharp corners and edges, install window guards, and use safety gates to prevent access to stairs or other hazardous areas.

Ethical Clearance: IEC approval is taken from the Institutional Ethical committee.

Contributor ship of Author: All authors equally contributed.

Conflict of interest: None to declare.

Source of funding: None to declare.

References:

1. Reddy KS Narayan, Murty OP. The Essentials of Forensic Medicine & Toxicology. 35th Edition. New Delhi: Jaypee Brothers Medical Publishers; 2022: 185.
2. Akrate D, Barmate NS. Pattern Of Accidental Cranio-Cerebral and Thoracic Injuries in Tertiary Care Center in Central Indian Population. J Forensic Med Toxicol. 2019;36(2):9-12.
3. Tirpude BH, Naik RS, Anjankar AJ, Khajuria BK. A Study of The Pattern of Cranio-Cerebral Injuries in Road Traffic Accidents. J Indian Acad Forensic Med. 1998; 20(1):9-12.
4. Gupta S, Dev PK, Moitra R, Chhetri D. Demographic Study of Fatal Cranio Cerebral Road Traffic Injuries in North Bengal Region. J Indian Acad Forensic Med. 2007;29 (1):25-7.
5. Pathak A, Desania NI, Verma R. Profile Of Road Traffic Accidents & Head Injury In Jaipur (Rajasthan). J Indian Acad Forensic Med. 2008;30(1):6-9.
6. Govekar G, Patel G, Rajdev B, Tailor C, Shilajiya D. Trends of Road Traffic Accidents in Surat City. J Indian Acad Forensic Med. 2009;31(4):326- 330.
7. Murkey P, Mujumdar A. In Study Conducted At MGIMS, Sewagram Rural Hospital of Central India Studied 173 Fatal Head Injury Cases of Various Causative Manners, During the Period 2008 To 2011.
8. Ramteke BW, Karmakar SN, Tumram NK. Critical Analysis of Cranio-cerebral Injuries in Adult Population at a Tertiary Health Centre: an Autopsy Study. J For Med Sci Law. 2020; 29 (2): 14-20
9. Sidramappa G, Gopinath M, Sharanabasavappa K. Injuries in Riders and Pillion Riders of Fatal Two-Wheeler Road Traffic Accidents in Raichur, Karnataka. J For Med Sci Law. 2022; 31 (2): 15-8.
10. Seikh MI, Shah JV, Patel R. Study of Death Due to Railway Accident. J Indian Acad Forensic Med. 2008;30(3):122-7.
11. Eqabal MZ, Rizvi SJ, Husain M, Srivastava VK, A Study of The Pattern of Head Injury in District Aligarh. U.P. India. J Indian Acad Forensic Med. 2005;27(2):103-7.
12. Goyal MK, Goyal R, Kochar SR, Goel MR, Fracture of The Temporal Bone: A Tomographic V/S Autopsy Study. J Indian Acad Forensic Med. 2007;29 (4):82-7.
13. Dash SK, Ray AK. Variability In Intracranial Haemorrhages in Relation to Nature of Trauma to The Head- A Two Year Study. J Indian Acad Forensic Med. 2009;31(4):344-9.
14. Dhillon S, Sekhon HS. Pattern and distribution of injuries in fatal road traffic accidents in Shimla (Himachal Pradesh). Med Leg Upd. 2007;7(4):115-8.
15. Sanjeeva L, Agnihotri AK, Ashok T, Murty OP. Patterns Of Injuries In Fatal Falls From Height- A Retrospective Review. J Forensic Med Toxicol. 1999;16(2):38-46.
16. Menon A, Nagesh KR. Pattern of Fatal Head Injuries Due to Vehicular Accidents in Manipal. J Indian Acad Forensic Med. 2005; 27(1):19-22.
17. Kumar A, Lalwani S, Agrawal D, Rautji R, Dogra TD. Fatal Road Traffic Accidents and Their Relationship with Head Injuries: An Epidemiological Survey of Five Years. Indian J Neurotrauma. 2008; 5(2):63-7.
18. Chandra J, Dogra TD, Dixit PC; Pattern of Cranio-Intracranial Injuries in Fatal Vehicular Accidents in Delhi, 1966-76. Med Sci Law. 1979;19(3):186-94.
19. Sharma BR, Harish D, Gauri Singh, Vij Krishan. Pattern of Fatal Head Injury in Road Traffic Accidents. Bahrain Med Bul. 2003; 25(3): 22-5.