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A STUDY OF THE PATTERN OF CRANIO-FACIAL INJURIES IN FATAL ROAD TRAFFIC ACCIDENTS IN TRIPURA

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ABSTRACT: Road traffic accidents are one of the major causes of morbidity & mortality especially in developing countries including India. Craniofacial injuries are the most common injuries found in fatal road traffic accidents. The objective of present study was to analyze the pattern of craniofacial injuries in these fatal accidents. The study was conducted at the mortuary of AGMC, Agartala during the period of July 2011 to June 2013. During this period 196 victims of fatal road traffic accident were autopsied. In the present study the male female ratio of victims was found to be 3.74:1. Most of the victims in the present study belonged to the age group of 21 to 30 years. Mechanized four wheelers (52.04%) were the commonest offending vehicle. Most of the death occurred in the month of November during office hours. Data analysis suggests that most commonly affected victims were the pedestrians with a total number of 84 cases (42.85%) followed by the motor cyclists with a total number of 41 cases (20.91%). Most common intracranial hemorrhage was SDH and fissured fracture of the skull bone was the commonest fracture found.

KEYWORDS: Road traffic accidents, Craniofacial injuries, Victims, SDH.

INTRODUCTION: Craniofacial injury, a common term which actually means cranio-cerebral damage and injury to face, has been recognized since ages. As found in medico-legal practice blunt craniofacial injuries are most frequently caused by traffic accidents, fall from height, assault, train accidents etc. and road traffic accidents are the main component, followed by fall from height and railway accidents. World Health Organization defined accidents as "an unexpected, unplanned occurrence which may involve injury".

A WHO advisory group in 1956 defined accident as an "unpremeditated event resulting in recognizable damage."¹ Of all the regional injuries sustained in such road traffic accidents, those of the craniofacial and neck are most common and important in forensic practice². Road traffic accidents contribute 30.2% of all kinds of accidental deaths and are the major causes of disability and death all over the world (WHO-1980).³ Road traffic injuries accounts for 2.1% of global mortality at present⁴. India accounts for about 10% of road traffic fatalities worldwide.⁵

In Delhi alone 31% are victims of craniofacial injury out of all vehicular accidents⁶. Even in our small state Tripura, there is an alarming 10 fold increase in the number of both two and four wheeler motor vehicles since last 10 years. As published by the State Transport Department the total number of registered motor vehicles till 25th November 2011 is 2,09,920. In the year 2011, the total number of RTA is 757 out of which 225 are fatal accidents.⁷

"A study of the pattern of craniofacial injuries in fatal road traffic accidents in Tripura" covering a period of 02(two) years has been planned in the department of Forensic Medicine & Toxicology, Agartala Government Medical College, Agartala, to give an overview about the patterns of fatal craniofacial injuries causing death in road traffic accidents in this part of the state.

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MATERIALS & METHODS: This study has been carried out in the mortuary of the Department of Forensic Medicine and Toxicology, AGMC & GBP Hospital on the medico legal cases coming for autopsy during the period of 1st July 2011 to 30th June 2013. During this period 1695 autopsies were conducted in the mortuary, out of which 327 were road traffic accident cases. Out of these 327 cases fatal craniofacial injury cases numbered at 196. All these 196 cases selected for the study were due to craniofacial injuries. Pre-designed and pre-tested questionnaire were prepared and information or data was collected from the following sources.

1) Inquest reports 2) History taken from the guardian 3) Hospital records 4) Post –mortem examination findings. Detail post mortem examination of the cases were done and the findings were recorded in a master chart prepared in Microsoft excel sheet and then appropriate statistical analysis using percentage and proportions was done for data analysis.

OBSERVATIONS AND RESULTS: 1695 numbers of medico-legal autopsies conducted during the 2 years period from 1st July 2011 to 30th June 2013. Out of these cases a total 327 cases were due to road traffic accidents which constituted 19.29% out of which fatal craniofacial injuries were encountered in 196 cases which constituted 11.56% of the total autopsy cases. The observations and results that have been charted are represented in the form of tables and diagrams which are as follows:

Seasonal variation:

Season	Number	Percentage
Summer	65	33.16
Rainy	60	30.61
Winter	71	36.22

Table 1: Showing Seasonal variation

Sex of the victims: It is seen that majority of the victims sustaining fatal craniofacial injuries in RTA were male with a total number of 155 cases (79.08%) and only 41 cases were female (20.92%). The male female ratio was found to be 3.74:1.

Age group of the victims:

Age Group	male	female	Total Number	Percentage (%)
0-10	07	03	10	5.1
11--20	17	02	19	9.69
21-30	37	04	41	20.92
31-40	32	07	39	19.89
41-50	27	11	38	19.39
51-60	22	06	28	14.29
61-70	07	05	12	6.12
71-80	04	03	07	3.57
>80	02	00	02	01.02

Table 2: Showing age group of the victims

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Type of the victims:

Type of victim	Total Number	Percentage
Pedestrian	84	42.85
4 wheeler driver	05	2.55
2 wheeler driver(motor cyclist)	41	20.91
4 wheeler occupant	27	13.77
2 wheeler occupant(pillion rider)	28	14.28
Bicycle rider	10	5.10
Rickshaw puller	01	0.51

Table 3: Showing the type of victims

Place of death:

Place of death	Total number	Percentage
Hospital	146	74.49
Way to hospital	36	18.37
Spot dead	14	7.14

Table 4: Showing the place of death

Period of survival of the victims: For the purpose of the study we divided the period into 6 categories –0(spot dead), I (0 to 6 hours), II (6-12 hours), III (12 to 24hours), IV (1 to 3 days), V (more than 3 days).

Period of survival	Number of cases	Percentage
I (0 Hours)	14	7.14
II (0 to 6 Hours)	95	48.47
III (>6 to <12 Hours)	40	20.41
IV(>12 to <24 Hours)	21	10.71
V (>1 day to <3 days)	14	7.14
VI (> 3 days)	12	6.12

Table 5: Shows the period of survival of the victims

Time of occurrence:

Time of incident	Number	Percentage
Morning (after 5 am up to 10 am)	38	19.38
Office hour(after 10am up to 5 pm)	97	49.48
Evening (after 5 pm up to 10 pm)	43	21.93
Night (after 10 pm up to 5 am)	18	9.18

Table 6: Shows the time of occurrence of the road traffic accident

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Type of the offending vehicle: The vehicles were broadly categorized into two classes that are mechanized and non-mechanized. Mechanized vehicles were again sub classified into 03 categories like 02 wheeler, 03 wheeler and 04 wheelers while non-mechanized vehicles were sub classified as 02 wheelers and 03 wheelers.

Mechanized motor vehicles			Non mechanized vehicles	
02 wheeler	03 wheeler	04 wheeler	02 wheeler	03 wheeler
85	05	102	03	01

Table 7: Showing the type of offending vehicle

Common external injuries over craniofacial region:

TYPE	EAR	EYE	NOSE & MOUTH	FACE	NUMBER
Abrasion	05	16	08	79	108
Contusion	01	15	03	05	24
Laceration	02	12	05	10	29
Fracture	nil	nil	03	06	09
Crush	02	03	02	01	08

Table 8: Showing the common external injuries over craniofacial region

CRANIO FACIAL INJURIES:

Scalp injury:

Figure No.1 showing the type of scalp injuries

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Skull injury:

Type of fracture	Number	Percentage
Fissured	48	50.00
Comminuted	12	12.50
Depressed	10	10.41
Sutural	02	2.08
Crushed	09	9.37
Fissured+ sutural	03	3.12
Fissured+comminuted	10	10.41
Fissured+ depressed	01	1.04
Fissure+depressed+comminuted	01	1.04

Table 9: Showing the type of skull fracture sustained by the victims

Cranial fossa and skull bone involvement:

Cranial Fossa involvement	Total number of cases
Anterior cranial fossa	11
Middle cranial fossa	15
Posterior cranial fossa	03

Table 10: Showing skull base fractures

Anatomical location	Number	Percentage
Frontal	21	21.87
Parietal	18	18.75
Temporal	58	60.41
Occipital	09	9.37
Combination	28	29.16

Table 11: Showing the anatomical location fracture of vault of skull

Meningeal injury: Meninges were intact in 169 cases, torn in 27 cases and crushed in 09 cases.

INTRACRANIAL HEMORRHAGES:

Figure No. 2 showing the types of intracranial hemorrhages

BRAIN INJURY:

Figure no. 3 showing the type of brain injury

DISCUSSION: The two years study period was divided into three categories like summer season (March to June), Rainy season (July to October) and winter season (November to February). It was found from data analysis that maximum craniofacial injury cases occurred during the winter months with a total number of 71 cases (36.22%). In summer season 65 cases (33.16%) and in rainy season 60 cases (30.61%) occurred. The findings of the study are similar to those conducted by Kumar A et al (2001-2005).⁸

The male female ratio was found to be 3.74:1. These findings are similar to the studies conducted by Kaul A et al⁹(3:1), Emejulu JKC¹⁰ (3:1), Ahmed et al¹¹ (3:1).

It was seen that maximum fatal craniofacial injuries in RTA were sustained by those who were in between 21 years to 30 years of age comprising a total 41 cases (20.92%). 37 males who belonged to 21-30 years age group sustained fatal craniofacial injuries while 11 females who belonged to 41-50 years age group sustained such injuries in RTAs. These findings are similar to the studies conducted by Momon chand A and Fimate L (1988),¹² Pillay VV¹³

For the purpose of study the victims were divided into 5 categories- Pedestrian, Driver, Occupant, Motor cyclist, Pillion rider, bicycle rider and rickshaw puller. Analysis of the data revealed that majority of the victims were pedestrians with a total number of 84 cases (42.85%) who are closely followed by the motorcyclists with a total number of 41 cases (20.91%). Pillion riders were involved in 28 cases and occupants of the 4 wheelers in 27 cases. The findings of the study are similar to those conducted by Sevitt S (1968)¹⁴ (43% pedestrians), Chandra J et al (1979)¹⁵

Data analysis shows that majority of the victims died in the hospital. 36 numbers of victims died on the way to the hospital and 14 victims died on the spot. 50 number of victims did not receive any treatment before their death at AGMC and GBP Hospital. Findings of the study are similar to the studies conducted by Sinha SN et al¹⁶ Baruah AP.¹⁷

It is evident from data analysis that majority of the victims died within 01 day (1st 24 hours) of the incident. 95 numbers of victims (48.47%) died within the first 06 hours of the incidence showing the need of strengthening emergency medical care in our state.

Mechanized 04 wheelers were the most common offending vehicle in a total number of 102 cases (52.04%) followed by the mechanized 02 wheelers (bike and scooter) in a total number of 85

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cases (43.36%). In 05 cases the offending vehicle was Auto rickshaw, in 03 cases the vehicle was bicycle and rickshaw was involved in a single case.

It was observed that the commonest injury sustained was facial abrasion with a total number of 79 cases (40.30%). Contusion of the eyes commonly known as black eye was present in 15 cases. Fracture of the nasal and other bones of face were present in three cases only. Abrasions as a whole constituted the major injury type on craniofacial and face with a total number of 108 cases (55.10%)

Data analysis suggests that contusion was the major scalp injury with a total number of 180 cases (91.83%) followed by laceration of the scalp with a total number of 87 cases (44.38%). Combinations of the injuries were present in 88 cases (44.89%). Surgically made incised wound were present in the operated cases. Crush injury was present in nine numbers of cases. The findings of the present study is consistent with the findings of study conducted by Sharma BR et al (2003).¹⁸

It is evident from data analysis that a total number of 96 victims, 75 males and 19 females sustained skull fracture including both skull cap and skull base fracture. 80 male victims and 22 female victims did not sustain skull injury. Out of these 96 cases, 29 cases sustained skull base fracture while the remaining 67 cases sustained fracture of vault of skull. 18 numbers of cases had combination of both skull cap and skull base fracture. Fissured fracture was most common finding in the fatal craniofacial injury cases with a total number of 48 cases out of total 96 fractures (50%) followed by comminuted fractures with a total number of 12 cases (12.50%).

Middle cranial fossa was most commonly involved sustaining fracture with a total number of 15 cases (7.65%). It is also found that fracture of the temporal bone is the commonest involving 58 cases (60.41%). Crush injury of the skull bones were present in 09 cases. Craniotomy (Burr hole) done were detected in 08 parietal bones and 05 temporal bones. The findings are consistent with the studies conducted by Fimate L (1992) ¹⁹(65.86% temporal bone fracture), Singh D et al (1996).²⁰

Subdural hemorrhage was the most common finding with a total number of 181 cases (92.34%) followed by subarachnoid hemorrhage with a total number of 149 cases (76.02%). Combination of both subdural and subarachnoid hemorrhage was present in 104 cases (53.06%). Extradural hemorrhage was found in 32 cases (16.32%) and intracerebral hemorrhage was found in 19 cases (9.69%) only. The findings are consistent with the studies conducted by Tyagi AK et al (1986)²¹ (69.3% SDH, 55.1% SAH), Baker CC et al ²²(52% SDH).

It is seen that brain was contused in 87 cases (44.38%). Contusion is the most common injury encountered by the victims. These contusions were found to be associated with subarachnoid hemorrhages. Brain laceration was found in 11 cases. Crush injury was present in nine cases.

CONCLUSION:

Our study revealed the following facts:

- Maximum head injury cases occurred during the winter months. Male female ratio was 3.74:1.
- Most of the victims in the present study belong to the age group of 21 to 30 years.
- Most commonly affected victims were the pedestrians.
- Total 146 cases (74.49%) died in the hospital after sustaining the head injuries.
- Majority of the victims died within six hours of the incident
- Most of the accidents occurred during the office hours (from 10 am to 5 pm)
- Mechanized four wheelers (trucks, buses, vans, jeeps etc.) were the most common offending vehicle.

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- Commonest injury sustained over the craniofacial region was facial abrasion. Contusion was the major scalp injury sustained by the victims.
- Fissured fracture was the most common finding in the fatal head injury cases.
- Fracture of temporal bone was found in 58 cases (60.41%). Middle cranial fossa also sustained fracture in 15 cases (7.65%).
- Subdural haemorrhage was the most common type of intracranial haemorrhage.
- Brain contusion was the most common injury encountered by the victims.

Road traffic accidents have become significantly responsible for loss of life, economic and social resources even in our small state of Tripura. With the sudden rise in the number of vehicles in the past ten years the incidences of traffic accidents also has risen. It is high time to better define the specific characteristics of the problem in a uniform manner so that preventive measures can be implemented accordingly. Primarily safety measures should focus upon three main factors viz. infrastructure, human behavior and vehicle design.

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Abrasion and laceration over the face

Diffuse contusion in the layers of the scalp and periosteum

Separation of sutures of vault of the skull

Avulsion laceration of the scalp with fracture of skull bone

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**Extradural haematoma
on right parietal area**

**Combined Subdural and
Subarachnoid hemorrhage**

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