

# A Study on the Association Between Extradural Hemorrhage and Skull Fractures in Head Injury

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## ABSTRACT

Fatal Intracranial haemorrhages have always been a major cause of mortality especially in traumatic head injuries. With the exponential growth in motor traffic and drastic changes in lifestyles, trauma especially involving the head has been a saddening reality in today's advanced urban life. This study involving 235 cases of deaths due to intracranial haemorrhages of varying aetiologies, specifically focuses on the propensity of association between Extradural Haemorrhage and skull fractures. It has been revealed in this study that of the various types of haemorrhages involving the brain, Extradural Haemorrhage is the least common, accounting for a meagre 3.8% (9cases) of the total number of cases. A total of 111 cases involved in the study manifested with skull fractures on the whole. Eight out of the aforementioned nine cases (88.8%) with Extradural Haemorrhage showed associated skull fractures. It therefore supports the observations made by several previous researchers that Extradural Haemorrhages are almost always associated with a fracture of the skull with exceptions that has mostly to do with age of the victims.

**Keywords:** Extradural Haemorrhage, Skull fracture, Intracranial Haemorrhages.

## INTRODUCTION

Intracranial haemorrhage can be caused due to traumatic brain/ head injury or due to natural causes. Traumatic causes being road traffic accidents fall from height, railway incidents, assaults and other accidents. Natural causes being strokes, tumours and bleeding disorders to name a few. Fatal intracranial haemorrhages cause one million deaths in India annually. Regardless of severity of the head injury, there is always a possibility that intracranial haemorrhages may arise. According to Bullock and Teasedale two thirds of patients presenting in coma had intracranial haematoma. These may be present at the time of injury, or develop secondarily or expand later on<sup>1</sup>.

Most cases of Extra Dural Haemorrhage (EDH) are associated with skull fractures and lie immediately below the fracture at the site of impact. It consists of an ovoid mass of clotted blood that lies in between the skull and the duramater. It is uncommon and present in only 5 to 15 % of fatal head injuries and 85% of them are associated with fractures<sup>2,3</sup>. In one study by Rowbotham, these cases represented about 3 to 5% of any large series of acute cerebral trauma<sup>4</sup>. Their incidence amongst head injuries in the post-mortem rooms is somewhat lower, since many are cured by surgical intervention<sup>5</sup>. Extradural haemorrhage is almost always due to trauma, chief exception being blood dyscrasias of infancy<sup>6</sup>.

Extradural bleeding commonly occurs in the presence of a skull fracture that causes the dura to separate from the bone, causing tears in the blood vessels (mostly the middle meningeal artery) and sinuses. In individuals with more elastic skulls, particularly children, skull deformation separates the dura and skull and causes an extradural haematoma without a skull fracture being present. Rare case reports with extradural haematomas without skull fracture have been reported in adults below 30 years of age<sup>7</sup>. Although a skull

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fracture is a prerequisite, the haematoma occurs only in about 20 percent of all skull fractures. And in relative correlation, 85% of extra dural haemorrhages are found to be associated with fractures<sup>8</sup>. The commonest area of occurrence of an extradural haematoma is the sides of the head on the convexity or the lateral aspect of the cerebral hemispheres. Around 70% of extradural haemorrhages occur in tempero-parietal area corresponding to an overlying fracture of the squamous temporal bone.<sup>3</sup>

This study endeavours to evaluate the propensity of an association between extradural haemorrhage and skull fractures and to put it into perspective against available evidence on the same.

## MATERIALS AND METHOD

235 cases of deaths due to fatal intracranial haemorrhages brought to the mortuary wing of Government Medical College, Thiruvananthapuram for autopsy over a time span of eight months were utilized for the purpose of this study. Objective findings including types of intracranial haemorrhages and skull fractures, entered in the post-mortem certificates recorded during autopsies were collected, and the data thus collected was analyzed using SPSS software.

## RESULTS

235 cases of Fatal Intracranial haemorrhage victims autopsied in the Department of Forensic Medicine, Government Medical College Thiruvananthapuram were analyzed and studied.

**Age and sex incidence:** The maximum number of victims of fatal Intracranial haemorrhages were in 51 to 60 year age group(47), closely followed by age group 71 to 80 years(45) and the minimum number of victims were in 21 to 30 year age group (1), there were only 2 victims below 10 years. There were 10 victims in age group of 11 to 20 years, 33 in 31 to 40 group, 38 in 41 to 50 years, 47 in 51 to 60 years, 38 in 61 to 70, 14 in 81 to 90, 7 in 91 to 100 age groups.

**Table 1: Age incidences in victims of Intracranial Haemorrhages (N = 235)**

Age in years	Frequency	Percent
0-10 years	2	0.8

*Conted...*

11-20	10	4.6
21-30	1	0.4
31-40	33	14.3
41-50	38	16.0
51-60	47	19.8
61-70	38	16.0
71-80	45	19.0
81-90	14	5.9
91-100	7	3.0
Total	235	100.0

**Sex incidence of victims:** out of 235 cases of fatal intracranial haemorrhage, 186 victims were males and 49 were females.

**Table 2: Showing Causes for Intracranial Hemorrhages (N = 235)**

Cause of injury	Frequency	Percent
RTA	150	63.7
Fall	31	13.1
Railway occurrence	16	6.8
Natural	15	6.3
Assault	8	3.4
Other occurrences	13	5.5
Not known	2	0.8
Total	235	100.0

**Types of intracranial hemorrhages:** Among the cases of Intracranial haemorrhages, extradural haemorrhages(EDH) was seen in 9 cases (3.8%), subdural haemorrhages were seen in 173 cases(73.6%), sub arachnoid haemorrhages were seen in 228(97.02%), intra parenchymal haemorrhages were seen in 19 cases(8.08%), and intraventricular haemorrhages were seen in 28 cases (11.9%).

**Table 3: showing types of intracranial haemorrhages**

Intracranial haemorrhage	n	%
Extradural	9	3.8
Subdural	173	73.6
Subarachnoid	228	97.02
Intraparenchymal	19	8.08
Intraventricular	28	11.9

**Table 4: showing the incidence of skull fractures in cases of intracranial haemorrhages (N = 235)**

Skull fracture	Frequency	Percent
Present	111	47.2
Absent	124	52.7
Total	235	100.0

**Proportion of extradural haemorrhages associated with fractures of skull:** Among the 9 cases of extradural haemorrhages, 88.8% of cases were associated with fracture and 11.2% cases revealed no fractures.

**Table 5: showing proportion of Extradural Haemorrhages associated with fractures of skull**

Extra dural Haemorrhages	n	%
With fractures	8	88.8
Without fracture	1	11.2
Total	9	100

## DISCUSSION

The objective of the study was to find out the proportion of cases with Extra dural Haemorrhages associated with skull fracture.

**Age and Sex incidence:** In the present study, among the 235 cases of Intra Cranial Haemorrhages the maximum incidence was in sixth decade with 47 victims. This observation did not correlate with studies of Raja Ram<sup>9</sup> and Rajeev<sup>10</sup> where the maximum age incidence was in fourth and fifth decade respectively. The difference in this incidence could be due to the changes in patterns of deaths over a period of time due to increased life expectancy, changes in life style and modes of transport and also due to the fact that the age groups from 30 to 60 years are the main bread winners, and ply more frequently on the roads. The minimum incidence was in third decade. This was not in agreement with the study by Rajeev and Rajaram, which could be explained as these particular age groups were found to be using high-end bikes with better safety and sophisticated balance features compared to other age groups, and if they happen to meet with an accident, they tend to recover earlier given their better state of health.

**Sex Incidence:** The majority of the victims in the present study were males (79.3%) followed by females (20.7%), which is in complete agreement with all the

studies, where male involvement was definitely higher than females. This observation could be due to increased use and exposure to vehicles and occupation by males in our society. Males are also the main bread winners, especially in lower and middle socio-economic strata.

**Skull fracture:** Fractures of skull were seen only in 47.2% of the cases in the present study. This was not in agreement with the studies of Rajeev (64%), Rajaram(73%) and Vijayakumar(57%)<sup>11</sup>. The reason for the increase in incidence of intracranial haemorrhages without skull fractures may be due to the increase in high velocity accidents where the mechanisms of injury are due to acceleration-deceleration shear strains rather than the effects of a direct impact.

In the present study the Extra Dural Haemorrhage had the least incidence of 3.8%, which was in agreement with the observations of Rowbotham who stated that EDH was uncommon and accounted for only 3 to 5% of cases of any large series of cerebral trauma<sup>4</sup>. There was only one case of extradural hematoma in the present study which had occurred without accompanying skull fracture. This was a case of a 14year old boy who showed bilateral frontal EDH. The above observation agrees with the fact that younger and elastic skulls can present with EDH without fracture although it's a rare occurrence. It is also consistent with the observation made by Galbraith<sup>7</sup>. The aforementioned case also showed bilateral Extra dural Haematoma. Hence, this observation agrees with that of Mckissock et al who stated that bilateral EDH was a very rare occurrence.<sup>12</sup>

In the present study, there were 47.2% instances of skull fractures, but only 3.4% of them had extra dural haemorrhages. This agrees with the opinion of Lindenberg, who stated that even though a skull fracture is a prerequisite, only less than 20% of skull fractures are associated with an Extra dural Haematoma<sup>8</sup>.

## CONCLUSIONS

1. The maximum age incidence for sustaining intracranial haemorrhages including Extradural Hemorrhage in general was in the 6<sup>th</sup>decade (19.8%).
2. Males constituted majority of the victims (79.3%) in the present study in deaths due to intra cranial haemorrhages.

3. The commonest intracranial Haemorrhage was Sub arachnoid haemorrhage (97%), followed by Sub dural haemorrhage (73.6% of the cases), Intraventricular haemorrhage (11.9%), Intraparenchymal haemorrhage (8.1% of cases), the least common being the incidence of Extradural haemorrhage, (3.8 %.)
4. Among the cases of Extradural haemorrhages, 88.8% of cases were associated with skull fracture and in 11.2% of cases they were not.

**Statement:** This study is an original self-funded research work and does not involve either issues of conflicts of interest or ethical implications. Ethical clearance has duly been obtained from the Institutional Review Board, Government Medical College, Thiruvananthapuram.

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