

# Clinico - Epidemiological Profile and Determinants of Fatal Injuries Sustained by Victims of Motorized Two Wheeler Accidents

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**Abstract:** *The objective of the study is to compare pattern, severity and circumstances of fatal injuries in motorized two wheeler accident victims (driver and the pillion rider). This is a retrospective study. Data was collected from post - mortem cases conducted in the mortuary of Gadag institute of medical sciences, Gadag, from January 2018 to December 2022.99 cases were studied. Most common rider and pillion rider victims are in age group 31 - 40 years. The common circumstance of accident was self fall 55% (pillion riders), 34% (riders). Head injury is the common cause of death in 73% (pillion riders) and 58% (riders), Skull and facial bone fracture is present in 74% (pillion riders), 47% (riders). Head injury was found to be more fatal in pillion riders than riders. Lower limb, rib and pelvic fractures are common among riders. Base of skull fracture was common among pillion riders. This study underlines the importance of helmets in reducing fatal pillion rider deaths.*

**Keywords:** Two wheeler accidents, rider, pillion rider, comparative analysis, injuries.

## 1. Introduction

Road traffic accidents (RTA) are a major public health issue and one of the five leading causes of morbidity and mortality around the world<sup>1</sup>. Most common vehicles involved are the motorized two wheeler accidents. There were estimated 1.19 million road traffic accident-related deaths in 2021 that is about 15 deaths in one lakh population<sup>2</sup>. Road traffic accidents form the leading cause of death worldwide among the age group 5 - 29 years, and the 12<sup>th</sup> most common cause of death, when all the ages are considered<sup>1</sup>. Globally four wheelers are the most common causes of death in road traffic accidents, followed by pedestrians and two wheelers<sup>2</sup>. Fatalities are more in the low income countries and least in the high income countries.

## 2. Materials and Methods

The study is a retrospective analysis of 99 fatal motorized two wheeler road accidents, which were autopsied in mortuary of Gadag institute of Medical Sciences, Gadag over a period of 5 years from January 2018 to December 2022. Data was collected from inquest forms and post mortem records. A Proforma was prepared to collect the data based on deceased's particulars like age, gender, Interval between accident and death of the person, type of offending vehicle, injuries sustained, cause of death etc. in relation to both the rider and the pillion rider.

## 3. Results and observations

### 3.1 Age and Gender distribution

Data was collected in 99 cases of which 77 cases were riders and 22 were pillion riders. Riders were predominantly males (M: F = 76: 1). Pillion riders were predominantly females (M: F = 7: 15). Highest number of victims were found in the age group 31 - 40 years. The gender and age distribution of the study sample is given in Table.1 and Table.2

**Table 1:** Age wise distribution.

Age Range (in years)	Rider	Pillion Rider
0 - 10	-	1
11 - 20	6	3
21 - 30	20	2
31 - 40	24	6
41 - 50	13	6
51 - 60	9	3
61 - 70	5	1
Total	77	22

**Table 2:** Age and Gender wise distribution.

Age Range (in years)	Rider		Pillion Rider	
	Male	Female	Male	Female
0 - 10	-	-	-	1
11 - 20	6	-	2	1
21 - 30	20	-	2	-
31 - 40	24	-	-	6
41 - 50	13	-	1	5
51 - 60	9	-	1	2
61 - 70	4	1	1	-
<b>Total</b>	<b>76</b>	<b>1</b>	<b>7</b>	<b>15</b>

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**3.2 Circumstances of accident**

Among the 99 cases studied, the most common circumstance of accident was self fall in riders (34%) and pillion riders (55%). Pillion riders were found to be more prone to self fall accidents. Four - wheelers (riders) and Two - wheelers (pillion riders) formed the most common offending vehicles in the circumstances of the accident as given in Table.3.

**Table 3:** Circumstances of accident.

Offending Vehicle	Rider	Pillion Rider
Self	26 (34%)	12 (55%)
Four wheeler	18 (23%)	2 (9%)
Heavy Vehicle	14 (18%)	3 (14%)
Two wheeler	9 (13%)	4 (18%)
Others	10 (12%)	1 (4%)
<b>Total</b>	<b>77</b>	<b>22</b>

**3.3 Period of survival**

The interval between the accident and the death of the person was calculated in the cases and was noted as the period of survival. The time interval was divided into instantaneous death, 0 - 2 hrs, 2 - 4Hrs, 4 - 12 hrs, 12 - 24 hrs, 1 - 3Days, 3 - 7Days, >7 Days. More cases were in the period of survival 0 - 2 hrs after the accident 74% in riders and 72% in pillion riders as shown in Table 4. Instantaneous death was seen in 5% of riders and 9% of pillion riders.

**Table 4:** Period of survival

Survival Period	Rider	Pillion Rider
Instantaneous/Spot	4 (5%)	2 (9%)
<2 hrs	53 (69%)	14 (63%)
2 - 4hrs	1 (13%)	3 (13%)
4 - 12hrs	5 (6%)	-
12 - 24hrs	2 (3%)	1 (5%)
1 - 3days	3 (4%)	1 (5%)
3 - 7days	-	-
>7 days	-	1 (5%)
<b>Total</b>	<b>77</b>	<b>22</b>

**3.4 Pattern of soft tissue injury**

On considering the soft tissue injuries, riders (33/77) were found to be more injured than the pillion riders (6/22). Liver was found to be the commonest soft tissue involved in 39% (riders), 50% (pillion riders). Distribution of soft tissue organ involvement is given in Table.5

**Table 5:** Soft tissue injury.

Soft tissue organ involved	Rider	Pillion Rider
Liver	13	3
Lungs	10	1
Spleen	8	2
Heart	1	-
Mesentery	1	-
<b>Total</b>	<b>33</b>	<b>6</b>

NB: No soft tissue injury in 53 (69%) riders and 17 (77%) pillion riders.

**3.5 Distribution of the fractures sustained**

Fractures of the facial and the skull bones were found in 47% of the riders and 74% of the pillion riders. Lower limb

fractures were found more common in riders (29%) than in pillion riders (9%). Rib fractures were also more common among riders. No fractures in 16 (21%) riders and 02 (09%) pillion riders. Few patients had fractures at multiple sites. Distribution of fractures are given in Table.6.

**Table 6:** Distribution of fractures

Fracture	Rider	Pillion Rider
Skull and facial	41 (47%)	17 (74%)
Upper limb (Rt.)	1 (1%)	1 (4%)
Upper limb (Lt.)	3 (3%)	2 (9%)
Lower limb (Rt.)	19 (22%)	2 (9%)
Lower limb (Lt.)	6 (7%)	-
Rib (Rt.)	6 (7%)	-
Rib (Lt.)	9 (10%)	1 (4%)
Pelvis	3 (3%)	-
<b>Total</b>	<b>88</b>	<b>23</b>

NB: No fractures in 16 (21%) riders and 02 (09%) pillion riders. Few patients had fractures at multiple sites.

**3.6 Types of Skull fractures**

Base of the skull fractures were found to be common both in riders (30%) and pillion riders (59%). Skull fracture was absent in 52% of riders and 23% of pillion riders as shown in Table.7.

**Table 7:** Distribution of fractures of skull.

Part of skull fractured	Rider	Pillion Rider
Base	23 (30%)	13 (59%)
Base + Vault	7 (09%)	4 (18%)
Vault	7 (09%)	-
No Skull fractures	40 (52%)	5 (23%)
<b>Total</b>	<b>77</b>	<b>22</b>

NB: No skull fractures in 40 riders and 5 pillion riders.

**3.7 Types of Skull fractures**

Among the cases studied, skull fractures were present in 48% of riders and 77% of pillion riders. Among the fractures fissure fracture is the most common 21/37 and 14/17.

**Table 8:** Distribution of type of fractures of skull

Types	Rider	Pillion
Fissure	21 (27%)	14 (64%)
Depressed	2 (3%)	-
Comminuted	14 (18%)	3 (13%)
No Skull fractures	40 (52%)	5 (23%)
<b>Total</b>	<b>77</b>	<b>22</b>

NB: No skull fractures in 40 riders and 5 pillion riders.

**3.8 Types of Intracranial hemorrhages**

On meningeal involvement, subdural haemorrhage and subarachnoid haemorrhage were found to be common in both the riders (46%) and pillion riders (64%). Interestingly, 35% of the riders were not having intracranial haemorrhage whereas it was only 14% in the pillion riders.

**Table 9:** Types of Intra - cranial Hemorrhages.

Intracranial Hemorrhages	Rider	Pillion Rider
SDH+SAH	35 (46%)	14 (64%)
SDH	4 (5%)	1 (4%)
SAH	6 (8%)	2 (10%)
EDH+SDH+SAH	4 (5%)	1 (4%)
EDH+SDH	1 (1%)	1 (4%)
EDH	-	-
No Intracranial Hemorrhages	27 (35%)	3 (14%)
<b>Total</b>	<b>77</b>	<b>22</b>

NB: No Intra - cranial haemorrhage in 27 riders and 3 pillion riders.

### 3.9 Cause of Death

Cause of death in majority of the cases studied were attributed to head injury, 58% (riders) and 72% (pillion riders). It was followed by Hemorrhagic shock with long bone fracture in riders (16%) and Intra - abdominal injuries among the pillion riders (13%) as described in Table.10.

**Table 10:** Cause of Death

Cause of Death	Rider	Pillion Rider
Head Injury	45 (58%)	16 (72%)
Hemorrhagic shock - Long bone Fracture	12 (16%)	1 (5%)
Intra - abdominal	9 (12%)	3 (13%)
Head injury + Intra abdominal	03 (04%)	1 (5%)
Head injury + Hemorrhagic Shock - Long bone fracture	3 (04%)	-
Head injury + Intra thoracic	02 (03%)	-
Intra abdominal + Hemorrhagic shock - Long bone fracture	-	1 (5%)
<b>Total</b>	<b>77</b>	<b>22</b>

## 4. Discussion

This study was conducted to evaluate the pattern, severity and the circumstances of the injuries sustained by the riders and the pillion riders among the victims of motorized two - wheeler accidents.

Legislative processes have led to mandatory use of helmets for two - wheeler riders, but large number of people still ignore its importance. In India it is common practice for pillion rider females to sit in side saddle fashion (both legs on same side) and males and children astride (legs on opposite sides). The quality of roads, road literacy and discipline have improved a lot from the past, but there is still a lot of scope for improvement. The present study is consistent with the works of other authors<sup>3, 4, 5</sup>.

Our findings indicate that the highest number of victims are in age group 31 - 40 years in both the riders and the pillion riders. As 31 - 40 year group population are the working age group, they are naturally the most common to use different vehicles for conveyance. Also in our study, the males are common victims among riders (M: F = 76: 1) and females among pillion riders (M: F = 7: 15). This is in concurrence with other studies<sup>3</sup>.

Self fall attributes to higher number of victims in both the riders and the pillion riders. Pillion riders were found to be more susceptible to self fall, probably because the pillion riders have an element of surprise and they have less response time.

In the total of 99 cases studied, majority of the victims died in < 2hrs after the incident among the riders (74%) and the pillion riders (72%). Among that 5% of riders and 9% of pillion riders died on the spot.

Liver is the most common soft tissue injured

In our study, the most common fractures are of head and face, followed by lower limbs. Similar results were also observed by other authors<sup>3, 4, 5</sup>. Fractures of the lower limbs

are more common among riders than pillion riders. A possible explanation for this could be the seating position of females who are usually positioned in side - saddle (legs on the same side) position and males in astride (legs on the opposite side) position. The side - saddle position in females could help them in avoiding a forceful impact with the vehicle as they could easily be thrown out of the vehicle, causing a much higher incidence of head injury. No fractures in 16 (21%) riders and 02 (09%) pillion riders. Few patients had fractures at multiple sites. Hence our study shows that pillion riders are more susceptible to fractures than riders.

In our study, Base of the skull fractures are common in both riders (62%) and pillion riders (76%). Fissure fractures are common among riders (27%) and pillion riders (64%), followed by comminuted fractures in both the riders (18%) and pillion riders (13%). No skull fractures were noticed in 40 riders (52%) and 17 pillion riders (23%). Hence the study shows a predominance of head injury among the pillion riders compared to the riders. This is in concurrence with other studies<sup>3</sup>.

Head injury is the cause of death in majority of the victims in both the riders (58%) and the pillion riders (72%). Followed by Hemorrhagic shock and long bone fracture in riders (16%) and Intra - abdominal injuries (13%) among pillion riders.

## 5. Conclusion

The present research shows that motorized two wheeler accidents are on the rise, and continue to be an important public health problem. Head injuries were the most common cause of death among both the riders and the pillion rider groups. This shows that the legislation on mandatory helmets need to be strictly enforced further. Also fresh legislation on mandatory helmets for the pillion riders also need to be looked into. Majority of cases studied here had died within first two hours of the accident, hence the emergency response services need to be further strengthened. Health education on road safety measures and strict enforcement of traffic rules especially helmet wearing,

speed limits etc. could go a long way in curbing the epidemic of road traffic accidents.

**Conflict of interest statement**

Nil

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Self

**Ethical approval**

Taken from Institutional Ethical committee, GIMS, Gadag.

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