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# Determination of fall related deaths: An autopsy study

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**Abstract**
**Background:** Trauma due to accidents or fall from height is a major cause of disability and mortality among individuals. The present study recorded fall related deaths.
**Materials & methods:** The present study was conducted on 104 deaths due to fall of both genders. In all cases, site of injury, GCS score, place and height of fall etc. was recorded.
**Results:** In present study, out of 104 patients, males were 65 and females were 39. Site of injury was head in 48, feet in 4, pelvis in 30 and thorax in 22 cases. Height of fall was 20 feet in 16, 40 feet in 63 and 100 feet in 25 cases.
**Conclusion:** Authors found that most commonly site of injury was head and manner of injury was accidental.

**Keywords:** Head, fall, suicide

## Introduction
Trauma due to accidents or fall from height is a major cause of disability and mortality among individuals aged less than 45 years in the United States of America, Europe and third world countries. The cost of treatment and rehabilitation of these patients is estimated to be more than 33 billion dollars in the United States of America [1]. Prevention is the most important solution for facing this phenomenon, which requires knowing the epidemiology of trauma. A fall is defined as an injury to a person that occurs after landing on the ground after falling from a higher place, such as a ladder, scaffold, building, roof, or other elevated place or work area. Falls mostly affect males, and disproportionately affect the very young or very old [2].
The pattern of injuries in cases of falls from heights is dependent on the height, body weight, velocity, nature of surface impacted, orientation of body at the moment of impact and the elasticity and viscosity of tissue of the contact body region, out of which height of fall is the major determining factor. Falls are the second most common cause of injury-associated mortality after traffic accidents. They comprise a significant percentage of blunt trauma cases and emergency department (ED) admissions [3].
As a person falls from height, the Kinetic energy keeps on increasing due to acceleration during the fall and is maximum at the moment of impact. This amount of kinetic energy is transferred to the body of the person at the moment of impact causing injuries. Determination of the anatomical site which first impacts the ground (the primary site of impact) is useful in reconstruction of the event [4]. The present study recorded fall related deaths.

## Materials & methods
The present study was conducted in the department of Forensic Medicine. It comprised of 104 deaths due to fall of both genders. Ethical clearance was taken prior to the study.
General information such as name, age, gender etc. was recorded. In all cases, site of injury, GCS score, place and height of fall etc. was recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## Results
**Table 1:** Distribution of patients

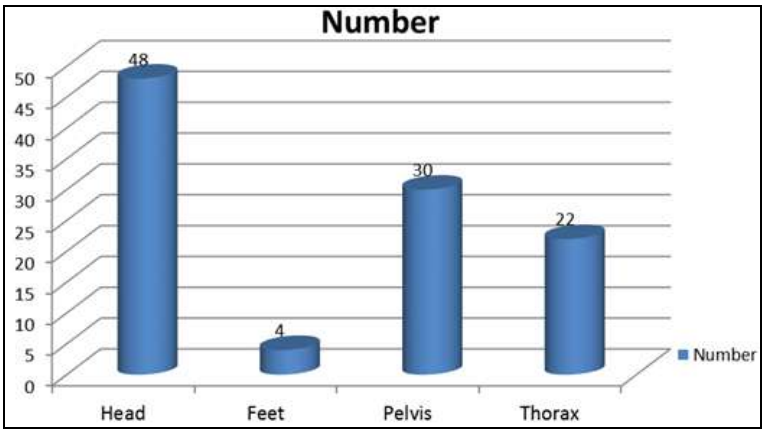
| Total-104 | | |
|---|---|---|
| **Gender** | **Males** | **Females** |
| Number | 65 | 39 |

Table 1 shows that out of 104 patients, males were 65 and females were 39.

**Table 2:** Site of injury

| Site | Number | P value |
|---|---|---|
| Head | 48 | 0.01 |
| Feet | 4 | |
| Pelvis | 30 | |
| Thorax | 22 | |

Table 2, graph 1 shows that site of injury was head in 48, feet in 4, pelvis in 30 and thorax in 22 cases.

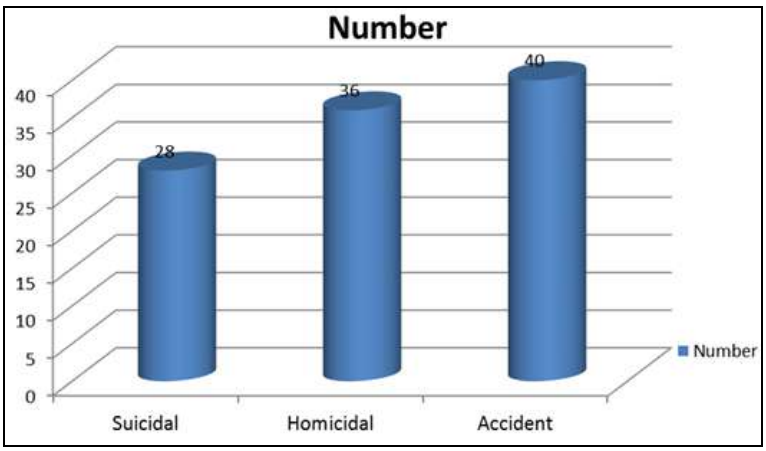



**Graph 1:** Site of injury

**Table 3:** Height of fall

| Height (Feet) | Number | P value |
|---|---|---|
| 20 | 16 | 0.01 |
| 40 | 63 | |
| 100 | 25 | |

Table 3 shows that height of fall was 20 feet in 16, 40 feet in 63 and 100 feet in 25 cases.




**Graph 2:** Manner of death

Graph II shows that fall was suicidal in 28, homicidal in 36 and accident in 40 cases.

## Discussion

In fall from height the rate of change of the direction and speed of movement that result in tissue injury. Assuming that the victim had been subjected to vertical free fall, then often extensive and severe injuries sustained by them would largely be the consequence of their bodies coming to an abrupt halt upon impact with the ground or some other structure and absorbing the forces of deceleration [5]. If the kinetic energy is discharged slowly enough to overcome the inertia of the tissue mass as a whole and to impart a relatively uniform motion to it, it will fail to produce a wound. The surface on to which a body falls determines the pattern of deceleration and energy discharge [6]. On a relatively yielding surface such as soft net or water the energy is given slowly, but on a relatively unyielding surface such as concrete, time of deceleration is less, so forces on the body will be much greater. The magnitude of the accompanying forces of deceleration may best be appreciated by considering the corresponding G forces (gravities) which measure the rate of change of movement [7]. The present study recorded fall related deaths.

In present study, out of 104 patients, males were 65 and females were 39. Goonetilleke *et al.* [8] found that majority of victims were males (69.8%). Age ranged from one year one month old female child to 90 years old elderly female.

Incidence was maximum in lower and lower middle income group (88.7%). Place of incidence was home in 66% of cases. Accidental death constituted 50.9%. Majority died due to fall into well (88.7%). Significant number of victims fell down from a height range of 5 to 10 meters (39.6%). Drowning was the foremost cause of death irrespective of height of fall (58.5%). External injuries were invariably present in all cases and internal injuries in 41.5%. Most frequent region involved was head in 33.9% cases. Injury severity was not proportional to the height of fall.

We found that site of injury was head in 48, feet in 4, pelvis in 30 and thorax in 22 cases. The height of fall was 20 feet in 16, 40 feet in 63 and 100 feet in 25 cases. The major determinant of injury and the changes of death directly proportional to the height fallen, as the accelerating force of the gravity is constant. At impact the deceleration forces are determined by the individual deceleration-mass and the nature of the landing surface and the body orientation of landing. Surfaces such as mud, snow, soft earth and to a lesser extent, water can permit an increased duration of impact, reducing deceleration forces and hence injury [9].

We observed that fall was suicidal in 28, homicidal in 36 and accident in 40 cases. Richter *et al*. [10] found that splenic injury was found to be the commonest cause of haemoperitoneum. Kidneys were not found to be injured in any of the cases in our study. As to the cause of death, cranio-cerebral damage was most common occurring in two-third of cases.

## Conclusion

Authors found that most commonly site of injury was head and manner of injury was accidental.

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