

The Pattern of Physical Injuries among Victims of Fatal Accidents in Bhopal, Madhya Pradesh

Brinda Patel¹, SK Asawa²

¹Senior Resident, Dept of Forensic Medicine & Toxicology, AIIMS, Bhopal, M.P., ²Professor & Head, Dept of Forensic Medicine & Toxicology, Government Medical College, Dungarpur, Rajasthan

Abstract

Background: The pattern of injuries is unique to the mode of the accident as well as to the causative agent. The objective of the present study was to describe the pattern of injury among victims of a fatal accident and draw a medicolegal conclusion from the pattern of injury. **Methods:** A total of 145 dead bodies brought for autopsy at the two selected post-mortem centres were included in the present study. The socio-demographic data like age, sex, religion, occupation as well as the circumstances leading to the death of the individual were gathered from documents and detailed interview of the friends/relatives/eyewitnesses etc. Among study participants, burns were the single largest category of accidents closely followed by road traffic accidents. The brain was the most common internal organ injured and the skull was the most common major bone fractured among the victims. One-fourth of all study participants were dead before being brought to hospital and one-third of all study participants survived for more than 48 hours after the incident. **Conclusion:** Septicaemic shock and craniocerebral injury were the most common cause of death among study participants.

Keywords: Accidents, Injury, Burns, Fall, Fatal, India.

Introduction

Trauma is an injury inflicted on a living tissue caused by the application of external force.^[1] As per section 44 of the Indian Penal Code, *an injury is defined as any harm illegally caused to any person in body, mind, reputation, or property.*^[2] Injuries can be classified as physical (or mechanical), chemical, thermal & miscellaneous depending on the nature of the causative agent.^[3] For medico-legal purposes, injuries can also be classified as suicidal, homicidal, accidental, fabricated, self-inflicted & defence. Traumatic instances can be unintentional (accidental) or intentional (suicidal or homicidal).^[4] It is estimated that worldwide about five million people die each year due to some type of injury.^[5] Moreover, different types of injuries collectively account for about 9% of global mortality & 12% of DALY (disability-adjusted life years).^[5]

An accident is the occurrence of a series of events resulting in unintended injury, death, or property damage. It is an unplanned event, occurring suddenly, unexpectedly

& inadvertently in an unforeseen circumstance.^[6] An accident is a result of defects lying either in the host (victim), agent (vehicle) & environment (road condition, traffic, weather conditions etc.) or a combination of defects at each of these three levels. Accidents represent an endemic of the modern and fast-changing world. There are different types of accident viz. road traffic accidents (RTA), railway accidents, falls from height, accidental fires, occupational accidents. In India, RTAs have the maximum share of unnatural deaths followed by burns.^[7] Globally, RTAs are considered as the 3rd leading cause of death after heart disease & cancer^[8] & the 3rd major preventable cause of unnatural deaths.^[9] 'Fall from height' is defined by ICD-9 as an event where a person falls to a ground-level from an upper level, whereas *FICSIT (Frailty & Injuries Cooperative Studies)* defines them as *unintentionally coming to rest on the ground or lower level.*^[10] The frequency, type & extensiveness of an injury depend on body weight, velocity, height, nature of surface impacted, body's orientation at impact.^[11] The most important among all these factors is the 'height' of

the fall.^[11] During the autopsy, the most important thing to do is to determine the primary site of impact to permit the forensic reconstruction of the event to form a medico-legal opinion whether the fall was suicidal, homicidal, or accidental.

The objective of the present study is to identify and describe the pattern of injuries sustained by victims of fatal accidents.

Material and Methods

Study Setting: The present study was carried out at the mortuary of People's College of Medical Sciences, Bhopal and Medicolegal Institute of Madhya Pradesh, Bhopal. **Study Duration:** The total duration of the study was one & a half year; from 1st January 2014 to 30th June 2015. **Sample Size:** For this study, we sampled and collected data from a total of 145 dead bodies on which the autopsies were conducted during the period of data collection.

Inclusion Criteria: Deaths due to accidents (e.g., road traffic accidents, falls from height & thermal injuries), who either died before reaching the hospital or were admitted to hospital before their death. **Exclusion Criteria:** (I) deaths due to non-accidental trauma (interpersonal or self-harm) (ii) Decomposed bodies preventing a valid autopsy, (iii) deaths due to causes other than trauma.

Data collection: The detailed medico-legal postmortem examination was carried out in the two selected centres after receiving requisition from a concerned police official, the inquest report & the dead

body challan. The socio-demographic data like age, sex, religion, occupation as well as the circumstances leading to the death of the individual were gathered from documents like inquest report, dead body challan and through detailed interview of the friends, relatives, neighbours, eyewitnesses, and police officials accompanying the dead bodies. In cases where the death of the victim occurred in the hospital, the treatment records available were also studied. All medico-legally important findings were documented by taking scaled photographs, whenever & wherever possible.

Data Analysis: All the data were collected in a paper-based data collection form. Thereafter, the data will be coded and entered in Microsoft Excel. The coded data were imported into Stata 15.1 version for analysis. For the continuous data, the author calculated the mean, median, and standard deviation. For discrete data, the author calculated and reported frequency, proportion, and percentage.^[12] Any statistical difference between the two proportions will be estimated using the Chi-square test.^[13] Any statistical difference between the two means will be estimated using the T-test.^[13]

Results

During the period of data collection, a total of 145 dead bodies fulfilling the selection criteria were brought to the mortuaries for autopsy. Table 1 gives details about the type of accident. As can be inferred from table 1, burns were the single largest category of accidents followed by road traffic accidents resulting in death among study participants. There was only a single case of death due to lightning.

Table 1: Distribution of study participants by type of accident (n=145)

Type of accident	n	%
Road traffic accident	53	36.6
Railway accident	7	4.8
Fall from height	18	12.4
Burns	65	44.8
Others	2	1.3
Total	145	100.0

Table 2 give details about the socio-demographic details of the study participants. The mean and the median age of the study participants was 38.6 and 28 years, respectively. Most participants were between 10-30 years of age followed by 30-60 years of age.

Occupationally, most of the study participants were field workers and met with an accident while on their job. This was closely followed by females working as a homemaker.

Table 2: Distribution of study participants by their socio-demographic data (n=145)		
Age		
0-10	5	3.4
10-30	77	53.1
30-60	44	30.3
>60	19	13.1
Gender		
Male	100	69.0
Female	45	31.0
Religion		
Hindu	123	84.8
Muslim	19	13.1
Others	3	2.1
Marital Status		
Unmarried	56	38.6
Married	79	54.5
Other	10	6.9
Occupation		
Field workers	51	35.2
Factory worker	7	4.8
Official/clerical	18	12.4
Housewife	34	23.4
Other	35	24.1

Table 3: Distribution of study participants based on injury to internal organ and fracture of major bones (n=80*)**

Fracture of Major Bones	n [^]	%
Skull & Face	48	26.2
Neck and Thorax	18	9.8
Pelvis	31	16.9
Upper Limb	39	21.3
Lower Limb	47	25.7
INTERNAL ORGAN INJURY		
ORGAN	n [^]	%
Brain	41	30.4
Lung	23	17.0
Heart	23	17.0
Liver	17	12.6
Other	31	23.0
***- Includes study participants without burn injury. ^- sample exceeds 145 because of multiple injuries.		

Table 3 illustrates the injury sustained by bones and internal organs among victims of the non-burn accident. Among study participants, skull & facial bones were the most commonly (26.2%) injured major bones closely followed by bones of lower limb (25.7%), neck & thorax

bones were least commonly injured bones (9.8%). Similarly, the brain was the most commonly injured organ (30.4%). Collectively, the hollow viscera of the abdomen were the second most common organ injured among the victims.

Table 4: Distribution of study participants based on the cause of death and survival after the accident (n=145)

Cause of death	n	%
Cranio-Cerebral Injury	44	30.3
Septicemic Shock	53	36.6
Polytrauma	21	14.5
Hemorrhagic Shock	25	17.2
Cardiac Arrest	32	22.1

Cont... Table 4: Distribution of study participants based on the cause of death and survival after the accident (n=145)

SURVIVAL AFTER ACCIDENT		
Time	n	%
Brought dead	28	19.3
<6	19	13.1
6-12 hour	8	5.5
12-24 hour	10	6.9
24-48 hours	31	21.4
>48 hours	49	33.8

Table 4 highlights the cause of death and the time for which the victim survived after the accident. Among study participants, septicemic shock was the most common cause of death. This is hardly surprising as most study participants suffered a burn injury. This was closely followed by craniocerebral injury. In our study, most victims survived for more than 48 hours and about one-fifth of victims were declared dead on arrival at the hospital. Most participants who survived for more than 24 hours after the incident suffered from burn and most participants who were dead before reaching hospital suffered from poly-trauma.

Discussion

The present study included data from a total of 145 victims of fatal accidents whose dead bodies were brought to the mortuary of People's College of Medical Sciences & Research Centre (PCMS & RC), Bhopal and Medico Legal Institute of Madhya Pradesh (MLI), Bhopal, for autopsy, during the period of data collection. The participants included victims of road traffic accidents, falls from height, railway accidents, accidental burns & other accidents. Most deaths were attributed to burns (44.8%), followed by road traffic accidents (36.6%), falls from height (12.4%), and railway accidents (4.8%).

In our study, out of a total of 145 victims, the majority were males (69.0%). In Indian society, men are generally the more active group (both economically and physically), thereby exposing themselves to various injury-causing agents. This may explain the observed male preponderance among study subjects. In our study, the single most common age group was 20-60 years, which also corresponds to the age group of maximum economic and physical activity. Children <10 years of age constituted the least common age group among study participants. All these participants (children) exclusively suffered from either burn or fall from height. The majority of the victims belonged to the Hindu community followed by Muslims. Similar results of Hindu predominance followed by Muslim were also reported by Gowri S et al.^[14] and Mazumdar A et al.^[15]. In the present study, most of the victims were married (54.5%), followed by unmarried (38.6%). This is easily understood as the most common age group in the present study was 21-40 years and this represents the bulk of the married population. Similar findings were also reported by other researchers e.g., Gowri S et al.^[14], Harish D et al.^[16] & Mangal HM et al.^[17].

In cases of death due to burn injury, women (61.53%) outnumbered men (38.46%). This female preponderance can be explained by the fact that in

our study most accidental burn were kitchen related. Furthermore, in our study about 23% of all participants were homemaker. Such female predominance among victims of accidental burns injuries is also reported by other researchers viz. Dhillon S et al (2005)^[18], Gowri S et al,^[14] & Bharadwaj SD et al^[19]. In contrast, Rani A et al^[20] and Chaudhary BL et al^[21] reported a slight male preponderance among burn victims. In our study male predominance was seen among victims of accidents that happened outdoors such as RTA. Moreover, in our study all the victims of fall from height were men. Similar findings were also reported by Kumar M et al^[22], Naik BV et al^[23], and Satish NT^[24].

In the present study, we observed that the most commonly affected region, bearing external injuries was head, neck & face/HNF, involving 74 cases (26%), followed by lower limb (25%), and upper limb (21%). Involvement of HNF & extremities was most common because of the obvious facts that all these are exposed & projecting body parts & most active parts at the time of infliction of trauma. Khan MK et al. observed a similar pattern of distribution, having a larger proportion of injuries in HNF & extremities as compared to thorax & abdomen.^[25] Merchant SP et al, Patil AM et al. also describes quite a similar pattern of injuries in conformity as observed in the present study.^[26, 27] Out of all the internal organs, the brain was the most injured organ (30%). Both lungs and heart were injured in 17% of cases each, whereas the liver was injured in about 12% of cases. The brain was found to be the most injured organ in many studies Mandal BK et al (2012) of RTAs, falls from height & assault.^[28]

Most cases of fracture were noted in the skull (26%), followed by lower limb (25%) followed by upper limb fractures (21%). As the head is the most prominent of the exposed parts of the body under its situation, it bears the brunt of violence in traumatic cases. Bairagi KK et al. (2010) also reported that most fractures were seen in the skull and face.^[29] Similarly, Ravikumar R (2013) found skull fractures in 67.75% of cases of RTA, especially among two-wheeler accidents.^[30] Mandal BK et al. also found the skull to be mostly fractured, followed by

thoracic bones & long bones respectively in RTA cases.^[28] Kumar JVK et al (2013) observed that there were skull fractures in almost all cases of fall from height wherever primary head impact was present.^[31]

In the present study, one-third of all participants remained alive for >48 hours after the incident and about one-fourth of participants were declared dead on arrival at the hospital. The longest period of survival was predominantly seen among the victims of burn injury whereas in cases of head injury most victims survived < 48 hours. Patil AM et al had more or less similar results.^[27] Khan MK et al. in their study on fatal head injury victims found that the greatest number of victims survived for 1-6 hrs (27.17%).^[25] Manish K. et al (2012) found that the maximum number succumbed to death within 6 hours.^[32] The variation noted may be due to the difference in the type of trauma, type of organs involved & time of medical attention etc. Among burn-related deaths, the majority survived for 3-7 days (48.64%); followed by spot deaths (22.97%). Such a long survival period was because the burnt tissue acts as a nidus for infection & sepsis sets in as a delayed complication leading to death in approximately 3-7 days. This was consistent with the results of Gadge SJ et al (2014)^[33], Chaudhary BL et al^[21] state that the maximum victims died on the spot, followed by a survival period of 3-7 days. Harish D (2013) on the other hand found that maximum victims survived for more than 1 week (24%).^[16]

Conclusion

Accidents constitute a major chunk of preventable deaths. Most of the participants in our study were either physically or economically active or both. The burn injuries were most common among housewife as most burn accidents were domestic incidents. Among victims of non-burn trauma, the most common injured internal organ was the brain and the most common major bone fractured was the skull.

Ethical Clearance: The protocol for the present study was approved by the Ethical Committee on Human Research of the People College of Medical Sciences,

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Conflict of Interest: Authors declare they have no conflict of interest.

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