

Original Research Article

Analysis of autopsies conducted for deaths due to accidental trauma: a ten years record-based study

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ABSTRACT

Background: Trauma is a largely preventable cause of death. Trauma can be avoided and death can be averted if timely medical services are made available. Hence it is important to know the causes of trauma, the factors associated with it and the types of fatal injuries associated with these causes.

Methods: A ten years record based study of the autopsies conducted in the Forensic Medicine department of a rapidly growing metropolitan area was undertaken from the autopsy registers and post mortem records.

Results: It was noted that the young age groups of 16 to 30 years and 31 to 40 years are most vulnerable. Major cause of trauma was road traffic accidents, followed by fall from height. Other causes are Rail accidents, domestic accidents, building collapse and industrial accidents. Head injuries and shock with hemorrhage are the major causes of death due to trauma.

Conclusions: Overall, males and younger population forms a major proportion of trauma victims. Among female victims the major causes of trauma were domestic accidents and house collapse and among male victims road traffic accidents, fall from height and railway accidents were major causes.

Keywords: Fall from height, Head injury, Road traffic accidents, Trauma

INTRODUCTION

Traumatic injury is a term which refers to physical injuries of sudden onset and severity which require immediate medical attention. The insult may cause systemic shock called “shock trauma”, and may require immediate resuscitation and interventions to save life and limb.¹

Traumatic injuries include motor vehicle collisions, sports injuries, falls, natural disasters and a multitude of other physical injuries which can occur at home, on the street, or while at work and require immediate care. Trauma is one of the biggest contributor to mortality

statistics in India. Deaths due to trauma are largely preventable. The commonest causes of trauma are Road Traffic accidents (RTA), fall from height, railway accidents, building collapse, industrial accidents, domestic accidents and landslide. According to “WHO Global Status Report on Road Safety 2015” more than 1.25 million people die on the world’s roads every year and tens of millions are injured or disabled every year.² Especially in low and middle-income countries road traffic injuries remain a serious health problem. Out of the Road Traffic Accidents, 80% of deaths and injuries occur due to mistakes by drivers. Common causes are over speeding, drunk driving, avoiding seat belts, poor visibility of roads, long drives, fatigues and giddiness

associated with it. RTA are on increase because of increased number of vehicles, lack of new roads and infrastructure, indiscipline, lack of regulatory control, drunk driving, bad roads, old/lack of up to date vehicles, inadequate training for drivers, inexperience, ignorance of traffic rules. Post accidents- lack of timely premedical and medical services, lack of trauma centers to deal with victims in golden hours.³ Railway accidents included fall from trains, hit by trains while crossing or walking on the tracks. Building collapse is possible because of lax quality control in construction industry especially in developing countries.⁴ Domestic accidents included fall on floor, slipping in bathroom, fall from height and fall from stairs, burns, scalds, electrocution.⁵

The probability of survival largely depends upon availability of health attention in the golden hour (Adams Cowley).⁶ It is therefore imperative that we study the factors associated with trauma deaths and the range of causes and injuries resulting from fatal trauma. This study was conducted in Forensic Medicine Department of an Education Institute situated in a rapidly developing Metropolitan area near Mumbai. This study will help in understanding the key factors in trauma, types of fatal injuries sustained in trauma and in organizing preventive measures for decreasing trauma deaths.

The objective of this study was to study the annual case load of Post mortem examinations of trauma deaths (excluding homicide and traumatic asphyxia) performed at the department of Forensic Medicine at this institute. And to study the various correlates associated with the trauma deaths. To suggest preventive measures to prevent trauma and deaths associated with trauma.

METHODS

After seeking permission from the Institutional Ethics Committee, the data regarding postmortems performed in the Forensic Department from 1st January 2006 to 31st December 2015 was taken from the PM registers. Additional data regarding type of injuries and causes was sought from the postmortem records of these cases. Data related to trauma was entered in MS Excel 2007 sheets and was analyzed by Excel 2007. For categorical data, Chi squared test was used to test significance of differences.

Inclusion criteria

All deaths occurring in the Institution or brought dead by the police and attributed to trauma during the ten years period of 2006 to 2015.

Exclusion criteria

Deaths due to trauma resulting from homicide and traumatic asphyxia, electrocution, burn and scald (as these topics have been considered in detail by the author in separate papers).

RESULTS

During the period of January 2011 to December 2016, a total of 5045 post mortem examinations were conducted in the department of which 816 were deaths due to trauma, which excluded Trauma due to homicide and traumatic asphyxial deaths.

Table 1: Age- sex differentials of trauma victims brought for autopsies to the FMT department.

Age (years)	Females	%	Males	%	Total	%
≤ 5	18	11.7	2	0.3	39	4.8
6-10	16	10.4	16	2.4	32	3.9
11-15	2	1.3	15	2.3	17	2.1
16-30	44	28.6	275	41.7	319	39.1
31-40	23	14.9	158	23.9	181	22.2
41-50	21	13.6	86	13.0	107	13.1
51-60	8	5.2	64	9.7	72	8.8
≥ 61	22	14.3	27	4.1	49	6.0
Total	154	100	662	100	816	100

Table 1 shows the age and sex composition of the victims who died of fatal trauma and were brought to the Forensic department for postmortem analysis. There were 154 female casualties with mean age of 32.9 years (SD =2.3 years) and 662 males with mean age of 33.3 years (SD = 15.2 years). The maximum deaths were in age group 16-30 years, which were 319 (39.1%), followed by age group 31 to 40 years which had 181 (22.2%) deaths.

Gender wise this pattern is seen in both males and females. If the age groups less than 15 are considered, there are 36 (23.4%) females and 51 (7.7%) males. Whereas in working age groups 16-51 years are considered, there were 88 (57.1%) deaths among females and 519 (78.4%) deaths among males. This difference is statistically significant ($\chi^2=37.6, p <0.005$).

Table 2 shows frequency of the cause of trauma and the Gender Differentials in Causes of Fatal Injuries. Maximum number of fatal trauma was due to road traffic accidents (RTA) (448, 54.9%), followed by injuries due to fall from height (160, 19.65%). The Table also shows the relation between gender and cause of trauma. It is observed from the table that percentage of males is more

in railway accidents, vehicular accidents and fall from height. Whereas the number of female victims is more in cases of domestic accidents, landslides and building collapse. This difference between incidence in types of accidents in different genders is statistically significant ($\chi^2=44.3$, $p<0.005$).

Table 2: Gender differentials in cause of trauma.

Cause of trauma	Female	%	Male	%	Grand Total	%
Unknown cause	7	4.5	31	4.7	38	4.7
Building collapse	17	11.0	17	2.6	34	4.2
Domestic accidents	11	7.1	11	1.7	22	2.7
Fall from height	32	20.1	128	19.2	160	19.6
Industrial accidents	2	1.3	11	1.7	13	1.6
Landslide	4	2.6	4	0.6	8	1.0
Rail accidents	15	9.7	77	11.6	92	11.3
Road traffic accidents	65	42.2	383	57.9	448	54.9
Wall collapse	1	0.6		0.0	1	0.1
Grand total	154	100.0	662	100.0	816	100.0

Table 3: Cause of death and age of the victims.

Cause of death	Age groups (years)								Total	%
	<5	6-10	11-15	16-30	31-40	41-50	51-60	>61		
Shock and haemorrhage	9	13	6	148	83	51	34	23	367	45.0
Blunt trauma	0			1	1	1		1	4	0.5
Crush injuries	3	1	0	11	8		1	0	24	2.9
Head injury	26	16	11	152	89	55	36	25	410	50.25
Polytrauma	1	2		7			1	0	11	1.3
Total	39	32	17	319	181	107	72	49	816	100.0

Table 4: Cross relation between cause of death and cause of trauma.

Cause of death	BC	DA	FFH	IA	LS	RA	RTA	WC	UK	Grand total	%
Shock and hemorrhage	20	8	59	8	6	34	211	1	20	367	45.0
Blunt trauma	0	0	0	0	0	1	3	0	0	4	0.5
Crush injuries	3	0	0	0	2	3	16	0	0	24	2.9
Head injury	9	14	99	5	0	53	213	0	17	410	50.2
Polytrauma	2	0	2	0	0	1	5	0	1	11	1.3
Total	34	22	160	13	8	92	448	1	38	816	100.0
%	4.2	2.7	19.6	1.6	1.0	11.3	54.9	0.1	4.7	100.0	

Table 3 shows cross relation between age groups and cause of death which proved to be fatal for the victims. Of the 410 cases of deaths due to head injuries, 152 (37.1%) were in age group 16-30 years, followed by 89 (21.7%) in age group 31-40 years. Of the 367 who died of shock and haemorrhage, 148 (40.3%) were in age group 16-31 years, followed by 83 (22.6%) in age group 31-40 years. In Table 4, we observe that in maximum cases the death is due to head injuries (410, 50.25%) resulting mainly out of Road traffic accidents (213,

51.9%), fall from height (99, 24.1%), rail accidents (53, 13.1%). This is followed by shock and haemorrhage (367, 44.9%) resulting from damage or injuries to internal or vital organs or fractures, common in Road traffic accidents (211, 57.5%), Fall from height (59, 16.1%), and rail accidents (34, 9.3%). Deaths due to crush injuries mainly resulted from road traffic accidents (16, 66.6%).

Table 5 shows the Cause of trauma in different age groups. It shows that of the 319 deaths in age group 16-

30 years, maximum deaths are due to vehicular accidents (172, 53.9%), followed by rail accidents (54, 16.9%) and fall from height (49, 15.4%). In age group 31-40 years,

maximum deaths were due to Road Traffic accidents (100, 55.2%) and fall from height (45, 24.9%).

Table 5: Cross relation between cause of trauma and age group in years.

Cause of trauma	Age groups (in years)								Total	%
	<5	6-10	11-15	16-30	31-40	41-50	51-6	> 61		
Building collapse	7	1	0	19	5	1	0	1	34	4.2
Domestic accident	3	3	0	1	3	2	2	8	22	2.7
Fall from height	14	7	4	49	45	16	16	9	160	19.6
Industrial accident	1	0	0	8	3	2	0	0	14	1.7
Landslide	1	1	0	3	2	0	1	0	8	1.0
Railway accident	1	4	1	54	13	5	8	6	92	11.3
Road traffic accident	11	16	12	172	100	73	41	23	448	54.9
Unknown cause	1	0	0	13	10	8	4	2	38	4.7
Total	39	32	17	319	181	107	72	49	816	100.0
% of total	4.8	3.9	2.1	39.1	22.2	13.1	8.8	6.0	100.0	

DISCUSSION

Table No1 shows that there are more male victims 662 (81.1%) than female victims 154 (18.9%). In working age groups, this difference is more obvious. This is because males are usually the bread earners of their family and have to stay out and involve in hazardous tasks to earn their wages. Other authors have also noted that males are major victims of trauma deaths.⁷

As seen in Table 2, most of the victims of deaths due to trauma in Domestic accidents, House collapse were females. The reason is that most of the females were housewives, being at homes, were trapped in building collapse with children. In cases of vehicular accidents, railway accidents, the percentage of males were higher. This is most probably because males are involved in outdoor works and have to travel by trains which are overcrowded in Mumbai. In fast growing, unregulated suburbs of Thane, faulty constructions are major cause of building collapse.

In Table 3 and 4, head injuries are a major cause of death across all age groups, especially in 16-30 years. Major cause of head injuries is Road Traffic Accidents. In Road Traffic accidents and in Rail accidents, person is hit with tremendous force. Also, there is head on collision. Head injury and injuries to vital organs leads to haemorrhage and shock. In some cases, especially in accidents involving two wheelers and pillion riders, the victim falls down and is run over leading to crush injuries. Some authors have noted that vehicular accidents commonly causes thoraco-abdominal trauma and most common cause of death was haemorrhage and shock.^{7,8} Other authors have also noted that head injuries and multiple injuries are common types of trauma.^{9,10,11} RTA as a common cause of trauma has been reported by other authors also, followed by fall from height.¹² Most of the

areas surrounding Thane cities are growing rapidly, and as people go in search of cheaper housing, they are ready to compromise on quality of housing and safety factors. This area has seen many incidences of building collapse and deaths and injuries associated with it. Also seen in these surrounding areas, industries with inadequate protective measures for workers, which results in trauma due to industrial accidents. Fall from height has resulted in 160 trauma deaths. This could be attributed to unsafe buildings, lack of railings near slopes, unsafe construction activities which include RCC works, masonry, wiring, plumbing, painting and fabrication. Head injury is commonest fatal injury in fall from height. Other authors have noted the same.^{13,14}

Table 5 shows that age group 16-30 years is the most vulnerable for traumas. Followed by age group 31-40 where accidents can occur because of outdoor activities. Road traffic accidents being the major killer in this group is because of lack of experience, adventure seeking/ risk taking behavior, over speeding, lack of regards for law, disregard for parental control.¹⁵ Domestic accidents are seen in extremes of age, i.e. Small children and elderly. This finding is similar to that of Bhandar et al.⁵

How to prevent deaths due to trauma

RTA can be reduced by constructing better roads and bridges, education and training of youth in driving and following traffic rules, checking drunk driving and high speed driving, improving road visibility and proper signage, active traffic regulation by authorities and punitive action against offenders.³ Road safety laws improve road user behaviour and reduce road traffic crashes, injuries and deaths – especially laws relating to the five key risk factors for road safety speed, drink-driving, the use of motorcycle helmets, seat-belts and child restraints. Progress has been made in 17 countries

(covering 409 million people) to amend laws relating to one or more of these risk factors over the past 3 years and bring them in line with best practice.²

Industrial accidents can be minimized by accidents prevention programmes, including ongoing training in safety, use of protective measures (e.g. Helmets), disallowing general workers in high risk areas, enforcement of factory laws and regulations.^{16,17}

Railway accidents can be reduced by removing unmanned crossings, creating awareness among commuters regarding entraining and detraining, Improved infrastructure for passengers and improved safety measures like signal system.¹⁸

Domestic accidents can be prevented by using anti-skid tiles in bathrooms, reducing cluttering in the house, keeping safe storage space for dangerous tools, medicines and poisons, and safety railing on stairs and safety grills on windows.

Trauma due to fall from height can be avoided by carrying out risk assessment by the employers, use of fall restraints and arrest equipment such as nets, airbags and harnesses, and safety training to the workers.¹³

CONCLUSION

A decadal record based study was conducted in the FMT department on the demographic parameters and the causes of trauma and causes of deaths in these victims. It is seen that males form a major proportion of the trauma victims. The proportion of female victims is more in domestic accident and house collapse and male victims are more in Road traffic accidents, fall from height and rail accidents. Age group 16-30 years is the most vulnerable for trauma deaths. General awareness in the population about hazards and prevention of various types of traumas, improvement of roads and bridges, laws and regulation for road traffic and for industries, making homes accident proof and proper scrutiny of building standards will go a long way in reducing incidences of accidents due to trauma. Post trauma, immediate access to health care to deal with the victims in the golden hour will decrease the incidence of trauma deaths and morbidity.

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