



1: Assistant Professor, Forensic Medicine and Toxicology Ghulam Muhammad Mahar Medical College, Sukkur.

2: Assistant Professor, Forensic Medicine and Toxicology. Liaquat National Hospital and Medical College, Karachi.

3: Senior Lecturer, Forensic Medicine and Toxicology. Isra University, Hyderabad.

4: Assistant Professor, Forensic Medicine and Toxicology. Shaheed Mohtarma Benazir Bhutto Medical University, Lyari, Karachi.

5: Assistant Professor, Forensic Medicine and Toxicology. Isra University, Hyderabad.

6: Associate Professor, Forensic Medicine and Toxicology. Liaquat University of Medical and Health Sciences, Jamshoro.

*=corresponding author
qadri.drnaveed@gmail.com.

Forensic Evaluation of the patterns of fatal injuries among pedestrians in road traffic accidents in Hyderabad, Pakistan.

Mir Ghulam Ali Talpur¹, Sadia Abdul Qayyum², Amna Mangi³, Hari Ram⁴, Naveed Ali Qadri^{5,*}, Abdul Waheed Ali Nahyoon⁶.

Abstract:

Introduction: Road traffic accidents (RTAs) preventable yet responsible for a large number fatalities among children and adults. It is estimated that RTA causes approximately 1.35 million deaths (27.5 deaths per 100,000 population) through out the world.

Objective: To evaluate the patterns of fatal injuries among pedestrians due to road traffic accidents brought in emergency unit of Liaquat University, hospital, Hyderabad.

Methodology: This cross-sectional study conducted between Jan 2019 to Dec 2019 and all victims of road traffic accidents brought in the emergency due to fatal injuries belongs to either sex or age-group were included. Data collected includes demographic details; type, site, impact, intensity of injuries and different types of vehicles involved in the accidents were recorded from history/ autopsy findings of medico-legal officer. Collected data was entered and analyzed in SPSS ver. 23.

Results: Motorcars were more involved (31.0%) in road traffic accidents followed by trucks/loaders (29.0%). Males (87.5%) outnumber female. Head and neck region (26.0%) affected most, while abdomen/pelvis were the least (16.0%) affected. Contusions occurred in predominantly (51.0%) while most (60.5%) pedestrians were found dead when received in the emergency unit. Most common cause of death was head injury induced complications.

Conclusion: Injuries to head, neck and facial regions are more common while contusions are the predominant type of injuries occur in the pedestrians. Skull bone is most commonly fractured bone among the victims

Keywords: Pattern of injuries, Pedestrians, Road traffic accidents .

Introduction:

Road traffic accidents (RTAs) are responsible for a large number fatalities among children and adults of age 5 to 29 years worldwide.¹ It is estimated that the fatalities resulting from RTAs leads to 1.35 million deaths (27.5 deaths per 100,000 population) around the world.¹ Younger age females (under 25 years of

age) are less likely to be involved in RTAs compared with male of same age group i.e. 73% of all death resulting from RTAs occurring among young males.^{1,2} According to the Global status report on road safety 2018, over 90% of this burden of global fatalities resulting from RTAs is from middle and low income countries including Pakistan.² Approximately, \$

500 billion of gross national product (GNP) lost worldwide due to the RTAs with the highest proportion from low and middle income countries (LMIC).³

Pakistan ranked first in Asia and ranked 48th in the world for most deaths caused by RTAs. According to the population bureau of statistics Pakistan, about ten thousand RTAs occurred in the 2019-20 of which over five thousand people lost their lives and more than 12000 became injured.^{4,5} In Sindh province alone, more than 700 people died in RTAs in the year 2019-2020. It is estimated that 67% of RTAs in the country may be attributed to human errors, followed by the poor infrastructure and deteriorating condition of roads (28%) and unfit vehicles (5%).^{5,6}

The road users including pedestrians, cyclists and motorcyclists represents over half of all deaths due to RTA injuries worldwide. Pedestrians are extremely vulnerable to the RTAs followed by cyclists and motorcyclists.⁷ These vulnerable road users don't have any protection that drivers usually have while driving.^{7,8} Investigations of transport and traffic related injuries may call upon the entire spectrum of forensic sciences and medico legal expertise. Forensic investigations of RTAs require evaluation of risk factors that lead to the accidents, resultant disability and its percentage, and in cases of fatal accidents the cause of death.^{9,10}

Objective:

To evaluate the patterns of fatal injuries among pedestrians due to road traffic accidents brought in emergency unit of Liaquat University, hospital, Hyderabad.

Methodology:

This cross-sectional survey was conducted at the accident and emergency department of Liaquat University Hospital, Hyderabad from January 2019 to December 2019. Victims of road traffic accidents including the pedestrians, of any age group and either gender, brought in the emergency unit after RTA (including dead) were included in the study. While all the victims of RTAs (were driving or occupant in the motor car), or patient admitted due to other injuries or health issues while driving were excluded from the study. Data was collected using a pre-designed written checklist including details of all victims like identification code, socio-demographic details (age, sex, and time of admission), history of accident (type of vehicle, position of the victim during accident and site of impact), nature of injuries (type, site and intensity of injuries) were

recorded using case sheets and Medico Legal Certificates (MLC) of the patients. Record of autopsy findings for all victims was collected from the office of medico legal officer. The injury pattern was documented by distributing the body into different regions.

Ethical approval for this study was obtained from the research ethic committee of Isra University, Hyderabad, while get keeper permission for data collection was taken from the Medical superintendent, Liaquat University Hospital Hyderabad. A written informed consent was also obtained from each conscious victim or from his/her guardians (in cases when patient was unable to participate in the consent process). The collected data was entered and statistically analyzed using SPSS ver. 23 and presented as frequency and percentages.

Results:

Total 200 victims of road traffic accidents were brought to the accident and emergency unit of Liaquat University Hospital, Hyderabad during study period. Among these, 121 (60.5) pedestrians were found dead on arrival at emergency unit while 79(39.5) subsequently died during treatment due to fatal injuries as a result of RTAs. The mean age of cases was 27.34 ±6.22 years, with a range of 7 and 50 years. Among all male were in greater proportion and highest proportion were between 31-40 years of age. Majority of pedestrians in present study were illiterate (37.5%) followed by those who were educated up to primary, secondary, higher and non-school going. (Table I)

Table I: Socio-demographic distribution of victims (n=200)

	n	%
Age group (in years)		
≤ 10	15	7.5
11-20	43	21.5
21-30	45	22.5
31-40	61	30.5
41-50	36	18.0
Gender		
Male	175	87.5
Female	25	12.5
Education Level		
Non-school going	9	4.5
Illiterate	75	37.5
Primary	59	29.5
Secondary	42	21.0
Higher	15	7.5

Four wheeler (cars) were involved in majority (31.0%) of RTAs followed by Trucks/Loaders 29.0%, Buses/pickups 23.0% and Motorbikes 18.0%. Majority 96 (48.0%) of RTA occurred at the major roads of city and district Hyderabad, 62(31.0%) befallen at the national highway/ motorway while remaining 42(21.0%) of these accidents were occurred at the other roads of city, district highway, rural areas and small town roads. Majority (26.0%) of victims reported with injuries over head, neck and face region, while nature of injuries includes contusions, abrasion and lacerations as shown in table 3.

Table II: Distribution of external injuries in victims of RTA over different part of the body (n=200)

Part of the body	Contusion	Abrasion	Laceration	Total
	102 (51.0)	48 (24.0)	50 (25.0)	200
Head, Neck & Face	22 (42.3)	16 (30.7)	14 (27.0)	52 (26.0)
Upper extremity	26 (60.4)	07 (16.4)	10 (23.2)	43 (21.5)
Thorax & Spine	20 (58.8)	06 (17.7)	08 (23.5)	34 (17.0)
Abdomen & pelvis	15 (46.8)	07 (22.0)	10 (31.2)	32 (16.0)
Lower extremity	19 (48.7)	12 (30.8)	08 (20.5)	39 (19.5)

Majority (45%) of pedestrians faced a frontal impact of injury, 35% had lateral impact and 20% had rear impact. Skull was the most fractured bone 58 (29.0%) followed by thorax 41(20.5%), lower extremities 30 (15.0%), upper extremities 22(11.0%), face 19(9.5%) while spine (7.5%) and pelvic bone (7.5%) were least affected. Nature and site of injuries are shown in table III. External injuries to the thorax and spine were observed more frequently (n=27), while 07 victims sustained internal injuries. Lung sustained more lacerations than contusions. Injury to bony thoracic cage sustained by 28 victims; fractures of rib was the most common 16 (57.2), sternum 06(21.4) and vertebra 06 (21.4). While external injuries to abdominal and pelvic region were observed in 14 cases, while in 18 cases internal abdominal injuries were identified. The spleen and liver were more commonly lacerated, whereas contusion was common in kidneys. (Table IV) Left side fractured bones of extremities were demonstrated in 44 victims compared with 38 of right side. Of the bones of extremities, most commonly fractured bone was

clavicle 23(28.0) followed by humerus 16(19.5), femur 10(12.2), radius 08(9.7), ulna 07(8.5), tibia 07(8.5) and other 11(13.4).

Table III: Distribution of regional injuries among studied pedestrians (n=200)

Part of the body	Impact						Total
	Frontal 78(45.0%)		Rear 66(35.0%)		Lateral 56(20.0%)		
	n	%	n	%	n	%	n(%)
Head, Neck & Face	23	29.5	19	28.8	10	17.8	52 (26.0)
Upper extremity	16	20.5	17	25.7	10	17.8	43 (21.5)
Thorax & Spine	14	18.0	07	10.6	13	23.2	34 (17.0)
Abdomen & pelvis	13	16.7	08	12.2	11	19.6	32 (16.0)
Lower extremity	12	15.3	15	22.7	12	21.4	39 (19.5)

Table IV: Details of external and internal injuries to thoracic and abdominal region

		n	%
Thoracic and spine injuries			
Internal n=7	Lungs	05	71.4
	Heart	02	28.6
External n=27	Contusions	15	55.5
	Abrasions	07	26.0
	Lacerations	04	14.8
	Incised wound	01	3.7
Abdominal and Pelvic injuries			
Internal n=18	Liver	06	33.3
	Spleen	04	22.2
	Kidneys	03	16.6
	Stomach	02	11.1
	Pelvis	03	16.6
External n=14	Contusions	06	42.8
	Abrasions	04	28.5
	Lacerations	03	21.4
	Incised wound	01	7.1

Discussion:

With the expansion of global population, increasing demand of vehicles for long and short travels along with extensive encroachments of roads, nasty pro-

density of violation of traffic rules and chaotic traffic systems in country like Pakistan is greatly contributing the rapid leaps in RTAs.^{2,3} The present study was designed to demonstrate and present the patterns, site, severity and substantial fatalities resulted from traffic injuries in pedestrians of different age groups. Highest proportion (30.5%) of death was observed between 31-40 years of age, a finding consistent with published data.¹¹⁻¹⁴ The mean age of victims in this study was 27.34 ±6.22 years while 53.0% of victims in the present study were between 21-40 years of age. Almost identical findings is reported by other series on the subject.^{11,12,15} Comparing with other age groups, people of younger age are more liable to RTA, probably their activities require more often travel compared to very young and older people. More than two-third of victims in this study were male, other studies also reported the similar pattern gender pattern.^{11,12,14,16,17} The involvement of young age group in RTAs found in this study may be explain on the basis that this is the most active phase of life, physically and socially; however, this is also the most productive age group for the society. Furthermore, male victims outnumbered females because of their more impulsive behavior and greater risk of exposure. Another probability for high male preponderance may that in developing country like Pakistan, for largest numbers of families, only males work outdoors and consequently more expose to have RTAs.

Four-wheeler (cars) were involved in majority (31.0%) of RTAs followed by trucks/loaders 29.0% and buses/pickups 23.0%. These findings are consistent with studies of Raza et al and El Bakash^{14,17} Cars in congested as well as open city roads while trucks/loader in main highways, district highways or even city roads accidents are mostly implicated due to unnecessary over-speeding, drunk while driving, frequent change of road lanes without indicating and less steadiness of the vehicle. There is great potential of reduction of the accidents and fatalities by improving safety awareness of all road users including drivers as well as pedestrians, humanizing the traffic administration and strictly implementing the traffic laws.

Majority 96(48.0%) of RTA occurred at the major roads of city and district Hyderabad, 62(31.0%) befallen at

the national highway/ motorway; while remaining 42 (21.0%) accidents occurred at other roads of city, district highway, rural areas and small-town roads. These findings are consistent with those reported by Farooqui et al.¹¹ This could be due to the fact that pedestrians are the road users that are the most susceptible to fatal RTAs due to their lack of protection. While a busy and densely built-up urban environments major city roads without proper pedestrian walkways or signals put pedestrians most at risk when crossing a major and busy city road in urban settings. Furthermore, nearness of residences of rural community to district or main highways, linked with undivided roadsides and traffic streams deprived of handrails increased their risks of facing a fatal RTA.

Most (46.5%) of the accidents in the present study happened between evening hours (05 pm-09 pm) followed by afternoon hours 12pm-04pm (23.5%). Moreover, the majority (57.5%) of reported accident cases occurred on week days (Monday-Fridays) (54.6%), when compared to weekends (Saturdays and Sundays) (45.4%). Similar findings are reported by Raza et al and Jooma et al. in their studies.^{14,18} Among those lost their lives after fatal injuries, majority 35 (35.7%) suffered from the fatal injuries to head and neck region followed by injuries to thoracic, abdominal and pelvis region 29 (29.7%), 18(18.3%) and 16(16.3%) respectively. Another study also reported that major cause of fatalities or deaths occurred in their study were due to the acute head trauma resulted in an ultimate cause of death i.e., cardio-respiratory failure.¹⁴ Majority (60.5%) of victims of RTA were found dead upon arrival in the emergency unit they might lost their lives on the accident site or during transportation to main accident emergency unit. This observation has been reported by different researchers.^{11,14,15,18} This raises serious concern over lack of availability of pre-hospital management services, referral system and delayed emergency services. The non-availability of health facility center near to the scene of the accident or lack of appropriate emergency management service in nearby health facility may be other possible reasons. In the current study, the head, neck and face regions were most commonly affected externally followed by upper and lower extremities. This is parallel to findings of earlier studies from India, Pakistan, Egypt and South Africa where head and neck region as

well as lower extremities were reported to be most common sites of injury among pedestrians.^{9,11-14,17,18} Whereas, autopsy findings revealed that diffuse injuries to internal organs like brain, heart, lungs, liver and spleen along with contusions, lacerations and rupture of such delicate organs cause death of RTA victims.

Conclusion:

The study concluded that majority of the RTA related deaths among pedestrians occur before reaching to the main health facility. Injuries to head, neck and facial regions are more common while contusions are the predominant type of injuries occur in the pedestrians. Frontal impact of injury occurs more pronouncedly while skull bone is most commonly fractured bone among the victims.

References:

1. World Health Organization (WHO), Road traffic injuries; available at: <https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries> (last accessed April 2021)
2. World Health Organization. Global status report on road safety 2018: Summary. World Health Organization; 2018. Available at :<https://www.who.int/publications/i/item/9789241565684> (last accessed April 2021)
3. Martin A, Lagarde E, Salmi LR. Burden of road traffic injuries related to delays in implementing safety belt laws in low-and lower-middle-income countries. *Traffic injury prevention*. 2018 Feb 28; 19(sup1):S1-6.
4. Hammad HM, Ashraf M, Abbas F, Bakhat HF, Qaisrani SA, Mubeen M, et al. Environmental factors affecting the frequency of road traffic accidents: a case study of sub-urban area of Pakistan. *Environmental Science and Pollution Research*. 2019 Apr;26(12):11674-85.
5. Pakistan Bureau of Statistics, Government of Pakistan, Road traffic accidents annual report 2021:[https://www.pbs.gov.pk/sites/default/files//tables/renam-as-per-table-type/tarffic accidents annaul 09 02 2021.pdf](https://www.pbs.gov.pk/sites/default/files//tables/renam-as-per-table-type/tarffic%20accidents%20annaul%2009%2002%202021.pdf)
6. Imran M, Nasir JA. Road traffic accidents. *The Professional Medical Journal*. 2015 Jun 10; 22 (06):705-9.
7. Varun A, Mishra PK, Tomar JS, Jain N. Socio-demographic profile of head injury victims in road traffic accidents, an autopsy based study at SAMC & PGI, Indore. *Indian Journal of Forensic and Community Medicine*. 2020 Aug 15;7(2):56-60.
8. Thippeswamy KH, CN RK, Govinda Raju HC. Pattern of Injuries in Road Traffic Accidents—An Autopsy Study. *Indian Journal of Forensic Medicine & Toxicology*. 2020 Jul 1;14(3).
9. Gupta JK, Sharma A. Assessment of 116 autopsies obtained in Forensics department. *Journal of Advanced Medical and Dental Sciences Research*. 2021 Mar;9(3).
10. Baghel J, Sarala M, Radhakrishna KV, Rautji R. Epidemiology of Fatal Road Traffic Accidents: A Six Year Retrospective Study in the Medico legal Centre of a Tertiary Care Health Set Up in Western Maharashtra. *Medico Legal Update*. 2020 Nov 18;20(4):230-5.
11. Farooqui JM, Chavan KD, Bangal RS, Syed MMA, Thacker PJ, Alam S, Sahu S, Farooqui AAJ, Kalakoti P. Pattern of injury in fatal road traffic accidents in a rural area of western Maharashtra, India. *AMJ* 2013, 6, 9, 476-482. <http://dx.doi.org/10.4066/AMJ.2013.1839>
12. Shamim M. Pattern of injuries from road traffic accidents presented at a rural teaching institution of Karachi. *Indian journal of surgery*. 2017 Aug;79(4):332-7.
13. Parkinson F, Kent S, Aldous C, Oosthuizen G, Clarke DL. Patterns of injury seen in road crash victims in a South African trauma centre. *South African journal of surgery*. 2013 Nov 13;51 (4):131-3.
14. Raza MZ, Ahmed F, Ahmed A, Ghani A, Malik L, et al. (2013) Title of the Study: A Retrospective Analysis of the Pattern and Severity of Injuries in Victims of Road Traffic Accidents in Karachi, Pakistan during 2010-2011. *Emergency Med* 3: 144. doi:10.4172/2165-7548.1000144
15. Reddy NB, Hanumantha, Madithati P, Reddy NN, Reddy CS. An epidemiological study on pattern of thoraco-abdominal injuries sustained in fatal road traffic accidents of Bangalore: Autopsy-based study. *J Emerg Trauma Shock*. 2014 Apr;7(2):116-20. doi: 10.4103/0974-2700.130882.

16. Mandal BK, Yadav BN. Pattern and distribution of pedestrian injuries in fatal road traffic accidental cases in Dharan, Nepal. *J Nat Sci Biol Med.* 2014 Jul;5(2):320-3. doi: 10.4103/0976-9668.136175.
17. El Bakash OH, Kabbash AE, El Gohary MS, Hafez AS. Evaluation of the patterns of injuries in road traffic accidents in great Cairo, Egypt. *The Egyptian Journal of Forensic Sciences and Applied Toxicology.* 2016 Dec 1;16(2):79-95.
18. Jooma R, Shaikh MA. Road traffic crash related injured and fatal victims in Karachi from 2007 to 2014: A time-series analysis. *JPMA. The Journal of the Pakistan Medical Association.* 2017;67(4):622.