Original Research Article

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20175356

Disability and mortality following road traffic injury: a follow-up study from a tertiary care centre of India

Ashish Chauhan¹, Naim Ahmed^{1*}, Jai Veer Singh², Vijay Kumar Singh¹, Ajai Singh³, Suresh Kumar⁴

¹Department of Community Medicine and Public Health, ³Department of Orthopedic Surgery, ⁴Department of Surgery, King George's Medical University, Lucknow, Uttar Pradesh, India

Received: 14 October 2017 Revised: 14 November 2017 Accepted: 15 November 2017

*Correspondence: Dr. Naim Ahmed,

E-mail: drnaimahmedkgmu@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Road traffic injury (RTI) is emerging as a huge public health problem throughout the world. The problem is magnified manifold as it mainly affects people in productive age-group causing significant mortality and disability. Very few studies have been done in India to assess disability following RTI though it has attained astronomic proportions. This study was undertaken to know the proportion of disability as an outcome amongst patients admitted for road traffic injuries in a tertiary care centre of Lucknow, India and to know the determinants of mortality and disability following Road Traffic Injuries amongst these patients.

Methods: A follow-up study was conducted on 267 patients of RTI admitted at Trauma Centre of King George's Medical University UP (tertiary care centre), Lucknow, India from November 2012 to June 2013. Systemic random sampling was used to select the patients. Disability was assessed using ten points modified Barthel index. Data analysis was done using SPSS 17.0 software.

Results: Mortality and disability were seen in 13.1 percent and 16.36 percent of the patients. Residence locale, road user type, time at first aid and admission, and head injury were significantly associated with mortality while extremes of age, residence locale and lower limb injury were significantly associated with disability. The level of significance was set at p value of 0.05.

Conclusions: RTI poses a huge burden on healthcare delivery system and society in the form of mortality and disability. Attempts pertaining various sectors should be made to reduce the incidence of RTI and ensuing disability.

Keywords: RTI, Disability

INTRODUCTION

Road transport is an essential part of the progress of any nation. It is required for proper connectivity between different locations. It enables increased access to jobs, economic markets, education, recreation & health care, which in turn have direct & indirect positive impacts on the health of the populations. However, road

transportation also poses a threat to the population in the form of road traffic accidents.

Road traffic accident is said to occur when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree or utility pole. Any injury occurring as a result of road traffic accident is referred to as road traffic injury by WHO.¹

²Hind Institute of Medical Sciences, Barabanki, Uttar Pradesh, India

According to WHO's Global Burden Of Disease Project for 2004, road traffic crashes caused over 1.27 million deaths that year-a similar number to those caused by non-communicable diseases.² It has been estimated that, unless immediate action is taken, road deaths will be the fifth leading cause of death by 2030, resulting in an estimated 2.4 million fatalities per year.^{2,3} Road traffic injury is the second leading cause of mortality in the 15-29 year age group.¹

In addition to fatalities, many less severe injuries are caused by road traffic crashes: between 20 and 50 million non-fatal injuries are estimated to occur annually around the world. These non-fatal injuries are an important cause of disability.

Taking this into consideration, the United Nations has rightly proclaimed 2011-20 as "The decade of action on road safety" and have called upon all member countries to prepare a decadal action plan for implementation in their respective countries so that the present rising trend of road accidents stabilizes and is reversed by the year 2020.⁵

In India, during the year 2011, there were around 4.98 lakh road accidents which killed 1.42 lakh people and injured more than 5 lakh persons, many of whom are disabled for rest of their lives. These numbers translate into one road accident every minute, and one road accident death in less than four minutes.⁵

An estimated 2 million people in India have a disability that results from a road traffic crash.⁶

This problem of RTI has grown to astronomic proportions in India but very less research has been done in this area especially on determinants of mortality and disability. The current study hence is an attempt to know the outcome of RTI and its determinants amongst patients admitted in a tertiary care centre of Lucknow, India.

METHODS

A follow-up study was conducted on patients of RTI admitted at Trauma Centre of King George's Medical University UP (tertiary care centre), Lucknow, India. The primary objective of the study was to know the outcome of patients of RTI which could be either in the form of recovery at the time of discharge, disability or death of the patient. Similar studies from India, which evaluated disability following RTI, were not found, so, the proportion of disability among patients of RTI was taken as 50 percent for the calculation of sample size. With the permissible error of 6% in the prevalence and a 95% confidence level, the sample size estimated was 267 patients of RTI.

A systematic random sampling technique was used to select the representative sample of patients of RTI admitted at Trauma Centre, KGMU, Lucknow. Sampling

interval was decided on the basis of injury surveillance data from trauma centre for the months of November 2011 to June 2012. Considering average admission rate, duration of study and sample size, it was decided to register every 4th patient admitted at trauma centre with RTI which fulfills inclusion criteria of the study and gave consent for participation in the study. In case of unconscious patients consent was taken from their relatives. Patients who were brought dead or were sent back from the emergency room were not included in the study.

Duration of study was eight months from November 2012 to June 2013 and since the study involved follow up of the patients till three months after their discharge, it was decided to register the patients for the first four months of study. One month was allotted to adjust for the hospital stay of the patients and the next three months were allotted to do follow up of these patients.

A pretested semi-structured interview schedule was used necessary information on Bio-social to collect characteristics, variables related to accident, outcome of the patient at discharge, and disability at the time of follow-up. Disability was assessed twice, once, at the time of discharge (as part of outcome) and then again at the time of follow up done after three months of discharge using ten points modified Barthel index. The Barthel index is a 10-item scale (range 0 to 20) that measures the patient dependence for help with the activities of daily living and is of greatest value at the severe end of the disability spectrum.^{7,8} A Barthel index score of less than the lower tertile (<13)was classified as disability on the basis of another study that used this scale.7

Descriptive statistics for continuous variables and frequency, percentage for categorical variables were determined. Chi-square test of independence was used to show the relation between independent and dependent variables. The level of significance was set at p value of 0.05.

RESULTS

This study was a descriptive follow-up study done among 267 victims of RTI admitted at a tertiary care centre in Lucknow, India. It was done to know the outcome of RTI amongst these patients and the determinants of outcome.

Out of total 267 patients registered in our study, 35 (13.1%) patients died during the course of their treatment while among those who survived, disability was seen in 36 (13.5%) patients. Maximum mortality and disability was seen amongst the age group of 16-30 and 31-45 years. Together these two groups contributed to 71.4 percent of total mortality and 66.6 percent of the disability seen in this study. A very high male preponderance was seen in both mortality (91.4%) and disability (88.9%). Majority of patients with mortality

(88.6%) and disability (75.0%) hailed from rural areas. A maximum of 31.4 percent of the patients who died during the course of their treatment were illiterate while no clear pattern of education emerged amongst those disabled due to RTI. Patients belonging to 3rd and 4th income quintile together contributed highest burden in mortality (42.9% and 40.0% respectively) and disability (50.0% and 36.1%). Vulnerable road users contributed 94.6 percent of all deaths due to RTI while this proportion was 69.4 percent for disability (Table 1).

Table 1: Outcome of the patients of road traffic injury according to their bio-social characteristics.

Bio-social characteristics	Mortalit (n=35)		Disability at follow up (n=36)		
	No.	%	No.	%	
Age group (in completed years)					
≤15	3	8.6	8	22.2	
16 to 30	12	34.3	12	33.3	
31 to 45	13	37.1	12	33.3	
46 to 60	6	17.1	2	5.6	
>60	1	2.9	2	5.6	
Sex					
Male	32	91.4	32	88.9	
Female	3	8.6	4	11.1	
Residence locale					
Urban	4	11.4	9	25.0	
Rural	31	88.6	27	75.0	
Education					
Intermediate and above	9	20.0	7	19.4	
High school	6	17.1	8	22.2	
Middle school	6	17.1	9	25.0	
Primary/literate	3	8.6	6	16.7	
Illiterate	11	31.4	6	16.7	
Income quintiles					
1st quintile	7	5.7	8	0.0	
2nd quintile	8	8.6	8	13.9	
3rd quintile	5	42.9	4	50.0	
4th quintile	8	40.0	10	36.1	
Road user type					
Vulnerable*	33	94.3	25	69.4	
Non-vulnerable	2	5.7	11	30.6	
*Vulnerable: Pedestrians, nedal cyclist and MTV users		J.,		20.0	

^{*}Vulnerable: Pedestrians, pedal cyclist and MTV users.

Mortality was seen in 20.7 percent of the patients in the age group 46 to 60 years and amongst 14.8 percent of the patients of age-group 31 to 45 years. Proportion of Disability was higher in the extremes of age with 40 percent of the patients aged 15 years or less and 28.6 percent of the patients aged more than 60 years. The difference in the proportion of disability in different age groups was significant. No significant difference was found in the proportion of mortality or disability in males and females. A significantly high proportion of mortality (18.1%) and disability (20.5%) was seen in the patients of rural areas as compared to their urban counterparts. A comparison of mortality and disability on the basis of education and in different income quintiles did not yield any statistically significant difference. When the road users were classified as vulnerable and non-vulnerable road users, then the proportion of mortality in vulnerable road users was 15.9 percent while it was 3.3 percent in

non-vulnerable road users. This difference in mortality in different road user groups was statistically significant. The proportion of disability was not significantly different in vulnerable (15.3%) and non-vulnerable road users (19.3%) (Table 2).

The proportion of mortality was higher in those MTV users who were not using helmet (18.9%) as compared to those who were using helmet (8.3%). However, this difference was not statistically significant. Also, No significant difference was found in the proportion of disability in MTV users, on the basis of helmet use. However, helmet use was associated with significantly less had injuries (p value 0.023) as head injury was seen in only 25 percent of the patients using helmets while this value was 49.2 percent among those who were using helmet (Table 3).

Table 2: Association of mortality and disability with bio-social characteristics of the patients of road traffic injury.

Bio-social	No. of patients	Mort	ality	P value	No. of patients	Disab	oility	P value
characteristics	(n=267)	No.	%	P value	(n=220)	No.	%	
Age-group (in completed	l years)							
≤15	23	3	13		20	8	40.0	0.024
16 – 30	119	12	10.1		99	12	12.1	
31 – 45	88	13	14.8	0.621	71	12	16.9	
46 – 60	29	6	20.7		23	2	8.7	
>60	8	1	12.5		7	2	28.6	
Sex								
Male	233	32	13.7	0.500	189	32	16.9	0.574
Female	34	3	8.8	0.590	31	4	12.9	
Residence locale								
Rural	171	31	18.1	0.001	132	27	20.5	0.045
Urban	96	4	4.2	0.001	88	9	10.2	
Education								
Intermediate and above	64	9	14.1		52	7	13.5	0.617
High school	74	6	8.1		66	8	12.1	
Middle school	54	6	11.1	0.126	43	9	20.9	
Primary/literate	30	3	10.0		27	6	22.2	
Illiterate	45	11	24.4		32	6	18.8	
Income quintiles								
1st quintile	65	7	10.8		53	8	15.1	
2nd quintile	64	8	12.5	0.936	52	8	15.4	0.985
3rd quintile	31	5	16.1		26	4	15.4	
4th quintile	62	8	12.9		53	10	18.9	
Road user type								
Vulnerable*	207	33	15.9	0.000	163	25	15.3	0.407
Non-vulnerable	60	2	3.3	0.009	57	11	19.3	0.487

^{*}Vulnerable: Pedestrians, pedal cyclist and MTV users.

Table 3: Association of head injury, mortality and disability with helmet use by MTV users.

Helmet	No. of patients	Head Inju		P	a patients		Mortality		No. of patients (n=120)	Disability		P
use	(n=156) No. %	value	(n=156)	No.	%	value	No.	%		value		
Present	24	6	25.0	0.023	24	2	8.3	0.206	20	2	10.0	0.434
Absent	132	65	49.2	0.023	132	25	18.9	0.200	100	17	17.0	0.131

No significant difference was seen in mortality and disability in the patients on the basis of getting first aid. However, the proportion of mortality was significantly higher in those patients who got first aid in 30 minutes to 60 minutes (26.9%) as compared to those patients who got it in less than 30 minutes (2.2%). A significant difference was seen in the proportion of mortality on the basis of time in getting admission at trauma centre with a higher proportion in those who got admission in 8 hours or more (27.4%). No significant relation of disability was seen with time in getting first aid, first intervention or admission (Table 4).

A significantly high proportion of mortality was seen in patients with blunt injury (33.3%) and internal hemorrhage (38.4%). 35 patients (33.7%) of head injury died during their hospital stay while the proportion of mortality in patients with thoracic injury was 39.1 percent. Proportion of mortality was lower in patients of lower limb injury (1.9%). Proportion of disability was not significantly different in different types of injury, however, a significant proportion of patients with lower limb injury had disability (22.6%) at the end of the study period, and this proportion was only 4.1 percent amongst the patients with upper limb injury (Table 5).

Table 4: Association of mortality and disability with pre-hospital care of the patients of road traffic injury.

Pre-hospital care	No. of patients	Mor	tality	P value	No. of patients	Disability		P value
	(n=267)	No.	%	r value	(n=220)	No.	%	
First aid given								
Yes	78	9	11.5	0.625	69	8	11.6	0.196
No	189	26	13.8	0.023	151	28	18.5	0.190
Time in getting first a	id (in minutes)							
<30	46	1	2.2		45	6	13.3	0.667
30-60	26	7	26.9	0.006	19	2	10.5	
>60	6	1	16.7		5	0	0.0	
Time in getting first in	tervention at any	health	facility (in hours)				
≤1	145	17	11.7	0.465	120	23	19.2	0.218
>1	122	18	14.8	0.403	100	13	13.0	
Time in getting admis	sion at trauma cen	tre (in	hours)					
<2	63	4	6.3		57	13	22.8	0.226
2–4	72	4	5.6	0.001	62	10	16.1	
4–8	70	10	14.3		59	10	16.9	
≥8	62	17	27.4		42	3	7.1	

Table 5: Association of mortality and disability with injury characteristics of the patients of road traffic injury.

Injury characteristics	No. of patients	Mort	ality	P value	No. of patients	Disability		Davolaro
	(n=267)	No.	%	P value	(n=220)	No	%	P value
Type of injury*								
Fracture	217	12	5.5	0.000	194	32	16.5	0.886
Dislocation	59	0	0	0.001	56	5	8.9	0.082
Cut wound/laceration	122	7	5.7	0.001	109	19	17.4	0.671
Crush injury	15	1	6.7	0.447	14	3	21.4	0.597
Blunt injury	27	9	33.3	0.001	18	2	11.1	0.530
Internal hemorrhage	91	35	38.4	0.000	51	8	15.7	0.881
Site of injury*								
Head	104	35	33.7	0.000	64	9	14.1	0.555
Maxilo-facial region	46	8	17.4	0.344	37	3	8.1	0.137
Thorax	23	9	39.1	0.000	14	4	28.6	0.202
Upper limb	81	4	4.9	0.009	74	3	4.1	0.000
Lower limb	161	3	1.9	0.000	146	33	22.6	0.000

^{*}Multiple responses

DISCUSSION

In agreement with other studies mortality was seen in 13.1 percent of the patients of RTI. However, the proportion of disability in our study (13.5%) was higher than that seen in a study by Chalya et al. The difference in the proportion of disabled patents could be due to the different measurement tools used to assess disability.

The age group of 16-45 years was involved in 71.4 percent of the mortality and 66.6 percent of the disability. This high involvement of this age-group could be attributed to their high mobility that leads to increased exposure to road traffic and risk taking behavior in the younger age group.

Higher proportion of patients hailing from rural areas was seen in both mortality (88.6%) and disability (75%). Their higher number could be due to their ignorance about rules and regulations pertaining to road safety. Patients of 3rd and 4th income quintile overwhelmed the patients who died (82.9%) or were disabled (86.1%). Their high number in mortality and disability could be due to their inability to afford quality treatment because although all the patients were from the same treatment centre but access to all treatment modalities is not uniform due to high cost involved with various treatment options that could have reached out of bounds of the patients of 3rd and 4th income quintile.

Barring a meager 5.7 percent of mortality, all those who died were vulnerable road users. This highlights the aptness of the name given to this category of road users

as they are really vulnerable to RTI and associated mortality. This vulnerability could be due to the mixed road use by all class of vehicles, poor implementation of road rules and no separate provision on all roads for pedestrians and pedal cyclists.

Among the MTV users, helmet was found to be protective for head injury (p=0.023) but no significant relation was established between helmet use and mortality or disability. This finding was in agreement with that by Crandon et al and establishes the fact that helmets prevent head injury but no association reported between helmet use and mortality needs further evaluation in a study with higher sample size. ¹¹

Highlighting the importance of timely first aid, the proportion of mortality was less in the patients who got First aid in less than 30 minutes in comparison to those who got it in more than 30 minutes. Also the proportion of mortality increased with the increase in the time to get admission and this result was similar to that seen in the study by Oluwadiya et al. ^{10,12}

About 33.7 percent of patients with head injury died during their hospital stay. This was the total mortality seen, so, in other words we can say that all the patients who died during their hospital stay had head injury. Similar findings of high mortality in patients with head injury were seen in other studies also. ^{9,10}

CONCLUSION

Road traffic injuries pose a heavy burden on health services and society in the form of mortality and disability. Both mortality and disability following RTI are seen in high proportion amongst the economically productive age-group that makes it impact on the socioeconomic front also. Head injury is seen to be a significant predictor of mortality while lower limb injuries proved to be the most common causes of disability among these patients. Timely administration of First aid and prompt access to definitive care can reduce the impact of RTI. The use of safety measures should also be promoted to reduce the mortality and disability associated with RTI.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

 Peden MM. World Health Organization, World Bank. World report on road traffic injury prevention. Geneva: World Health Organization;

- 2004. Available at: http://site.ebrary.com/id/10053723. Accessed on 3 August 2017.
- 2. The global burden of disease, 2004 update. Geneva: World Health Organization; 2008. Available at: http://www.myilibrary.com?id=193781. Accessed on 28 August 2017.
- World Health Organization. World health statistics. Geneva: World Health Organization; 2010. Available at: http://site.ebrary.com/id/ 10393307. Accessed on 28 August 2017.
- 4. WHO G. National burden of disease studies: a practical guide. World Heal. 2001. Available at: http://www.thaibod.net/documents/NBD%20Manua 1%20V2.0.doc. Accessed on 28 August 2017.
- 5. Government of India. Ministry of Road Transport and Highways. Transport Research Wing. Road Accidents In India; 2011.
- Gururaj G. Road Traffic Injury Prevention in India, National Institute of Mental Health & Neuro Sciences, Publication No. 56, Bangalore, India, 2006
- 7. Mahoney FI, barthel DW. Functional evaluation: The Barthel Index. Md State Med J. 1965;14:61–5.
- 8. McPherson KM, Pentland B. Disability in patients following traumatic brain injury--which measure? Int J Rehabil Res Int Z Für Rehabil Rev Int Rech Réadaptation. 1997;20(1):1–10.
- Chalya PL, Mabula JB, Dass RM, Mbelenge N, Ngayomela IH, Chandika AB, et al. Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania. J Trauma Manag Outcomes. 2012;6(1):1.
- Mishra B, Sinha N, Sukhla S, Sinha A. Epidemiological study of road traffic accident cases from Western Nepal. Indian J Community Med. 2010;35(1):115.
- 11. Crandon IW, Harding HE, Cawich SO, Frankson MA, Gordon-Strachan G, McLennon N, et al. The impact of helmets on motorcycle head trauma at a tertiary hospital in Jamaica. Bmc Res Notes. 2009;2(1):172.
- 12. Oluwadiya KS, Olakulehin AO, Olatoke SA, Kolawole IK, Solagberu BA, Olasinde AA, et al. Pre-hospital care of the injured in South Western Nigeria: a hospital based study of four tertiary level hospitals in three states. Annu Proc Assoc Adv Automot Med. 2005;49:93–100.

Cite this article as: Chauhan A, Ahmed N, Singh JV, Singh VK, Singh A, Kumar S. Disability and mortality following road traffic injury: a follow-up study from a tertiary care centre of India. Int J Community Med Public Health 2017;4:4712-7.