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INJURIES IN THE NATIONAL CAPITAL REGION – A CROSS-SECTIONAL STUDY OF THE CHALLENGING EPIDEMIC.

Plastic Surgery

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ABSTRACT

Background: Injuries are an emerging public health problem that has grown into epidemic proportions. Many injuries are linked to social, environmental, cultural, and biological issues in causation; recognized as man-made and behaviour-linked disorders, and linked to socio-demographic transition. Prevention, acute care, and rehabilitation are the major challenges we are facing today. **Materials & Methods:** A cross-sectional study was conducted at the National Injury Surveillance Centre (NISC) Department of Dr. Ram Manohar Lohia Hospital, New Delhi. Data was collected from 2861 participants (>18 years) of injury cases during 12 months (Jan-Dec 2019). Participants were selected using the Convenience Sampling Technique. The data were analysed statistically using SPSS software to assess the risk factors and pattern of injury among the population of the National Capital Region, Delhi. **Results:** In this study, the mean age was 36.6 years. The male to female ratio was 2.1:0.7. The age group 18-45 years is affected predominantly (71.1%). Around 48.8% were students (matriculation/junior school). 39.5% (1131) were unemployed. 1999 (69.9%) were accidental (unintentional), 1671 (58.4%) were having moderate to severe injury, 1675 (58.5%) happened on-road, and 1341 (46.9%) were having soft tissue injury. 1198 (41.9%) were RTI cases and 816 (28.5%) were assault/quarrel cases, the second most common mode of injury. **Conclusion:** With the realization that injuries are caused by a complex interaction among agents (vehicle, product), and human and environmental factors operating in complex social and economic systems, injury prevention and control depending on evidence-based research is gaining momentum. There is an urgent need for developing comprehensive, integrated, and intersectoral approaches based on scientific understanding.

KEYWORDS

Accidents, Assault, Injury pattern, Road traffic injury.

INTRODUCTION

India has confronted rapid industrialization, urbanization, and motorization over the past two decades. This rapid pace of alteration in the traditional ways of living and working, culture, societal standards, and motorization in India is found to be combined with the lack of safety in the environment. Injuries have become one of the emerging public health problems in India. They are believed to be caused by events associated with threatening behaviour in humans and their failure to address their safety. Research in the past decades has revealed that injuries occur due to a complex interaction of humans, agents (vehicle/products), and environmental factors in any socio-economic and political context.[1]

As per the Road Accident Report for 2019, a total number of 449,002 accidents took place in the country during the calendar year 2019 leading to 151,113 deaths and 451,361 injuries. India accounts for 11% of the accident-related deaths in the world and ranks first across 199 countries. National Highways which comprise 2.03% of the total road network, account for a disproportionate share of 35.7% of deaths in 2019 pointing to the need for improved remedial measures.[2] Nearly about 30 to 40% of deaths in India occur at the scene of collision before the injured person could get the primary care.[3] Apart from a deficiency in emergency care, reports have indicated the inadequacy in the number of skilled staff and medical resources that result in an increasing number of secondary injuries. The prevalence of the injuries and their causes tend to differ amongst individuals based on their age, gender, and other factors.

As India moves forward in its quest for growth, development, and economic prosperity, the dark and ugly side of this progress is rapidly emerging due to the absence of accompanying safety systems. Being a developing country, India is witnessing an increasing burden of disease resulting from injuries, particularly the youngsters. The preventable causes of mortality and morbidity in youngsters today are resulting from unintentional injuries. The majority of deaths of children and adolescents are found to be more in the low- and middle-income countries (LMICs) than the high-income countries. India is one of those middle-income countries, along with a rise in infectious conditions in children, the number of injury-related health problems is rising.[1] Deaths and injuries have become quite common in states with rapid motorization, suggesting the critical concerns that need to be addressed in road traffic. Apart from the lack of strictness in traffic law, there is a lack of awareness in the public regarding the appropriate conditions to follow while driving. In this context, the current study is intended at determining the major risk factors and the patterns of injuries occurring in the population of National Capital Region (NCR) Delhi, India.

METHODS

A cross-sectional study was conducted at the National Injury Surveillance Center (NISC) Department of Dr. Ram Manohar Lohia Hospital, New Delhi. Data was collected from 2861 participants (>18 years) of injury cases during 12 months (Jan-Dec 2019). Participants were selected using the Convenience Sampling Technique**.** The data were analyzed statistically using SPSS software to assess the risk factors and pattern of injury among the population of the NCR Delhi.

RESULTS

A total of 2861 participants were included in the study, out of which 74.1% (2121) were male and 25.8% (738) were female. 77.1% (2208) were in the 18 to 45-year age group, 16.4% (467) were in the 45 to 60-year age group and 6.5% (186) were ≥60-year. Around 92(3.2%) deaths were reported during this study. Males were predominant in all the age groups (Table I)

Table I . Frequency distribution of the trauma injury cases according to age group with respect to gender wise at NISC Department of Dr RML Hospital.

Age Group (year)	Male N (%)	Female N (%)	Transgender N (%)	TOTAL
18 to <45	1654(74.9)	552(25)	2(0.1)	2208(100)
45 to <60	349(74.7)	118(25.3)	0(0)	467(100)
≥60	118(63.4)	68(36.6)	0(0)	186(100)
TOTAL	2121(74.1)	738(25.8)	2(0.1)	2861
Total Number of Injury Cases (>18 Years) in Delhi		Number Of Deaths		
2861		92(3.2%)		

The frequency distribution of the Education and Occupation level of injured cases showed 1999cases (69.9%) were in matriculation/junior/secondary school certificate and 178 (6.2%) were illiterate. 1131 (39.5%) were unemployed, 6 (0.2%) were professionals, 8 (0.3%) were semi-professionals, 730 (25.5%) were clerical/shop owner/farmers, 611 (21.4%) were skilled workers, 239 (8.4%) were semi-skilled workers, 103 (3.6%) were unskilled workers in the study. It was found that 1131 (39.5%) of the injuries were found to be in the unemployed. (Table II)

Table II Frequency distribution of the education and Occupation level wise at NISC Department of Dr RML Hospital

Education level	Number Of Cases N (%)	Occupation	Number Of Cases N (%)
Illiterate	178(6.2)	Professional	6(0.2)
Literate (without education level)	243(8.5)	Semi-professional	8(0.3)
Below primary	3(0.1)	Clerical/shop owner/farmer	730(25.5)
Primary	27(0.9)	Skilled worker	611(21.4)
Middle/lower secondary	171(6)	Semi-skilled worker	239(8.4)
Matriculation/junior school	293(10.2)	Unskilled worker	103(3.6)
Matriculation/junior school	1395(48.8)	Unemployed	1131(39.5)
Graduate & PG	522(18.2)	Not applicable	4(0.1)
Not applicable	1(0)	Unknown	29(1)
Unknown	28(1)	Total	2861(100)
Total	2861(100)		

The most common mode of injury was unintentional i.e, around 1999 cases (69.9%), 817 (28.6%) were intentional/assault and 38(1.3%) were self-harm. It was found that 1671 (58.4%) of the injuries were moderate in severity and 234 (8.2%) of the injuries were severe in the study. (Table III)

Table III Frequency distribution of the cases according to intent-wise and severity at NISC Department of Dr RML Hospital

Intent Status	Number Of Cases n/N=2861 (%)	Severity Injury	Number Of Cases n/N=2861 (%)
Unintentional	1999(69.9)	Minor	953(33.3)
Self-harm	38(1.3)	Moderate	1671(58.4)
Intentional / Assault	817(28.6)	Severe	234(8.2)
Unknown	7(0.2)	Unknown	3(0.1)
Total	2861(100)	Total	2861(100)

The most common mode of injury was road user trauma injury cases ie.,1675 (58.5%) , 1060 (37%) home, 68 (2.4%) workplace, 7 (0.2%) sports, 21 (0.7%) railway-line, 7 (0.2%) school/institution/education area, 1 (0.001%) farm/place of primary production, 7 (0.2%) athletic area and 22 (0.8%) were other trauma injury cases. According to nature of injury, 427 (14.9%) were fracture cases, 1341 (46.9%) were soft tissue injury, 9 (0.3%) were traumatic injury, 37 (1.3%) were sprain, 281 (9.8%) were cut injuries, 13 (0.5%) sharp, 47 (1.6%) hematomas and 63 (2.2%) burn cases respectively. (Figure 1)

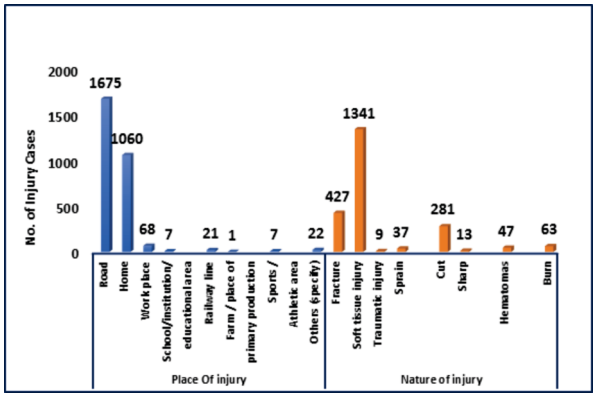

Figure 1. Frequency distribution of the injury cases according to place of injury and nature of injury.

According to the identified reason for 2861 trauma injury cases. 1198 (41.9%) were RTI cases, 669 (23.4%) were fall trauma injury cases, 816 (28.5%) assault/quarrel, 53 (1.9%) stab/cut, 63 (2.2%) burns, 26 (0.9%) fall of object, 3 (0.1%) poisoning, 2 (0.1%) drowning, 1(0%) hanging and 3 (0.1%) were animal bites respectively. It was found that most of the injuries, 1198 (41.9%), were road traffic injuries in the study. (Table IV)

Table IV. Identified reason of injury cases.

Injured Reason	Number Of Cases n/N=2861 (%)
Road traffic injury	1198(41.9)
Fall	669(23.4)
Assault / quarrel	816(28.5)
Stab / cut	53(1.9)
Firearm	1(0)
Burns	63(2.2)
Poisoning	3(0.1)
Drowning	2(0.1)
Hanging	1(0)
Animal bites	3(0.1)
Fall of object	26(0.9)
Others (specify)	8(0.3)

It was found that most of the injuries were road traffic injuries contributing to 72% in the 18 to 45-year age interval. (Table V)

Table V: Representation of the Association between Injury Reasons with Age Interval.

Mode of injury	Age Interval			Total	P-Value
	18 to <45 Year	45 to <60 Year	≥60 Year		
Road traffic injury	862(72)	242(20.2)	94(7.8)	1198(100)	0.0001
Fall	439(65.6)	128(19.1)	102(15.2)	669(100)	
Assault / quarrel	661(81)	123(15.1)	32(3.9)	816(100)	
Stab / cut	45(84.9)	7(13.2)	1(1.9)	53(100)	
Firearm	1(100)	0(0)	0(0)	1(100)	
Burns	48(76.2)	8(12.7)	7(11.1)	63(100)	
Poisoning	3(100)	0(0)	0(0)	3(100)	
Hanging	1(50)	0(0)	1(50)	2(100)	
Sport	1(100)	0(0)	0(0)	1(100)	
Animal bites	1(33.3)	2(66.7)	0(0)	3(100)	
Fall of object	15(57.7)	6(23.1)	5(19.2)	26(100)	
Others (specify)	7(87.5)	1(12.5)	0(0)	8(100)	
Unknown	14(77.8)	3(16.7)	1(5.6)	18(100)	
Total	2098(73.3)	520(18.2)	243(8.5)	2861(100)	

As the P-value of Chi-square was less than <0.05 (0.001) 5% level of significance with 95% CI. It was found that most of the injuries were road traffic injuries contributing 72% in the higher secondary/intermediate/pre/pre-university senior secondary category of education. (Table VI)

Table VI: Representation of the association between Injury Reasons with education level.

Mode of injury	Education Level											
	Illiterate	Literate (without education level)	Below primary	Primary	middle/lower secondary	Matriculation/junior school Certificate/secondary	Higher secondary/intermediate/pre-university senior secondary	Graduate &PG	Not applicable	Unknown	Total	P-value

Road Traffic Injury	40 (3.3)	83 (6.9)	0(0)	7 (0.6)	55 (4.6)	82 (6.8)	647 (54)	268 (22.4)	0(0)	16 (1.3)	1198 (100)	0.001
Fall	68 (10.2)	71 (10.6)	3 (0.4)	13 (1.9)	40 (6)	69 (10.3)	302 (45.1)	99 (14.8)	1(0.1)	3 (0.4)	669 (100)	
Assault / quarrel	53 (6.5)	72 (8.8)	0(0)	2 (0.2)	64 (7.8)	117 (14.3)	374 (45.8)	133 (16.3)	0(0)	1 (0.1)	816 (100)	
Stab / cut	0(0)	2 (3.8)	0(0)	2 (3.8)	5 (9.4)	9 (17)	28 (52.8)	6 (11.3)	0(0)	1 (1.9)	53 (100)	
Firearm	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1 (100)	0(0)	0(0)	0(0)	1 (100)	
Burns	10 (15.9)	6 (9.5)	0(0)	3 (4.8)	4 (6.3)	8 (12.7)	23 (36.5)	7 (11.1)	0(0)	2 (3.2)	63 (100)	
Poisoning	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2 (66.7)	0(0)	0(0)	1 (33.3)	3 (100)	
Hanging	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1 (50)	0(0)	0(0)	1 (50)	2 (100)	
Sport	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1 (100)	0(0)	0(0)	0(0)	1 (100)	
Animal bites	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2 (66.7)	1 (33.3)	0(0)	0(0)	3 (100)	
Fall of object	6 (23.1)	4 (15.4)	0(0)	0(0)	1 (3.8)	5 (19.2)	6 (23.1)	4 (15.4)	0(0)	0(0)	26 (100)	
Othes (specify)	0(0)	2 (25)	0(0)	0(0)	0(0)	0(0)	4 (50)	1 (12.5)	0(0)	1 (12.5)	8 (100)	
Unknown	1 (5.6)	3 (16.7)	0(0)	0(0)	2 (11.1)	3 (16.7)	4 (22.2)	3 (16.7)	0(0)	2 (11.1)	18 (100)	

As the P-value of Chi-square was less than <0.05 (0.0001) 5% level of significance with 95% CI. It was found that most of the road traffic injuries were seen in the unemployed. (Table VII)

Table VII: Representation of the Association between Injury Reasons with Occupation

Mode of Injury	Occupation										
	Profession al	Semi profession al	Clerical / shop owner / farmer	Skilled worker	Semi-skilled worker	Unskilled worker	Unemployed	Not applicable	Unknown	Total	P-value
Road traffic injury	3 (0.3)	4 (0.3)	352 (29.4)	316 (26.4)	72 (6)	23 (1.9)	411 (34.3)	0(0)	17 (1.4)	1198 (100)	0.0001
Fall	1 (0.1)	1 (0.1)	150 (22.4)	112 (16.7)	45 (6.7)	17 (2.5)	337 (50.4)	3 (0.4)	3 (0.4)	669 (100)	
Assault / quarrel	2 (0.2)	3 (0.4)	198 (24.3)	152 (18.6)	95 (11.6)	55 (6.7)	309 (37.9)	1 (0.1)	1 (0.1)	816 (100)	
Stab / cut	0 (0)	0 (0)	13 (24.5)	12 (22.6)	10 (18.9)	2 (3.8)	15 (28.3)	0(0)	1 (1.9)	53 (100)	
Firearm	0(0)	0(0)	1 (100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(100)	
Burns	0(0)	0(0)	11 (17.5)	8 (12.7)	7 (11.1)	5 (7.9)	30 (47.6)	0(0)	2 (3.2)	63 (100)	
Poisoning	0(0)	0(0)	0(0)	1 (33.3)	0(0)	0(0)	1 (33.3)	0(0)	1 (33.3)	3 (100)	
Hanging	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(50)	0(0)	1 (50)	2 (100)	
Sport	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1 (100)	0(0)	0(0)	1 (100)	
Animal bites	0(0)	0(0)	1 (33.3)	1 (33.3)	1 (33.3)	0(0)	0(0)	0(0)	0(0)	3 (100)	
Fall of object	0(0)	0(0)	3 (11.5)	3 (11.5)	5 (19.2)	1 (3.8)	14 (53.8)	0(0)	0(0)	26 (100)	
Others (specify)	0(0)	0(0)	0(0)	2 (25)	1 (12.5)	0(0)	4 (50)	0(0)	1 (12.5)	8 (100)	
Unknown	0(0)	0(0)	1 (5.6)	4 (22.2)	3 (16.7)	0(0)	8 (44.4)	0(0)	2 (11.1)	18 (100)	

In the age group > 60 years, decreased risk of occurrence of trauma injury was seen especially in RTI 0.3290(0.116,0.92), assault/quarrel [0.14(0.05,0.424)] and stab/ cut [0.06(0.007,0.617)] with confidence interval (95%) respectively. But, with education level, increased risk of occurrence of trauma injury was seen with stab/ cut [23.3(1.99,273.29)] with primary low-level education at confidence interval (95%). Similarly increased risk was seen in primary level education with assault/ quarrel & stab/cut with 3.3(1.45,7.52) & 9.5(2.31,39.44)] respectively with confidence interval (95%). (Table VIII)

Table VIII: Association of selected variables with the risk of trauma injuries cases using 12-months of 2019 recall period among participants aged >18 years using multiple logistic regression.

	Total (N=2861)	Odds ratio for Trauma Injury Cases in the last 12 months of 2019 Year with 95% confidence interval				
		RTI Odds ratio CI (95%)	Fall Odds ratio CI (95%)	Assault/Quarried Odds ratio CI (95%)	Stab/Cut Odds ratio CI (95%)	Burn Odds ratio CI (95%)
Sex						
Male	2090(74%)	1.2 (2.97, 0.55)	1.1 (2.71, 0.5)	1.3 (3.07, 0.56)	2.5 (7.68, 0.81)	1.2 (3.27, 0.44)
Female (Reference)	735(26%)	1.00	1.00	1.00	1.00	1.00
Age group (Year)						
>18 (Reference)	2070(73.3%)	1.00	1.00	1.00	1.00	1.00
18 to <45	514(18.2%)	0.70 (0.269, 1.828)	0.72 (0.277, 1.917)	0.46 (0.177, 1.222)	0.38 (0.113, 1.34)	0.41 (0.125, 1.393)
>60	241(8.5%)	0.32 (0.116, 0.92)	0.69 (0.248, 1.962)	0.14 (0.05, 0.424)	0.06 (0.007, 0.617)	43 (0.121, 1.583)
Education Level						
Illiterate (Reference)	439(15.5%)	1.00	1.00	1.00	1.00	1.00
Primary (low level Education)	199(7.0%)	4.4 (0.56, 35.61)	3.9 (0.49, 31.31)	5.2 (0.66, 41.81)	23.3 (1.99, 273.29)	3.8 (0.42, 36.29)
Primary (Proper level Education)	2187(77.4%)	4.7 (2.11, 10.85)	2.1 (0.96, 4.98)	3.3 (1.45, 7.52)	9.5 (2.31, 39.44)	1.4 (0.53, 3.74)

Occupation						
Professional/Semi Professional	14(5%)	1.00	1.00	1.00	1.00	1.00
Semi-skilled/unskilled	1064(37.7%)	Na	Na	Na	Na	Na
Skilled	603(21.3%)	1.6 (0.7, 3.79)	0.96 (0.41, 2.26)	1.7 (0.74, 4.08)	2.4 (0.85, 6.92)	1.1 (0.41, 3.02)
Unemployed/Not applicable (Reference)	1144(40.5%)	3.4 (0.98, 12.09)	1.5 (0.43, 5.4)	2.2 (0.65, 8.06)	3.5 (0.82, 14.99)	1.1 (0.27, 5.06)

DISCUSSION

The study conducted by Dandona et al. in 2011 [4] reveals the pattern of road use and incidence and risk factors associated with Road Traffic Injuries amongst children between 5 to 15 years of age, residing in urban areas of Hyderabad. The researchers randomly sampled 50 clusters from a total of 2542 clusters (3.8 million people) in the year 2001. The selected participants belonged to the age group of 5 to 49 years. The survey comprised of questions related to the road traffic use, average number of road trips, injury suffered due to RTI, duration, the severity of the RTI, and days required for recovery. Based on the analysis of data, they found that the road traffic injuries were suffered by a total of 2809 (98.4%) of the participants and they belonged to the age group of 5 to 14 years. Amongst them, the majority (52%) were boys and 7.6% of the children (5 to 14 years) were employed.

Studies have also shown that the incidence and spinal injuries resulting from road accidents are increasing all over the world, particularly in developing countries. In the research work of Agarwal et al. in 2007 [5]**,** the researchers studied the demographic profile and the recovery processes of the individuals admitted to hospitals due to spinal injuries. They collected data from the hospital records between 1st January 2003 and 31st December 2004, for assessing the age and gender of patients along with their neurological injury level, processes involved in the management of injury, the recovery of patients, their status, and neurological condition at discharge. Amongst the total of 207 patients with traumatic and non-traumatic spinal injuries, the ratio of men to women was 3.6:1, indicating that the majority were men. Most of the patients who sustained spinal injuries belonged to the age range between 20 to 39 years. 118 patients were discovered to have a neurological deficit. The researchers further found that the leading cause of spinal injuries in those patients fell from height (58.9%), followed by accidents of motor vehicles (21.3%). While the majority (74.4%) underwent the conservative management process for their injuries, the rest (25.6%) required surgical interventions.

Chhabra & Arora *et al* [6] attempted to assess the demographic profile of patients with traumatic spinal injuries through a retrospective study. By analysing the case sheets of 1138 patients and undertaking a telephonic survey of 200 random patients from the case sheet population, the researchers concluded that the male: female ratio of patients with traumatic spinal injuries was 5.9:1 amongst whom the majority (63.19%) were married. However, in this study Road, Traffic Injury was found to be the leading and most common spinal injury in 45% of cases while fall from height was found to be the cause in 39.63% of the total cases.

The age and gender inclination of the current study could be because males predominantly work outdoors being more commonly exposed to traffic and partly due to their reckless behavior. This study found that more than 77% of the victims were in the age group between 18-and 45 years. This shows that the people of the most active and productive age group are involved in RTAs, which adds a serious economic loss to the community. The accident rates were 2.8 times higher in males than in females according to this study. This was similar to the findings made by Mitra S *et al* [7] and Singh *et al* [8]. Similar results were found in studies conducted by Mehta in Delhi [9] and Choudhary *et al* from Sevagram [10]. The pattern of injuries being soft tissue injury over hands and legs in the present study was in concordance with Mitra S *et al* [7] and Pathak *et al* [11]. Findings on fatal outcome in terms of either death or permanent disability was comparable to Mitra S *et al* [7] Bhuyan and Ahmed [12], Dandona and Mishra [13].

Besides the characterization of trauma, measuring the impact of the intervention on RTI cases through well-designed public health and clinical research methods such as trauma registries and surveillance programs, this work is expected to open up a new horizon in "Accidentology." An intervention study with an extensive awareness campaign might show rays of hope in the future.

CONCLUSION

Despite the size of the burden and the known potential for prevention, the need for international attention to injuries in terms of both policies and resource investments in public health is lacking. There is an urgent need for a comprehensive approach to reducing the burden of this challenging epidemic. Successful prevention strategies may include multifaceted approaches such as education, incentives for safe human behaviour, legislation/enforcement, and environmental changes. Stringent enforcement of legislation and overall awareness generation towards current and potential road users might be helpful to reduce the enlarging prevalence and address post-injury situations.

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