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Original Research Article

Dynamics of road traffic accident and traumatic injury in south India: Cross sectional study

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Abstract

Background:
Road Traffic Accident (RTA) is described as "an occurrence that takes place on a route or street open to public traffic; resulting in one or more individuals being hurt or killed, when at least one moving vehicle is involved". The rapid growth of individualised means of transportation, the mix of slow- and fast-moving cars, a lack of roadside discipline, drunk driving, and cell phone usage while driving are the main contributors to RTA in our nation.
Aims and objectives
1. To study the dynamics of accident and site of injury in the victims
2. To identify the common type of vehicles and injuries produced in a road traffic accident.

Materials and Methods: The hospital based descriptive study was conducted in the Department of Forensic Medicine, Sri Manakula Vinayagar Medical College and Hospital, Puducherry during a period of one year from May 2013 to June 2014. Among 781 patients were taken during the study period. After obtaining informed consent, the principal investigator was collected the data using structured questionnaire contain basic characteristics like, age, gender, history of alcohol consumption, Dynamics of accident, Site of the injury and types of vehicles used at the time of injury.
Results: The median age of the study participant was 31.00 (IQR 23 – 43) years. Among 781 cases, 664 (85.01%) were males and 117(14.98%) were females. Skid and fall from two wheeler is the most common type of accident which constitutes to about 32.1% of all types of accidents. Head is the most common part injured (24.0%), followed by lower limb (16.9%), and followed by upper limbs (16%). Most of the cased had two wheeler accident.
Conclusion: These dynamics, accident sites, and accident types may shed light on it, and the nation may need to enact stricter laws and raise awareness of the issue.

Keywords: Collision, pedestrian, accident, two wheelers, head injuries

Introduction

Road Traffic Accident (RTA) is described as "an occurrence that takes place on a route or street open to public traffic; resulting in one or more individuals being hurt or killed, when at least one moving vehicle is involved" [1]. According to the International Road Traffic Safety and Data analysis group (IRTSD) conference on "Asia needs to Act on Road Crashes", in

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Asia over 2000 people die on the road everyday resulting in 60% of casualties worldwide and about 3,00,000 disabled permanently [2]. Due to India's rapid economic growth and high population density, the volume of traffic on the roads is also growing.

The United Nations General Assembly declared 2011–2020 as the Decade of Action for Road Safety with the general objective to stabilise and then reduce the number of road traffic deaths throughout the world since RTIs are a significant health burden on the global society [3]. According to the world health statistics report, in next five years vehicle ownership may double causing streets and highways to be choked by inadequately maintained vehicles [4]. It is estimated that by the year 2020, when compared to other natural deaths, death and disability due to road traffic accidents will rise from current place of 9th to 3rd place [5]. The rapid growth of individualised means of transportation, the mix of slow- and fast-moving cars, a lack of roadside discipline, drunk driving, and cell phone usage while driving are the main contributors to RTA in our nation. [5].

The rapid growth in the number of vehicles, poor compliance to traffic laws and regulations, such as maintaining lane discipline and driving in zigzag patterns by the general public, badly maintained and congested roads, alcohol abuse, a lack of awareness of the need for helmets, and new generation of fast vehicles have all been identified as the main causes of road traffic accidents in this region of the country. Despite the advancements in technology and medicine, it is still difficult to properly reduce death and disfigurement caused by traffic accidents.

The main aim of this cross sectional study was to analyse the dynamics of a road traffic accident and also to identify the common types of vehicles and injuries encountered in an accident.

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Materials and Methods

The hospital based descriptive study was conducted in the Department of Forensic Medicine, Sri Manakula Vinayagar Medical College and Hospital, Puducherry during a period of one year from May 2013 to June 2014.

Sample Size calculation

The sample size was calculated using the software open epi. From May 2011 to June 2012, 1623 road traffic accident cases were reported to Casualty, accounting for 43% of all Medico-legal cases. So with this 43% as P, with a Precision of 5%, and a Design Effect of 2, the sample size would be approximately 753 round off the figure totally 760 patients was taken.

Methodology: The data collection was done by a principal investigator. The study participants included in the study were Patients attending causality with the history of road traffic accident with the following inclusion criteria.

Inclusion criteria

Only Road Traffic Accident cases reported directly at SMVMCH casualty of all ages and both sexes.

Exclusion criteria

1. Patients with mechanical injuries caused Means (train, assault, fall from height.etc)
2. Road Traffic Accident cases which are not reported at SMVMCH Casualty

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3. Cases of Road Traffic Accident which have been Referred or treated before reporting to SMVMCH Casualty.

Initially first aid treatment will be done for the patients, once the patient is stabilized the principal investigator will collect the data using structured questionnaire. The structured questionnaire contain basic characteristics like, age, gender, history of alcohol consumption, Dynamics of accident, Site of the injury and types of vehicles used at the time of injury. An Informed and written consent was obtained in Tamil language from all the subjects prior to their participation in the study. In case if the respondents are illiterate, a left thumb impression were obtained, for whom additional witness signature of literate was obtained. Interview was conducted in a closed environment where privacy to be ensured. Data were collected after patients have consulted the specialist doctor for their treatment. A detailed history was taken and thorough clinical examination was done in all the subjects. Statistical Analysis: the collected study data were entered in Microsoft Office Excel 2013 and analyzed using SPSS 21 software. Continuous variables like age was expressed in median and inter Quartile Range. Description of categorical variables like gender, Description of categorical variables like gender, alcohol consumption, Dynamics of accident, sites of injuries and common types of vehicles causing them were expressed as frequency and percentage.

Ethical consideration

Ethical principles such as respect to the patient, beneficence and justice were strictly adhered. The approval to conduct the present study was obtained from the "Institutional Ethics Committee "(IEC). Informed written consent was obtained from all the study participants before administering questionnaire, after explaining the risks and benefits in a language comfortable to them.

Results

Table 1: Basic Characteristic of the study population

	Frequency	**Percentage**
Median Age (IQR)	31.00 (23 – 43)	
Gender		
Male	664	85.02%
Female	117	14.98%
Alcohol consumption		
Yes	126	16.1%
No	655	83.9%
Dynamics of accident		
Head on collision	173	22.2%
Hit a fixed object	31	4.0%
Over turn	21	2.7%
Fall from moving vehicle	43	5.5%
Hit from back	100	12.8%
Hit from side	125	16.0%
Run of the road	11	1.4%
Skid and fall	251	32. 1%
Pedestrian run over	26	3.3%
Total	781	100.0%

The median age of the study participant was 31.00 (IQR 23 – 43) years. It is observed that out of 781 cases included in the present study 664 were males (85.01) and 117 were females (14.98) and the male female ratio is 6.67:1. Among the total number of road traffic accident

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cases studied in this study nearly 126 (16.1%) cases of all the drivers have consumed alcohol. This study reveals that skid and fall from two wheeler is the most common type of accident which constitutes to about 32.1% of all types of accidents. Head on collision with other vehicle contributed to about 22.2% of all accidents. Vehicle hit from side and hit from back constitutes to about 16% and 12.8% respectively. 5.5% of total accidents have occurred due to the individuals falling from moving vehicle.3.3% o total type of accidents were pedestrian run over's.

Table 2: Site of injury

Site of the injury	No. of cases	Percentage
Head and thorax	55	12.9%
Head, thorax and abdomen	19	4.5%
Lower limbs	72	16.9%
Head injuries	102	24.0%
Pelvis, low limbs, up limbs, spine	31	7.3%
Head and neck and spine	42	9.9%
Groin and back	9	2.1%
Groin	2	0.5%
Upper limbs	68	16.0%
Low limb, spine and back	25	5.9%
Total	425	100.0%

In the study conducted, shows that head is the most common part injured (24.0%), followed by lower limb (16.9%), and followed by upper limbs (16%). Among injuries in more than one area, head and thorax are the most common part getting injured (12.9%), followed by head, neck and spine (9.9%), and followed by injuries in pelvis, lower limbs, upper limbs and spine. The area which is least affected by accidents are the groin and back (2.1%).

Table 3: Common sites of injuries and common types of vehicles causing them:

	Bicycle	Two wheelers	Three wheelers	Light motor vehicles	Heavy goods vehicles	Heavy passenger vehicle	Bullock cart
Head	77	131	2	-	1	2	4
Upper limb	31	43	3	4	2	18	2
Lower limb	18	16	3	17	1	5	2
Thorax	2	4	6	14	6	23	-
Abdomen	-	3	4	9	1	2	-
Pelvis	-	6	-	-	-	-	-
Back	-	6	1	2	-	-	-
Spine	-	2	-	2	-	-	-

From this current study we were able to find out that head injuries are more in number in two wheeler accidents, followed by bicycle users. Upper limb injuries are also commonly seen among two wheeler accidents followed by pedal cycles. Lower limb injuries are more in number in cyclist and light motor vehicle accidents. Thoracic and abdominal injuries are more in light motor vehicle accidents. Pelvic injuries are more among two wheeler accidents and spinal injuries are also seen among two wheeler and light motor vehicle accidents.

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Table 4: Common type of vehicles and common types of injuries produced:

	Pedal cycle	Two wheelers	Light motor vehicles (auto, car & jeep)	Heavy motor vehicles (passanger and goods)
Abrasion	29	142	19	46
Contusion	4	13	3	8
Laceration	26	88	21	4
Fracture	3	9	8	2
Crush injury	-	-	1	4
Puncture wound	-	-	-	1

The current study was helpful in finding out that among the different types of injuries produced abrasion was common among two wheeler accidents, followed by heavy vehicular accidents, followed by pedal cycle accidents and finally light motor vehicular accidents. Contusion was the most common type of injury among two wheeler accidents. Accidents by two wheelers contributed for the most number of lacerations and fractures. Crush injuries were common heavy vehicular accidents.

Discussion

From the dynamics of accidents we came to know that skid and fall from vehicles is the commonest type, where abrasions are inevitable due to the contact of the skin surface on to the rough surface of the road. Lacerations may happen only when there is an indulgence of a hard force from other vehicle or any fixed object like median, barracades, tree etc. Puncture wounds are usually rare and will be seen only if there is any tail gatting ie. Hitting on any sharp projecting object present at the back of the vehicle travelling in the front [6].

In our study we found out that skid and fall from two wheeler is the most common type of accident. Vehicle hit from side and hit from back constitutes to about 16% and 12.8% respectively. 5.5% of total accidents have occurred due to the individuals falling from moving vehicle.3.3% of total type of accidents were pedestrian run over's. The findings of the present study correlates with the findings of an Indian study, by Kocher Sr *et al*. where they found out that skid and fall of the motorcycles is the commonest form of accidents especially among motorcycles with front wheel disc brake [7]. Gunjan B *et al* in their study done in Indira Gandhi medical college Ahmedabad among the total 423 subjects of road traffic accidents 63.59% of accidents occurred due to sideways collision at the intersection of the roads followed by hit from behind [8]. Behra C *et al*. in their study done in Delhi observed that most of the two wheelers accidents occurred due to impact from behind by another vehicle followed by fall of the motor cycle rider on the road due to various reasons [9]. The increased number of skid and fall type of road traffic accidents in our study can be justified with bad road conditions, improper driving skills and crossing of stray animals in the roads in this part of rural Pondicherry.

The increase in the percentage of alcohol users can be justified by the increase in the number of liquor shops in this part of Pondicherry and the socio economic status of the people in this study area is less when compared to the people along the east coast road.

In the present study, we were able to find out that head is the most common part injured (24.0%), followed by lower limb (16.9%), followed by upper limbs (16%).These findings can be correlated with the findings of the study done by Punia Rk. *et al*. in Jaipur, that isolated head injuries are the most commonest type on injuries especially among motor cyclist. Most of the head injuries were due to fall of the motor cycle occupants which correlates with head on collision with the vehicle coming on the opposite direction [10].

Among injuries in more than one area, head and thorax are the most common part getting injured (12.9%), followed by head, neck and spine (9.9%), and followed by injuries in pelvis, lower limbs, upper limbs and spine. The area which is least affected by accidents are the

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groin and back (2.1%). Correlation can be obtained from the study done by Ravikiran. *et al*. where injuries in multiple sites are common among two wheeler users. Among them head is the most commonly affected part as a site of impact or injured as a result of fall, thoracic and spinal injuries can also be seen [11].Similar findings of multiple injuries in road traffic accidents were found in a study done in Singapore [12].

Spinal injuries are relatively less in this study. The correlation of this finding can be obtained from a study where they concluded that spine is the least vulnerable area as it is the well protected part of the body [13]. From this current study we were able to find out that head injuries are more in number in two wheeler accidents, followed by bicycle users. Upper limb injuries are also commonly seen among two wheeler accidents followed by pedal cycles. Similar findings were noted in a study done in Bangalore where they found out that head injury is the most common type of injury among two wheeler users [14]. The usage of helmets were not recorded in the present study.

Injuries to the lower limbs are more in accidents caused by four wheelers. This can be well explained by the low bumper heights of the vehicles like car, jeep and van. So the lower limbs become the site of primary impact in cases of pedestrians and two wheelers hit by car from side. The correlation of such a finding is obtained from the study made in Philadelphia where 85% of the lower limb injuries were caused by light motor vehicles due to impact [15].

Among the 571 cases which had both surface and internal injuries, abrasions were the common type of injuries seen among 41.35% of cases, followed by lacerations (24.3%), followed by contusions (4.9%). 3.9% of cases had fractures, 0.9% of cases had crush injuries, 0.2% of cases had punctured wounds. Similar results were found in a research conducted in this region of the nation, where abrasions and lacerations are the most prevalent kind of injuries suffered by motorcyclists, followed by bicyclists and bullock cart drivers [16].Contradictory findings were observed in a study done in Andhra Pradesh were lacerations are the common type of injury among road traffic accident victims affecting the lower limbs [17].

There are certain limitations of this study such as vehicles on the road which were not included in the list of vehicles in the Performa. The usage of helmet by the two wheeler users was not ascertained. Alcohol usage by the road user is studied only based on the history and clinical findings and not on any analytical or laboratory investigations.

Conclusion

Majority of the road traffic accident victims were males. Among two wheeler accidents, skid and fall was most common and head is the commonest part getting injured. Abrasion and contusion are commonly seen in two wheeler accidents followed by lacerations and fractures. Crush injuries are seen only in heavy vehicular accidents. To conclude in order to reduce the alarming number of road traffic accidents and to prevent it completely appropriate safety measures such as solar-powered cats eyes, reflectors, crosswalk lighting, traffic signals, and hazard signals should be placed. Special attention towards accident prone areas by appointing patrol service to be provided. Proper guidance to parents regarding the supervision of the vehicle usage by their children is also essential.

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