

Incidence and Pattern of Maxillofacial Trauma Due to Road Traffic Accidents: A Prospective Study

Amit Agnihotri · Dhanaram Galfat ·
Deepshikha Agnihotri

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Abstract

Background The incidence and causes of road traffic accidents (RTAs) vary with geographical location, socio-economic status, religion and era. The etiological factors and associated injury patterns may be important in planning for preventive measures and treatment planning. The aim of this study was to evaluate and analyze the etiological factors, patterns and the frequency of maxillofacial injuries due to RTAs.

Materials and Methods This prospective study was conducted on 350 patients with facial trauma due to RTAs. Records related to age, sex, the cause of the RTA, the vehicle type, time to reach the hospital, the use of seat belts, helmets, and other safety devices were evaluated and reviewed.

Results Two-wheelers were the most involved (53.71 %) vehicle type and negligence of traffic rules (24 %) was the most common etiological factor. Male to female ratio was 6.3:1. The age group of 21–50 (68.85 %) years was mostly affected. The nasal bone (29.14 %) was most often the site of fracture followed by mandible (28.0 %). The rate of accident was higher during 1000–1400 hours (23.14 %) period and during weekends (38.0 %). Majority (58.57 %) of victims reached the hospital within 6 h of accident.

Conclusion The low utilization of safety devices like seat belts and helmets as well as speeding, negligence of traffic rules and reckless driving were identified as etiological factors.

Keywords Road traffic accidents ·
Maxillofacial fracture · Etiological factors

Introduction

Being the most exposed part of the body, the face is particularly prone to trauma [1]. Trauma to the facial region cause injuries to skeleton components, dentitions as well as soft tissues of the face. The incidence and pattern of maxillofacial fractures vary from country to country depending upon prevailing geographical, social, cultural and environmental factors [2]. In developed countries increased incidence of trauma were reported due to road traffic accidents, however in developing countries and western world inter personal violence is the most causative factor [2]. The contributory factors in road traffic accidents include excessive speeding, use of alcohol, drugs, road conditions, poor light.

Road traffic accident (RTA) is a leading cause of morbidity and mortality in adults below the age of 50 years and the greatest number of cases are males in the 21–30 year age group [3–5]. The treatment of trauma is more costly than of any other major disease [5]. Annually, more than 1 million deaths are recorded worldwide annually, while non-fatal road traffic accidents are a major problem causing hospitalization and permanent disability to thousands of person each year [6].

The aim of this study is to know about the pattern and identify the risk factors of maxillofacial fractures, provide

A. Agnihotri (✉) · D. Agnihotri
Guru Gobind Singh College of Dental Science and Research
Centre, Burhanpur, Madhya Pradesh, India
e-mail: dramit_agnihotri@yahoo.com

D. Agnihotri
e-mail: shikha_198302@yahoo.co.in

D. Galfat
Mahaveer teerthanker Medical College, Moradabad,
Uttar Pradesh, India
e-mail: drgalfat@yahoo.com

evidences for recommendation of possible preventive measures, to help the policy makers evolve a better trauma care program by focusing on the target groups and introduce cost effective preventive measures.

Materials and Methods

This study was conducted in the department of Oral and Maxillofacial Surgery, from 15th June 2011 to 14th June 2012. It was a prospective cross-sectional study of victims of road traffic accidents. Selection for the study was based on the pattern of maxillofacial fractures due to road traffic accidents. Patients with facial injuries from other causes were excluded from the study. Age, sex and the part of the face affected was not the criterion for selection. All the patients included in our study were registered in our proforma. Detailed history was taken from patients and attendants regarding place, mode of accident and possible cause of accident.

Detailed clinical examination of the patient was done and findings noted in a proforma. All the radiological and investigation findings were recorded. The recorded data were evaluated and analyzed under following headings: Age, sex, day of injury, time of injury, place of injury, time interval between RTA and hospitalization, alcohol intoxication, vehicle involved, type of impact, cause of accident, helmet used or not, seat belt used or not, bone involved, joint affected and head injury.

Results

The study was conducted in 350 patients. Most common age group affected was 21–50 years (68.85 %) and the mean age of the victims was 32.42 years. Male to female ratio was 6.3:1. The frequency of occurrence of RTA (38.0 %) was more at weekends i.e. Saturday and Sunday. The peak time for occurrence of RTA was observed to be 1000–1400 hours (23.14 %). The lowest accident rate was observed during 1400–1800 hours (8.0 %).

Most of the patients reached the hospital within 6 h of RTA (58.57 %). Only 7.7 % patients reached the hospital within 1 h of RTA. 10.85 % patients were found to be under the influence of alcohol at the time of accident.

In our study, the commonest vehicle involved was two-wheeler (53.71 %), followed by four-wheeler (21.14 %) and three-wheeler (5.14 %). The pedestrians were involved in 19.14 % of cases and others in 0.8 % of cases. The mode of majority of cases was head on collision (37.14 %), followed by side-on accidents (21.14 %).

In our study, the most common cause for RTA (Table 1) was negligence of traffic rules (24.0 %), followed by

Table 1 Cause of RTA

Sr. no.	Cause of RTA	No. of victims	Percentage
1	Road condition	53	15.14
2	Poor light	7	2.0
3	Parked vehicle	21	6.0
4	Pedestrian on road	69	19.71
5	Animal on road	16	4.5
6	Speeding	81	23.14
7	Not following traffic rules	84	24.0
8	Mobile use	7	2.0
9	No cause found	12	3.4
Total		350	100

Table 2 Use of helmets

Sr. no.	Two wheeler used	No. of helmet users	No. of non users	Total
1	Motor cycle	8	82	90
2	Scooter	0	69	69
3	Moped	0	9	9
4	Bicycle	0	20	20
Total		8	180	188

excessive speed (23.14 %). In this study we found that motor cycle was mostly responsible for the accident in as many as 25.71 % cases, scooter in 19.71 % cases and cars in 7.4 % cases. Most common mode of accident of two-wheeler was side-on accident (33.4 %), followed by head-on collision (27.4 %). The most common cause of accident of two-wheeler was speeding (36.17 %), followed by negligence of traffic rules (32.44 %) and bad road conditions (8.5 %).

Out of 188 two-wheeler users in our study only 8 were wearing helmet at the time of accident (Table 2). In our study, no four-wheeler victims used seatbelt. Three hundred and fifty victims sustained 430 body part injuries. Commonest bone affected was nasal, mandible followed by zygoma and maxilla (Table 3).

Discussion

RTAs are a major cause of maxillofacial trauma, Ferguson [7] showed that 19.25 % RTA victims were 20 years and fewer than 8.75 % were 60 years and above 72 % were 20–59 years. Beyaztas and Alagozlu [8] observed that the most common age group was 1–25 years (44.5 %). Saidi and Kahoro [9] observed peak incidence in the 21–30 year age group. Wong and Leong concluded that median age was 31 years. In our study the commonest age group affected was

Table 3 Distribution of injuries according to involved bone

Sr. no.	Facial bone fractured	No. of injuries to bones	Percentage	Relative percentage of victims
1	Nasal	102	23.7	29.14
2	Mandibular	98	22.7	28.0
3	Zygoma	83	19.3	23.7
4	Maxillary	70	16.2	20.0
5	Orbital	47	10.9	13.4
6	Frontal	30	6.9	8.5
Total		430	100	

21–50 years (67.31 %) with mean age of 32.68 years. The more frequent involvement of 21–50 year age group may be due to their involvement increased in travelling to work place and outdoor activities. The other causes of increased incidence of accidents in this age group may be their risk taking behavior along with lack of knowledge or in most of the cases, violation of traffic rules.

Trivedi and Seth [11] found that 78.3 % of the fatal accidents involved males. Souzer et al. [12] found that males constitutes 71 % and females 29 % of the total RTA victims. According to Tavis et al. [13] overall male to female ratio is 4:3. The male to female ratio varied with the type of crash and differed by passenger and drivers. For passengers injury rate from collisions with other vehicles were greater for females. Ratio in injury from loss of control crashes was similar for both genders. In our study males were affected in 86.28 % of total accidents and females in 13.72 % of crashes. The overall male to female ratio was 6.3:1. This may be because in Indian society mostly males bear the burden of earning and hence are more prone to accidents due to increased outdoor activity.

Souzer et al. [12] found higher accident rates in the weekends. Our study also shows similar results with 30.0 % accidents on weekends (i.e. Saturdays and Sundays). This increase in rate of RTAs can be attributed to increased outdoor activities during the weekends with increase in the number of drivers who are under the influence of alcohol.

Beyaztas et al. [8] observed that 39.83 % accidents occurred between 1200–1800 hours. Souzers et al. [12] also observed that the peak time of RTA was 1200–1800 hours. In our study we observed that the peak time for accidents was 1000–1400 hours (23.14 %) and 21.14 % between 1800–2200 hours. During these periods the traffic density increased especially around offices, factories, schools, colleges and market. This suggests that these areas should have a sound traffic control management during the peak hours so as to prevent the accidents and preserve precious lives.

Delay in reaching hospital is of prognostic value and assesses the trauma care transport system. Beyaztas et al. [8] in their study observed that 45.2 % victims reached the hospital within first hour of accident. In our study only 7.7 % victims reached the hospital within 1st hour which is the golden hour in the management of the trauma victims. The reason for very few victims reaching within this interval may be lack of public awareness and apathy and lack of communication and proper ambulance transport system.

In our study majority of the victims (58.57 %) reached the hospital within 6 h. The reason may be that majority of the accidents were in the urban area and this may also be due to the presence of certain transport services (Cheeta, Chetak and Charlie) provided by police department for road traffic victims and their prompt action led to decrease in the delay time.

Though majority of the victims reached the hospital within 6 h but a significant proportion of RTA victims (34 %) could not reach the hospital within the 6 h period, the cause for this delay may be lack of proper approach roads in rural areas. Another cause for delay may be the existing referral system in our country at present, from the primary health centre the victim is referred to the district hospital from where the victim is referred to tertiary centre where definitive treatment is given.

Beyaztas et al. [8] in his study observed that 14.28 % of the cases were involved in alcohol. Blood alcohol was detected in 18.7 % victims in study group of Wong and Leong [10]. In our study we found 10.85 % victims intoxicated with alcohol by clinical parameters. Those who consumed less quantity of alcohol escaped from clinical detection whereas those who reported to hospital late.

Souzer et al. [12] in his study observed that most morbidity and mortality has been observed in minibus, bus and motor bike accidents. Saidi and Kahoro [9] in their study found that the total vehicle occupant constituted 70 % and pedestrian constituted 21.3 %. The public service minibus caused 20 % of the injuries. Wong and Leong [10] showed the relative risk between motorcyclist and motor car drivers as 18.8:1. In our study majority of the victims were two wheeler occupants (53.71 %), followed by four-wheeler (21.14 %). Pedestrians were involved in 19.14 % of cases and three wheelers in 5.14 % of cases. This increased involvement of two wheeler occupants may be due to over speeding, negligence of traffic rules and bad road conditions.

Our observations showed that in cases of RTA of two-wheeler, most common mode of accident was side on accident (33.4 %). On analyzing the cause for accident in two wheeler crashes we found that the most common cause to be speeding (36.17 %), followed by negligence of traffic rules (32.44 %) and bad road condition (8.5 %).

On analyzing the vehicles involved in the accidents (driven by the victims or against the victim), we found that motorcycle was responsible for the accident in as many as 25.71 % cases, scooter was responsible in 19.71 % cases and cars in 7.4 % cases. The reason for increased involvement of motorcycles may be over speeding and negligence of traffic rules.

Dolan [14] stated that human factor is a predominant cause in 64–71 % of crashes. Environmental factors in 12–19 % and vehicular factors are the cause in about 8 %. In 20 % crashes no cause could be identified, in other crashes all three factors were present. In our study commonest cause for accident was observed to be not following traffic rules (24.0 %), excessive speed was the cause in 23.14 %, pedestrian on road in 19.71 % and poor road condition in 15.14 % cases, other causes were parked vehicle on road, animal on road, poor light, use of mobile and in 3.4 % cases the cause could not be identified.

Wong and Leong [10] showed that head injuries were seen in 21.44 % cases and only 10.44 % victims were using helmet during driving the two-wheeler. In our study we also noticed that only 4.25 % victims used the helmet and 95.75 % victims were without helmet at the time of accident.

The analysis of injury pattern of maxillofacial region showed that the most common bone to be affected was nasal (23.7 %), followed by the mandible (22.7 %) and zygoma (19.3 %).

Summary and Conclusion

- Our study revealed that 21–50 years age group is the most frequently affected age group. The mean age of the victims of RTA was 32.68 years.
- The male to female ratio was 6.3:1.
- The rate of accident was higher during 1000–1400 hours period and during weekends (30.0 %).
- Only 7.7 % victims reached hospital within 1st hour of accident and majority (58.57 %) of victims reached within 6 h of accident.
- We found 10.85 % of victims intoxicated with alcohol at the time of accident.
- Majority of victims were two wheeler occupants (53.71 %), followed by four wheeler occupants (21.14 %). Pedestrian were involved in 19.14 % cases.
- Most common mode of accident of two-wheeler was side on accident (33.4 %). Most common cause of accidents of two-wheelers was speeding, negligence of traffic rules and bad road conditions.

Human factors were responsible for accidents in majority of cases (not following traffic rules, speeding, pedestrian on

road in decreasing order of frequency), environmental factors also played significant role for the causation of accidents (poor road condition, poor light).

In this study most common fractured bone was nasal (23.7 %) followed by mandible (22.7 %).

Only 4.25 % of the two wheeler occupants were using helmet at the time of accident. In this study we found no driver was using seat belt at the time of accident.

The youth of our country should be thoroughly and properly exposed to the traffic rules, they should be made aware regarding safety measures to be followed while driving. Awareness programs should be arranged for the general population by the local governing bodies in order to make them aware regarding the first aid management of trauma victims. The public should be aware of utility of helmet and seat belts while driving. Strict laws should be enforced against drunken driving, to reduce road traffic accidents.

This study aims to initiate a system of trauma registration where trauma rated can be monitored, time trends established and concrete data provided in its time, place and person distribution. This study will help the policy makers to evolve a better trauma care program by focusing on the target groups and introducing cost effective preventive measures. Further in-depth study of morbidity and mortality patterns of the RTA victims, causes of accidents and possible preventive measures and their effects is recommended.

References

1. Oji C (1999) Jaw fractures in Enugu, Nigeria. *Br J Oral Maxillofac Surg* 37:106–109
2. Israr N, Shah AA (2001) Retrospective study of zygomatic complex fractures in Sheffield, England. *Pak Oral Dent J* 21:50–59
3. Kuner EH, Schlickewei W, Oltmanns D (1996) Injury reduction by the airbag. *J Injury* 27:185–188
4. Adekeye EO (1980) The pattern of fractures of the facial skeleton in Kaduna, Nigeria. A survey of 1447 cases. *J Oral Surg Oral Med Oral Pathol* 6:491–495
5. Oikarinen VJ, Lindqvist C (1975) The frequency of facial bone fracture in patients with multiple injuries sustained in traffic accidents. *Proc Finn Dent Soc* 71:53–56
6. Mason PN (1990) Facial injuries. In: McCarthy JG (ed) *Plastic surgery*. Saunders, Philadelphia, pp 868–872
7. Ferguson AL (1974) Epidemiology of traffic accidents. *S Afr Med J* 48:599–602
8. Beyaztas FY, Alagozlu H (2002) Evaluation of traffic accident cases admitted to the emergency department of the Cumhuriyet university hospital in 1988. *Ulus Travma Derg* 8:29–33
9. Saidi HS, Kahoro P (2001) Experience with road traffic accident victims at the Nairobi hospital. *East Afr Med J* 78:441–444
10. Wong E, Leong MK (2002) Road traffic accident mortality in Singapore. *J Emerg Med* 22:139–146

11. Trivedi & Seth (1981) Epidemiology of fatal accidents. *Int J Surg* 3:169–174
12. Sozuer M, Yildirim C, Senol V, Unalan D, Nacar M, Gunay O (2000) Risk factors in traffic accidents. *Ulus Travma Derg* 6:237–240
13. Tavis DR, Kuhn EM, Layde PM (2001) Age and gender patterns in motor vehicle crash injuries: importance of type of crash and occupant role. *J Accid Anal Prev* 33:167–172
14. Dolan WD (1983) Automobile related injuries. Council on scientific affairs. *J Am Med Assoc* 249(23):3216–3222