



Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study

Mohanavalli Singaram, Sree Vijayabala G, Rajesh Kumar Udhayakumar

Department of Dentistry, ESIC Medical College and Post Graduate Institute of Medical Sciences and Research, Chennai, India

Abstract (J Korean Assoc Oral Maxillofac Surg 2016;42:174-181)

Objectives: This retrospective study aims to evaluate the prevalence of maxillofacial trauma in a developing country, along with its pattern, etiology and management. Data for the present study were collected from the Department of Dentistry, ESIC Medical College and Post Graduate Institute of Medical Sciences and Research, Chennai in India.

Materials and Methods: The medical records of patients treated for maxillofacial injuries between May 2014 and November 2015 were retrospectively retrieved and analyzed for prevalence, pattern, etiology, and management of maxillofacial trauma. SPSS software version 16.0 was used for the data analysis.

Results: Maxillofacial fractures accounts for 93.3% of total injuries. The mean and standard deviation for the age of the patients were 35.0 ± 11.8 years and with a minimum age of 5 years and maximum age of 75 years. Adults from 20 to 40 years age groups were more commonly involved, with a male to female ratio of 3:1. There was a statistically significantly higher proportion of males more commonly involved in accident and injuries ($P < 0.001$).

Conclusion: The most common etiology of maxillofacial injury was road traffic accidents (RTA) followed by falls and assaults, the sports injuries seem to be very less. In RTA, motorized two-wheelers (MTW) were the most common cause of incidents. The majority of victims of RTA were young adult males between the ages of 20 to 40 years. The malar bone and maxilla were the most common sites of fracture, followed by the mandible. The right side of the zygomatic complex was the predominant side of MTW injury. The majority of the zygomatic complex fractures were treated by conservative management. Open reduction and internal fixation were performed for indicated fracture patients.

Key words: Fractures, Injuries, Mandible, Maxillofacial, Zygomatic

[paper submitted 2015. 12. 24 / revised 2016. 2. 7 / accepted 2016. 2. 11]

I. Introduction

Trauma is one of the leading causes of death among people under 40 years of age¹. Maxillofacial injuries are one of the most common injuries associated with other injuries and adult males are the most common victims. Road traffic accidents (RTA) are the major cause of maxillofacial injuries in developing countries². Our institution is a referral center, predominantly treating low-income insured employees. The

Department of Dentistry routinely treats maxillofacial injury cases. The main aim of this retrospective study was to evaluate the prevalence of maxillofacial injury, etiology, type of injury, site of maxillofacial fractures, and their management.

II. Materials and Methods

The records of maxillofacial injury patients from May 2014 to November 2015 who reported to the Department of Dentistry, ESIC Medical College and Post Graduate Institute of Medical Sciences and Research (PGIMSR), Chennai in India were retrieved. Patients who reported with facial soft tissue injuries were also included. Head injury patients with brain involvement who required neural intervention and mortal cases were excluded. The records of 267 patients between the ages of five to seventy-five years were retrospectively analyzed. Data including age, gender, mode of injury, etiology, anatomical fracture site, consciousness status, alcohol

Mohanavalli Singaram

Department of Dentistry, ESIC Medical College and Post Graduate Institute of Medical Sciences and Research, K. K. Nagar, Chennai 6000078, India

TEL: +91-044-24748959 FAX: +91-044-24742825

E-mail: mona13omfs@gmail.com

ORCID: <http://orcid.org/0000-0003-2905-2966>

©This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Copyright © 2016 The Korean Association of Oral and Maxillofacial Surgeons. All rights reserved.

abuse at the time of injury, and treatment rendered were extracted. The etiology of injury was categorized into four main categories: (1) RTA involving automobiles, motorcycles and bicycles, including drivers, pillion riders, passengers, and pedestrians; (2) Fall(s) from heights or while playing or due to systemic illness like epilepsy; (3) Assaults or interpersonal violence; and (4) Sports injuries and other injuries. Fractures were grouped and coded according to International Classification of Diseases (ICD)-10: S02.4, zygomatic complex (ZMC) fracture involving malar bone and maxilla; S02.3, orbital floor fracture; S02, fractures involving facial and skull bones; S02.6, mandible fractures (which includes condyle, ramus, angle, body of the mandible, parasymphysis, symphysis); S02.5, tooth fracture; and S02.2, nasal bone fractures. Statistical analysis using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) was performed. Study outcomes were measured using percentages, the mean, standard deviation and tests of proportion as appropriate. The prevalence of injury in a particular age group and gender distribution, etiology, type of fracture, management and influence of alcohol were analyzed. For comparison, the existing literature related to maxillofacial injuries was reviewed.

The study was approved by the Institutional Review Board of ESIC Medical College and PGIMS (No. 17 -03/07/2015 ESIC MC PGIMS -EC).

III. Results

Out of 267 case records in the age group between 5 to 75 years, maxillofacial fractures accounted for 93.3% of total

injuries. The mean age and standard deviation of the patients was 35.0 ± 11.8 years, with a minimum age of 5 years and a maximum age of 75 years. Adults between 20 to 40 years of age were more commonly involved. Gender distribution shows that 74.5% (199/267) of subjects were male and 25.5% (68/267) were female, with a male to female ratio of 3:1. (Fig. 1, Table 1) The test of proportion for males and females shows that there was a statistically significantly higher proportion of males involved in accident and injuries ($P < 0.001$).

1. Etiology

(1) The report shows that the most common cause for maxillofacial injury was RTA, accounting for 73.8% of injuries (197/267), among which motorized two-wheelers (MTW) were the major cause of these injuries (90.9%, 179/197), including skids and falls, collision with other vehicles and pedestrians.

(2) Trauma due to fall accounted for 18.0% of injuries (48/267), mostly involving children who fell while playing, elderly people who fell down due to systemic illness, or men who fell down under the influence of alcohol.

(3) Assault by a known person constituted for 6.7% of injuries (18/267).

(4) Three cases of sports injury and one case of industrial injury were reported in our data. (Fig. 2, Table 1)

The test of proportion between RTA and other injuries showed that there was a statistically significantly higher proportion of RTA compared to other types of injuries ($P < 0.001$). Overall results revealed that 41.6% of males (111/267) were

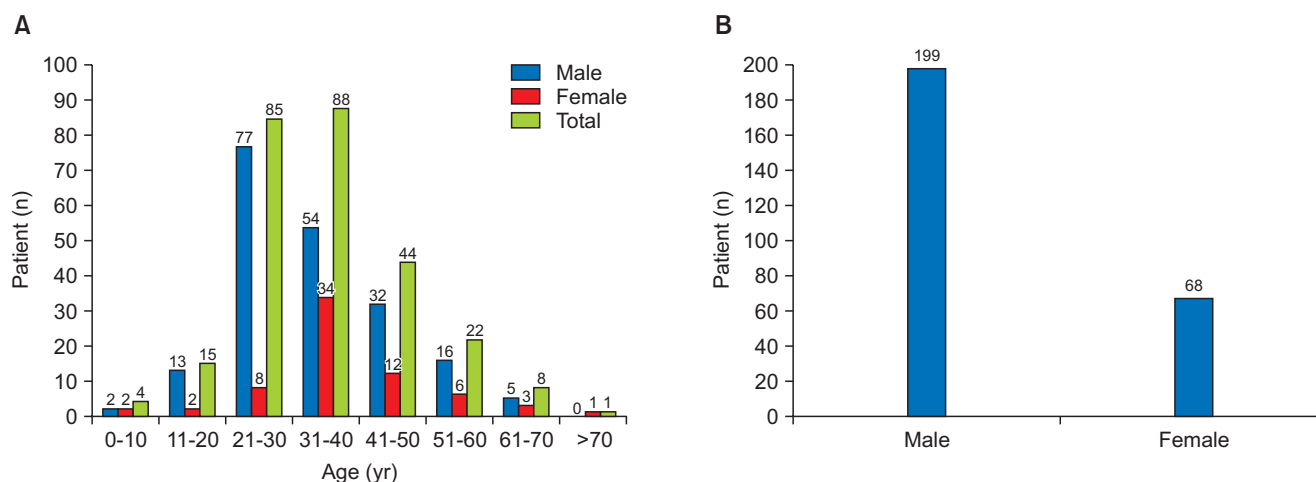


Fig. 1. A. Prevalence of maxillofacial injury. B. Gender distribution.

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg* 2016

Table 1. Prevalence and pattern of maxillofacial injuries

Age (yr)	Number of injuries	Sex distribution		Etiology				Type of fracture/pattern ¹						
		Male	Female	RTA	Fall	Assault	Sports	S02	S02.2	S02.4	S02.6	S02.3	S02.5	SI
0-10	4	2	2	0	4	0	0	0	0	1	1	1	2	0
11-20	15	13	2	7	6	0	2	1	0	4	8	1	4	1
21-30	85	77	8	72	10	3	0	10	9	39	28	9	23	6
31-40	88	54	34	69	10	8	1	3	3	36	28	6	22	6
41-50	44	32	12	29	7	7	1	5	3	17	11	5	12	3
51-60	22	16	6	17	5	0	0	2	2	13	8	1	5	1
61-70	8	5	3	3	5	0	0	0	0	2	3	0	2	1
>70	1	0	1	0	1	0	0	0	0	0	1	0	0	0
Total	267	199	68	197	48	18	4	21	17	112	88	23	70	18
		(74.5)	(25.5)	(73.8)	(18.0)	(6.7)	(1.5)	(7.9)	(6.4)	(41.9)	(33.0)	(8.6)	(26.2)	(6.7)

(RTA: road traffic accidents)

¹Industrial accident; S02: skull and facial bone fracture, S02.2: nasal bone fracture, S02.4: malar bone and maxilla fracture, S02.6: mandible fracture, S02.3: orbital floor fracture, S02.5: tooth fracture, SI: soft tissue injury.

Values are presented as number only or number (%).

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. J Korean Assoc Oral Maxillofac Surg 2016

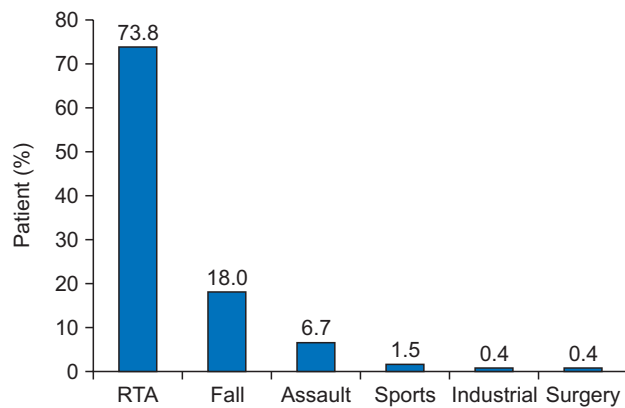


Fig. 2. Etiology of injury. (RTA: road traffic accidents)

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. J Korean Assoc Oral Maxillofac Surg 2016

under the influence of alcohol at the time of injury. Among MTW accidents, 48.6% (87/179) of injuries were on the right side, 31.3% (56/179) were on the left side and 19.6% (35/179) were bilateral. The test of proportion for the side of injury (right vs left) showed that there was a statistically significant difference in the side of injury, indicating that injury on the right side was more common compared to the left side ($P < 0.05$).

2. Site or type of fracture

Analysis shows that 41.9% of fractures (112/267) involved the malar and maxillary bone, 33.0% (88/267) were mandibular fractures, 26.2% (70/267) were tooth (dentoalveolar) fractures, 8.6% (23/267) were orbital floor fractures, 7.9%

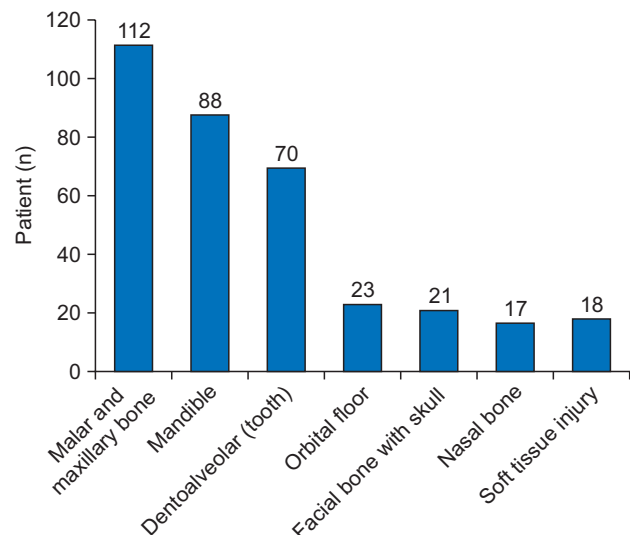


Fig. 3. Site of maxillofacial fracture.

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. J Korean Assoc Oral Maxillofac Surg 2016

(21/267) were facial bone fractures with skull bone fracture, 6.4% (17/267) were nasal bone fracture, and 6.7% (18/267) were soft tissue injuries. (Fig. 3, Table 1)

3. Management

The study found that 31.1% of fractures (83/267) were treated conservatively (65 cases of zygomatic maxillary complex, 14 condylar fractures, and 4 nasal bone fractures), close reduction was performed for 27.7% of fractures (74/267), 34.5% of fractures (92/267) were treated by open reduction,

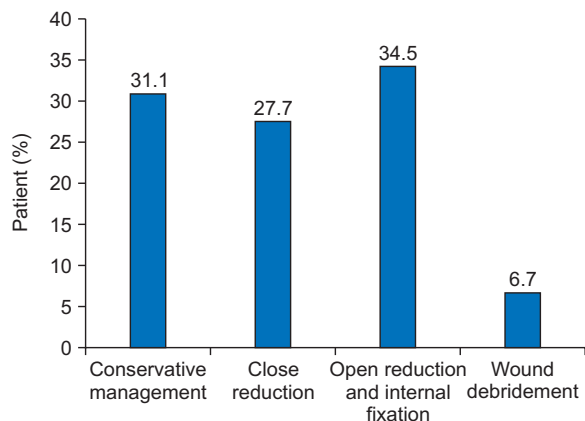


Fig. 4. Management for maxillofacial injuries.

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg* 2016

and internal fixation was performed wherever indicated. Wound debridement was performed for 6.7% of soft tissue injuries (18/267). (Fig. 4, Table 1)

IV. Discussion

The maxillofacial region is the most exposed part of the body and is more vulnerable to trauma. Trauma is one of the major causes of death among people under 40 years of age¹. Major causes for maxillofacial fracture as reported worldwide are interpersonal violence, traffic accidents, falls and sports injuries³. RTA contribute significantly to mortality and morbidity throughout the world and in large numbers in developing countries. Reports reveal that 20% to 60% of all road traffic injuries involve some form of maxillofacial injury, and 62% involve motorcycles⁴. The prevalence of maxillofacial injuries varies from 17% to 69%, and this large difference might be due to various environmental factors, socioeconomic conditions, cultural reasons, and traffic rules. In the present study, RTA accounted for 73.8% of injuries, and MTW were the major (90.9%) cause in injuries that involved skids and falls in collisions with other vehicles, including riders, pillion riders, and pedestrians. This might be due to differences in the proportion of vehicles registered in India and three highly motorized countries (HMC), the USA, China, and Brazil. The car population as a proportion of total motor vehicles is only 13% in India compared to HMCs (56%-80%). On the contrary, the proportion of MTW is much higher (70%) in India compared to HMCs. This high proportion of MTWs has a large effect on traffic and crash patterns. Pedestrians, bicyclists, and MTW riders are very vulnerable

to injury and constitute 60% to 80% of all traffic injuries in India⁵. The number of deaths or injuries caused by MTW is about 15 to 20 times greater than for enclosed vehicles⁶. In our study, the major cause of maxillofacial injury was MTWs (90.9%). Our institution is a referral center, predominantly treating insured employees of low-income groups. Their main mode of transportation is MTW (bike, scooter) and bicycles. Nearly (41.6%) of males injured by MTW were under the influence of alcohol at the time of injury. These injuries usually involved a skid or fall from a vehicle or collision with another vehicle or loss of control due to an unexpected encounter with pedestrians or animals. The higher frequency of maxillofacial injuries among males compared to females is a universal finding of previous studies⁷⁻⁹. In the present study, 74.5% (199/267) were males and 25.5% (68/267) were females, with a male to female ratio of 3:1.

Studies have reported zygomatic fractures as the most common subtype among midfacial fractures in both children and adults^{4,10,11}. The maxilla (22%), orbit (16%), and nasal (16%) bones were the most frequently fractured facial bones¹². In our study, 41.9% of fractures involved the malar bone and the maxillary bone, followed by mandible fractures (33.0%), tooth (dentoalveolar) fractures (26.2%), orbital floor fractures (8.6%), facial bone fracture with skull bone fracture (7.9%), nasal bone fractures (6.4%), and soft tissue injuries (6.7%). In other studies, alveolar ridge fracture occurred more frequently among children than among adolescents¹³. The incidences of facial bone fractures were 39.3% and 51.8% among children aged 6 to 10 years and 11 to 14 years, respectively, and the most commonly involved age group was 11 to 14 years^{13,14}. In other study reports, the incidence of facial fractures in children in India was 5.5%¹⁵, and this could be due to the fact that young children are less often involved in occupational or violence related incidents, which are the typical causes of adult facial fractures¹⁶. Accidental fall is the leading cause of maxillofacial injuries in children, accounting for 43% to 71.42% of injuries^{13,15,17,18}. Among children below the age of 15 with injury due to falling while playing, the injury was mild, causing only soft tissue laceration or dentoalveolar or tooth fracture, rather than being a severe injury. The literature indicates that as the age of patients increases, the patterns of fractures progressively resemble that of adult patients¹⁹. In our study, 2.2% (6/267) of reported injuries were in the 0 to 13 age group, and all were due to accidental fall while playing or fall from a bicycle. Out of 6 patients, there were 2 dentoalveolar (tooth) fractures, 3 mandible fractures, and 1 ZMC fracture. This low prevalence rate might

be because of mild, unnoticed injuries, or subjects may have received treatment in dental clinics outside the study area. In adults, fall was the second most common cause of injury, accounting for 18.0% (48/267) of maxillofacial injury, of which 52.1% (25/48) involved adult males, and 12 were under the influence of alcohol at the time of injury. Assault: Various reports reveal domestic violence as the cause of maxillofacial injuries among women, with a prevalence between 34% and 73%, representing a worldwide problem that crosses cultural, racial and socioeconomic lines²⁰. In our study, 3.0% (8/267) of females and 3.7% (10/267) of males between 20 to 50 years of age had reported an assault injury by known persons. This result was markedly lower compared to previous study results. Likewise, the proportion of sports injuries was much lower in the present study, at 1.5% (4/267), and the male-female ratio was 3:1.

Pattern of injury: The peak incidence (47%) of mid-face fracture was in the age group of 21 to 30 years⁷. The most common fracture was ZMC fracture, ranging from 36% to 62.5%^{4,7}. In our report, 41.9% of fractures (112/267) involved

the malar bone and maxillary bone, 33.0% (88/267) were mandible fractures, 26.2% (70/267) were tooth (dentoalveolar) fractures, 8.6% (23/267) were orbital floor fractures, 7.9% (21/267) were facial bone fracture with skull bone fracture, 6.4% (17/267) were nasal bone fractures, which included 2 cases of isolated nasal bone fracture, and others were associated with Lefort II and III fractures. Dentoalveolar segment fracture accounted for 26.2% of injuries. In the present study, reported skull bone fractures (which were referred to our department but not requiring neurosurgical intervention) included depressed frontal bone fractures of the outer table, temporal bone fractures, and sphenoid bone fractures. In addition, 6.7% (18/267) of soft tissue injuries were treated by wound debridement.

In the present retrospective study, an interesting point to note was that 61.3% of malar and maxillary bone fractures were on the right side of the face. These injuries mainly resulted from skid falls from a MTW. A few patients were asked about the history of their injury, and they reported that they were right handed and had applied the right-hand

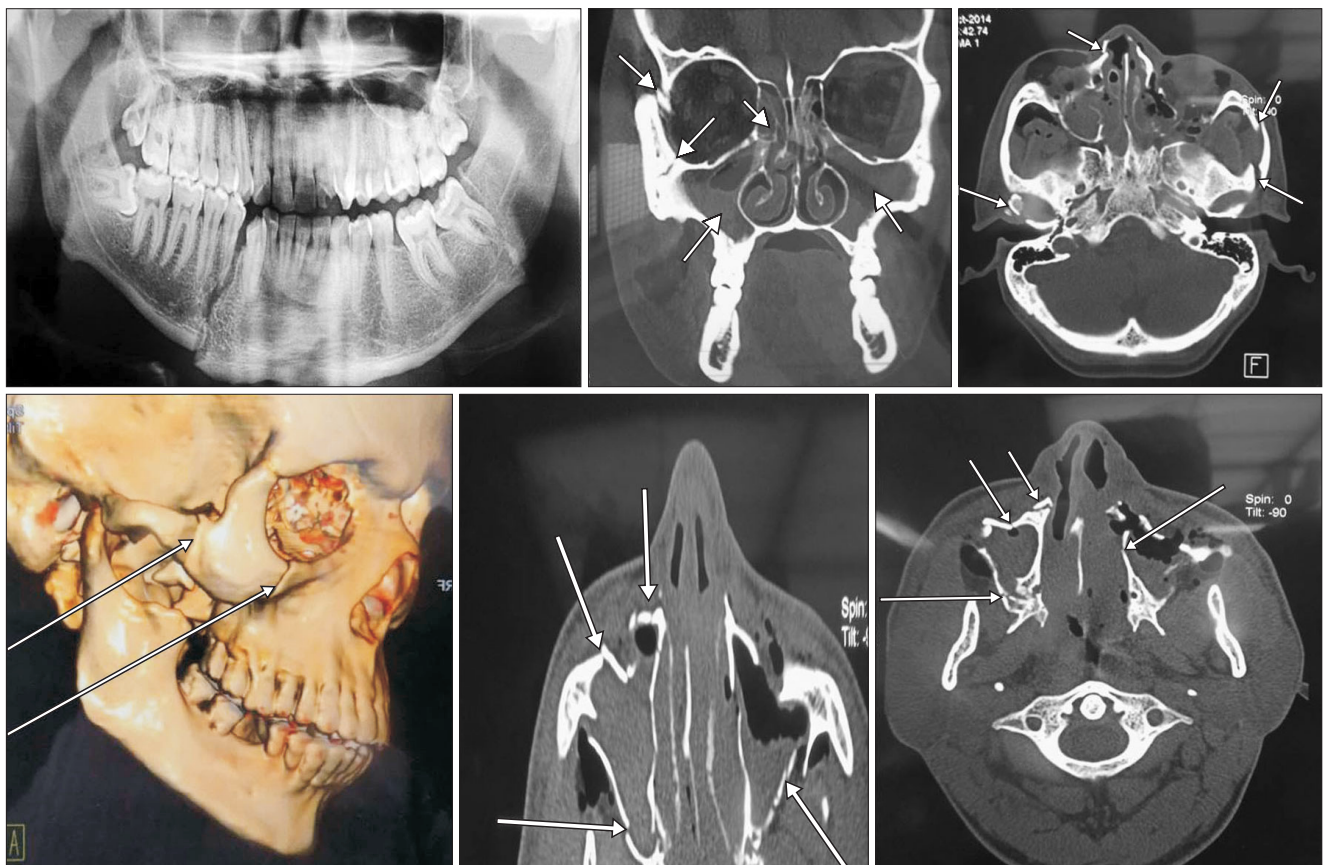


Fig. 5. Patients orthopantomography and computed tomography of maxillofacial injuries (arrows).
 Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. J Korean Assoc Oral Maxillofac Surg 2016

brakes at the time of the accident, indicating that the front wheel possibly caused the skid. In future studies, the type of vehicle (MTW) and the mechanism for the side of injury should be further evaluated. Management of maxillofacial injuries is a real challenge for oral and maxillofacial surgeons, and demands both skill and expertise. Open reduction and internal fixation (ORIF) were the major types of management performed for patients. (Fig. 5) Most ZMC (S02.6) fractures were treated conservatively, when fractures were nondisplaced and without any functional or esthetic or neurological deficits. Dento alveolar fractures, condyle fractures without displacement or dislocation or occlusal derangement were treated by close reduction and indirect fixation by intermaxillary fixation. ZMC fractures and zygomatic arch fractures not involving occlusion were elevated by the Gillies temporal approach if fractures were stable after elevation, and no direct fixation was done. All panfacial fractures, multiple fractures with occlusal derangement, and displaced fractures that were not reduced by close reduction and unstable ZMC fracture after elevation were treated by open reduction and direct fixation by miniplate osteosynthesis. (Fig. 6, 7)

A study conducted by Singh et al.²¹ reported that 3.88% of injured patients were intoxicated with alcohol at the time of their accidents and all were male. Agnihotri et al.²² reported that the rate of RTA was increased on weekends due to an increase in the number of drivers who were under the influence of alcohol. In our study, 41.6% (111/267) of males were under the influence of alcohol at the time of injury. When approaching a cross road, in order to turn to the right hand side, the driver needs to change gear, brake, indicate, scan for on-coming traffic, make a decision on when it is safe to turn, and steer and turn the vehicle in a coordinated sequence. Alcohol could affect psychomotor skills, ability to maintain balance and coordinate physical activities. Prabhu et al.²³ reported that even as alcohol consumption is decreasing in some developed countries, it is on the rise in developing nations, particularly among those aged 21 to 35 years. This illustrates the urgent need for the implementation of measures to prevent RTA.

The monthly incidence of maxillofacial fractures was fairly constant along with seasonal variations, as reported in several previous studies^{14,24,25}. In India, August to November is the rainy season, and there is an increased incidence of acciden-

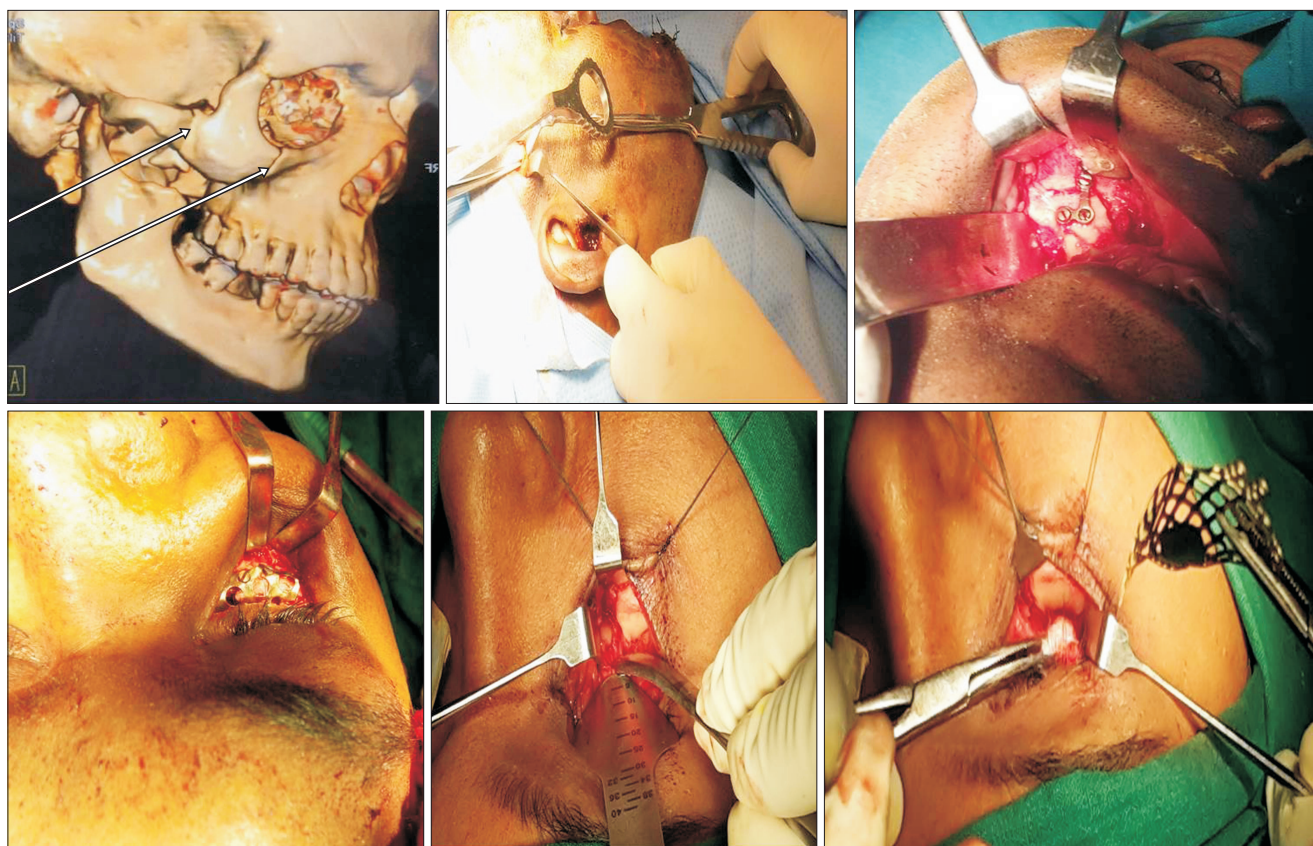


Fig. 6. Management of zygomatic complex fracture and orbital floor fracture.

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg* 2016

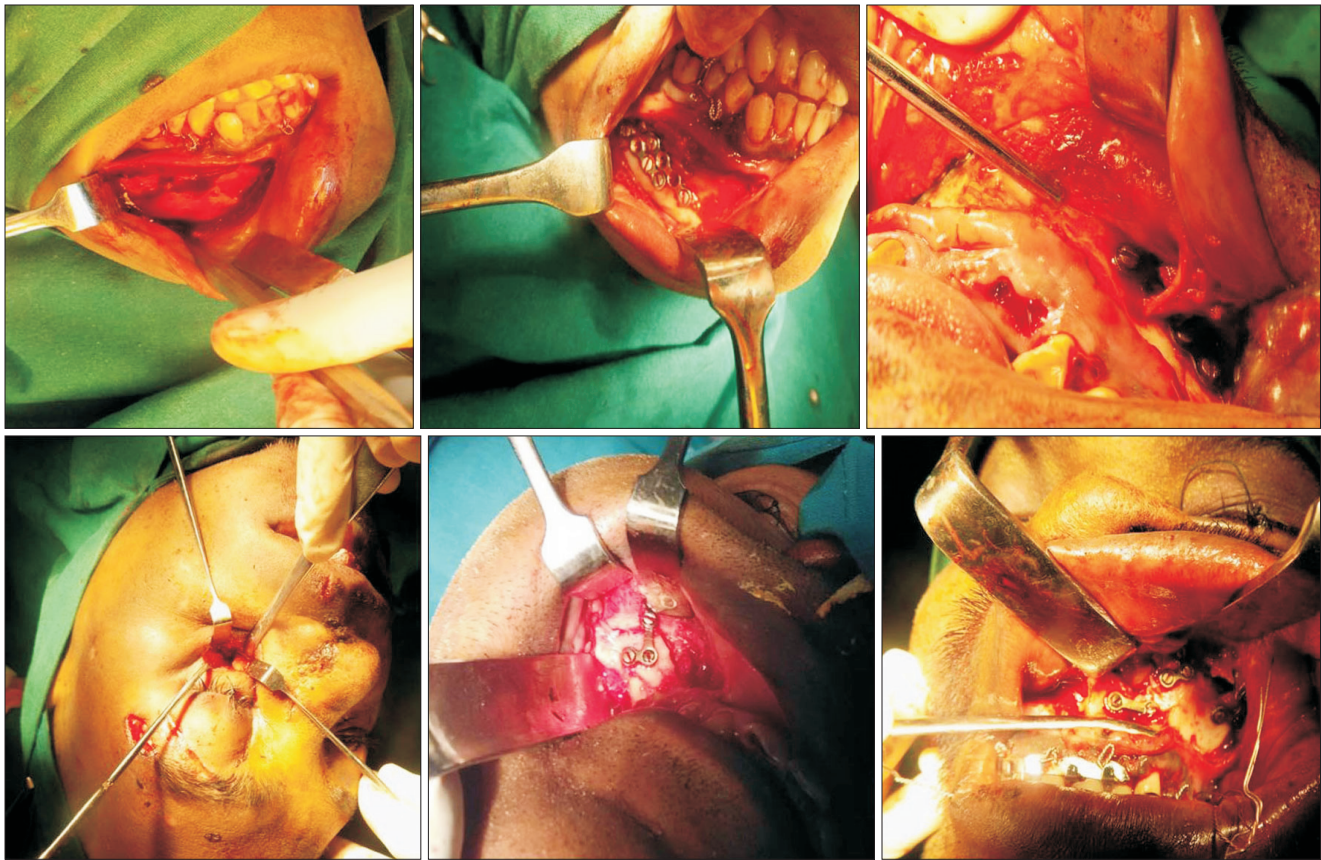


Fig. 7. Open reduction and internal fixation done when indicated.

Mohanavalli Singaram et al: Prevalence, pattern, etiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg* 2016

tal falls and RTA. In the present study, the highest number of cases was reported during these months.

V. Conclusion

Our reports revealed that the main cause of maxillofacial injury was RTA, and males aged 20 to 40 years more often sustained maxillofacial injury. Fractures of the malar bone and maxilla were the major prevalent fractures in the maxillofacial region, MTW were the major cause of injury, and the influence of alcohol was also one of the important factors responsible for injuries. Although the majority of malar and maxillary fractures were treated conservatively, ORIF was performed wherever indicated.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

ORCID

Mohanavalli Singaram, <http://orcid.org/0000-0003-2905-2966>
Sree Vijayabala G, <http://orcid.org/0000-0001-9582-2186>

References

1. Gassner R, Tuli T, Hächl O, Rudisch A, Ulmer H. Cranio-maxillofacial trauma: a 10 year review of 9,543 cases with 21,067 injuries. *J Craniomaxillofac Surg* 2003;31:51-61.
2. Akama MK, Chindia ML, Macigo FG, Guthua SW. Pattern of maxillofacial and associated injuries in road traffic accidents. *East Afr Med J* 2007;84:287-95.
3. Qudah MA, Bataineh AB. A retrospective study of selected oral and maxillofacial fractures in a group of Jordanian children. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002;94:310-4.
4. Subhashraj K, Nandakumar N, Ravindran C. Review of maxillofacial injuries in Chennai, India: a study of 2748 cases. *Br J Oral Maxillofac Surg* 2007;45:637-9.
5. Mohan D. The road ahead: traffic injuries and fatalities in India. New Delhi: Transportation Research and Injury Prevention Programme, Indian Institute of Technology Delhi; 2004:1-30.
6. Jagnoor J. Road traffic injury prevention: a public health challenge. *Indian J Community Med* 2006;31:129-31.
7. Septa D, Newaskar VP, Agrawal D, Tibra S. Etiology, incidence and patterns of mid-face fractures and associated ocular injuries. *J*

- Maxillofac Oral Surg 2014;13:115-9.
8. Subhashraj K, Ramkumar S, Ravindran C. Pattern of mandibular fractures in Chennai, India. *Br J Oral Maxillofac Surg* 2008;46:126-7.
 9. Bataineh AB. Etiology and incidence of maxillofacial fractures in the north of Jordan. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;86:31-5.
 10. Ferreira P, Marques M, Pinho C, Rodrigues J, Reis J, Amarante J. Midfacial fractures in children and adolescents: a review of 492 cases. *Br J Oral Maxillofac Surg* 2004;42:501-5.
 11. Imahara SD, Hopper RA, Wang J, Rivara FP, Klein MB. Patterns and outcomes of pediatric facial fractures in the United States: a survey of the national trauma data bank. *J Am Coll Surg* 2008;207:710-6.
 12. Gopalakrishna G, Peek-Asa C, Kraus JF. Epidemiologic features of facial injuries among motorcyclists. *Ann Emerg Med* 1998;32:425-30.
 13. Kambalimath HV, Agarwal SM, Kambalimath DH, Singh M, Jain N, Michael P. Maxillofacial injuries in children: a 10 year retrospective study. *J Maxillofac Oral Surg* 2013;12:140-4.
 14. Joshi SR, Saluja H, Pendyala GS, Chaudhari S, Mahindra U, Kini Y. Pattern and prevalence of maxillofacial fractures in rural children of central maharashtra, India. A retrospective study. *J Maxillofac Oral Surg* 2013;12:307-11.
 15. Kumaraswamy SV, Madan N, Keerthi R, Singh DS. Pediatric injuries in maxillofacial trauma: a 5 year study. *J Maxillofac Oral Surg* 2009;8:150-3.
 16. Eggenesperger Wymann NM, Hölzle A, Zachariou Z, Iizuka T. Pediatric craniofacial trauma. *J Oral Maxillofac Surg* 2008;66:58-64.
 17. Gassner R, Tuli T, Hächl O, Moreira R, Ulmer H. Craniomaxillofacial trauma in children: a review of 3,385 cases with 6,060 injuries in 10 years. *J Oral Maxillofac Surg* 2004;62:399-407.
 18. Karim T, Khan AH, Ahmed SS. Trauma of facial skeleton in children: an indian perspective. *Indian J Surg* 2010;72:232-5.
 19. Thorén H, Iizuka T, Hallikainen D, Lindqvist C. Different patterns of mandibular fractures in children. An analysis of 220 fractures in 157 patients. *J Craniomaxillofac Surg* 1992;20:292-6.
 20. Arosarena OA, Fritsch TA, Hsueh Y, Aynehchi B, Haug R. Maxillofacial injuries and violence against women. *Arch Facial Plast Surg* 2009;11:48-52.
 21. Singh R, Singh HK, Gupta SC, Kumar Y. Pattern, severity and circumstances of injuries sustained in road traffic accidents: a tertiary care hospital-based study. *Indian J Community Med* 2014;39:30-4.
 22. Agnihotri A, Galfat D, Agnihotri D. Incidence and pattern of maxillofacial trauma due to road traffic accidents: a prospective study. *J Maxillofac Oral Surg* 2014;13:184-8.
 23. Prabhu P, Srinivas R, Vishwanathan K, Raavi A. Factors influencing alcohol and tobacco addiction among patients attending a de-addiction Centre, South India. *J Int Soc Prev Community Dent* 2014;4:103-7.
 24. Haug RH, Foss J. Maxillofacial injuries in the pediatric patient. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;90:126-34.
 25. Tanaka N, Uchide N, Suzuki K, Tashiro T, Tomitsuka K, Kimijima Y, et al. Maxillofacial fractures in children. *J Craniomaxillofac Surg* 1993;21:289-93.