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Systematic Review of Pattern of Maxillofacial Trauma in Indian Scenario.

Kalyani Bhate¹, Kapil Kshirsagar², Deepak Kulkarni³, and Sushmita Mitra⁴.

¹Professor *Department of Oral and Maxillofacial Surgery, Dr.D.Y. Patil Vidyapeeth's Dr.D.Y Patil Dental College and Hospital, Pimpri, Pune 411018, India

²Reader, Department of Oral and Maxillofacial Surgery, D.Y. Patil Dental School, Charoli BK, Via Lohegaon, Pune 412105, India

³Professor and Head, Department of Oral and Maxillofacial Surgery, Dr.D.Y. Patil Vidyapeeth's Dr.D.Y Patil Dental College and Hospital, Pimpri, Pune 411018, India

⁴Lecturer, Department of Oral and Maxillofacial Surgery, Dr.D.Y. Patil Vidyapeeth's Dr.D.Y Patil Dental College and Hospital, Pimpri, Pune 411018, India

ABSTRACT

Maxillofacial trauma has experienced an increase in number in the last decade. Though a number of studies have been done on pattern, incidence and cause of maxillofacial trauma in various local populations in India, no systematic review of the pattern and cause of maxillofacial trauma in India has been done. Hence, the purpose of this systematic review is to present the epidemiologic data on pattern of maxillofacial trauma in India. Electronic searching of Pubmed, ScienceDirect and institute library databases to identify studies reporting the epidemiology of injuries in maxillofacial trauma in India. A total of 23 studies were eligible for inclusion in this review. The most common anatomic part involved was found to be mandible, the most common age group involved was 21-30 years while males were more commonly involved than females. The main cause of maxillofacial trauma all over India was found to be road traffic accidents. The findings from studies all over India show that road traffic accidents (RTAs) cause most of the maxillofacial injuries, mandible being the more commonly involved bone. The accidents involve young males in productive age group causing concerns as in time, money and aesthetics.

Keywords: maxillofacial trauma; RTAs; systematic review; India

**Corresponding author*

INTRODUCTION

The face often constitutes the first point of contact in various human interactions and is frequently the likely target for blows in assault cases as well as accidents. Maxillofacial trauma is thus a common presentation in Casualty department of hospitals either as an isolated injury or as a part of multiple injuries to the head, neck, chest, and abdomen. These injuries may cause serious functional, psychological, physical, and cosmetic disabilities [1].

About 1.25 million people die each year as a result of RTAs. Road traffic injuries are the most common reason of death among young people. Without action, road traffic crashes are predicted to rise to become the 7th leading cause of death by 2030 [2].

Facial fractures constitute a significant percent of trauma patients. Being the most exposed part of the body, the face is particularly prone to trauma. The anatomic location and pattern of such fractures are determined by the mechanism of injury and direction of impact. In addition to being anatomically complex, its exposure to the external environment is more in comparison with the rest of the body; such injuries therefore require detailed evaluation and treatment [3]. Trauma to the facial region causes injuries to skeletal components, dentition as well as soft tissues causing loss of aesthetics and function. The incidence and pattern of maxillofacial fractures vary from country to country depending upon the prevailing geographical, social, cultural and environmental factors [4]. These injuries are often associated with severe morbidity due to their close proximity to vital organs such as brain and cervical vertebrae causing loss of function and even death [5]. The numbers of maxillofacial injuries in India are rising. There are various reports on the incidence of maxillofacial fractures in different countries. There appears a different cause of maxillofacial injuries in developed as against developing countries [6]. A number of studies have been published till date to state the pattern, analyse the causes and find gender and age predilection. The increase in number of maxillofacial injuries seems to be directly proportionate to the increase in number of vehicles on Indian roads. Road traffic accidents have assumed a major role in health status of young Indians. Here, we analysed systematically the cause and pattern of maxillofacial injuries in India based on articles published on the same subject.

MATERIALS AND METHOD

The aim of this study was to evaluate the cause and pattern of maxillofacial injuries in India.

Selection Criteria

Reports from observational studies published in peer-reviewed literature were selected. The inclusion criteria was-

1. Studies about maxillofacial trauma
2. Studies in Indian scenario
3. Studies about adult population
4. Studies that give information of main cause of trauma, main bone involved, age and sex predilection.

While exclusion criteria was-

1. Studies about injuries other than maxillofacial trauma
2. Studies about places abroad India
3. Studies about paediatric population
4. Studies that give inadequate information as to main cause of trauma, main bone involved, age and sex predilection.

Search Strategy

A comprehensive search of the literature was undertaken.

This included electronic searching of the Pubmed, ScienceDirect and institution library.

In addition, the bibliographies of included studies and review articles were hand-searched to identify potentially eligible studies not captured by the electronic searches. Keywords used in the electronic searches were maxillofacial trauma, India, epidemiology, road traffic accidents, facial trauma, incidence and pattern.

Study Selection

All the citations from the electronic searches were combined in an electronic spread sheet. Duplicate records were discarded before titles and abstracts were screened to identify and remove citations that were irrelevant or obviously did not meet the selection criteria. Full-text versions of all the remaining, potentially eligible studies were retrieved, and three independent reviewers (K.B., K.K. and S.M.) evaluated the articles for compliance with the selection criteria. Any disagreement was resolved by mutual consensus in consultation with a third independent reviewer (D.K).

Data Extraction

Data from included studies were extracted and tabulated in an electronic spread sheet. The data of interest were as follows: (1) general study descriptors (e.g. authors, year of publication, and study design), (2) description of the study population (e.g. location, sex distribution and age), and (3) main epidemiologic findings (e.g. injury and exposure data, distribution of injuries by anatomic location, and type of injury, and causative factors for injury).

This review adhered to guidelines in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) Statement. (Figure 1)

RESULTS

23 studies which fit the inclusion criteria were selected. There were 11 studies from North India, 5 from South India, 2 from East India, 3 from West India and 2 from Central India. 18 studies found mandible to be the main bone involved in trauma, the involved age group was the found to be 21-30 years in majority of the studies. Males were uniformly more commonly affected than females. RTAs were main cause for maxillofacial trauma than assault, falls or other causes.

Table 1. Provides a descriptive summary of the characteristics of the included studies.

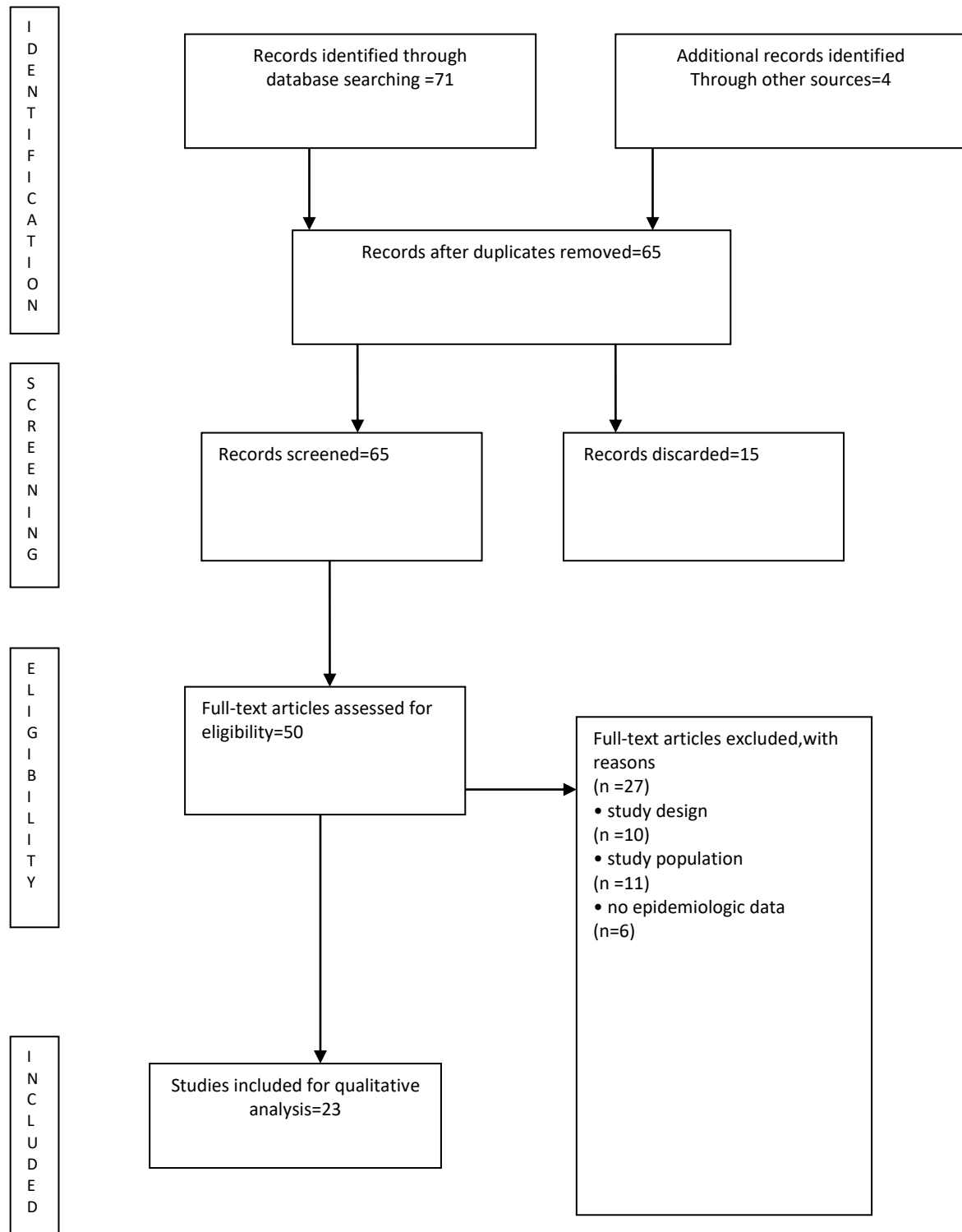
	Author names	Place	Total sample size	Bone involved	Age in years	Main causative factor	Gender
1	Parveen Lone ²³	Jammu	787	Mandible 44.34 %	21-30 (76.49%)	RTA 73.95%	Male 76%
2	Rishi Bali ⁹	Yamunanagar	740	Mandible 70.2%	21-30 (38.3%)	RTA 71.89%	Male 81.08%
3	Ashok K Gupta ²¹	Punjab	189	Zygoma 57.4%	21-30 (34.9%)	RTA 79.9%	Male 72.5%
4	Pranav Kapoor ¹	East Delhi	1000	Mandible 63.0%	21-30 (60.0%)	Interpersonal assault 54%	Male 85.0%
5	Subodh S. Natu ¹³	Lucknow	66	Mandible 100%	21-30 (28.8%)	RTA 68.2%	Male 81%
6	Ruchi Pathak ⁴	New Delhi	542	Mandibular 77.3%	31-40 (36.3%)	RTA 56.8%	Male 78.9%
7	Prasad B Rajendra ¹⁴	Mangalore	100	Zygoma 48%	21-40 (79%)	RTA 54%	Male 80%
8	Sukhminder Jit Singh Bajwa ¹⁹	Patiala, Punjab	129	Maxilla and nasal bones 51.9%	15-40 (62.8%)	RTA 90%	Male 83.72%
9	Rajasekhar Gali ⁵	Nellore, Andhra Pradesh	638	Mandible 41.4%	18-40 (53.9%)	RTA 71.9%	Male 79.4%
10	Kiran Gadre ⁸	Pune	6,872	Mandible 51.63%	21-30	RTA	Male

					35.2%	86.4%	
11	Kolli Yada Giri ²⁵	Rohilkhand region, Uttar Pradesh	144	Parasymphysis 32.63%	21-30 (35.4%)	RTA 79.2%	Male 84.7%
12	Rajay A. D. Kamath ³	Davangere, Karnataka	111	Mandible 74.77%	21-30 (41.8%)	RTA 74.7%	Male 74.7%
13	Dhananjay Barde ²²	Nagpur, Maharashtra	1842	Mandible 25%	21-30 (37.5%)	RTA 68%	Male 79.1%
14	Indu Bhusan Kar ²⁷	Cuttack, Odisha	539	Mandible 100%	21-30 (37.4%)	RTA 80.31%	Male 87.87%
15	Sandeep Pandey ²⁸	New Delhi	1,108	Mid-face fractures 81%	21-30 (39.98 %)	RTA 49.01 %	Male 89.62 %
16	Vibha Singh ²⁹	Lucknow	1,038	Mandible 47.87%	21-30 (37.66%)	RTA 97.10%	Males 89.1%
17	Chandra Shekar BR ³⁰	Mysore	546	Mandible 60.4%	11-40 years (78.3%)	RTA 61.3%	Male 83%
18	Yadavalli Guruprasad ³¹	Bangalore	689	Mandible 50.3%	21-30 (42.5%)	RTA 74.3%	Male 75.9%
19	Dilip Septa ³²	Indore	200	zygomatic complex fractures 62.5 %	21-30 (47%)	RTA 64 %	Male 76%
20	G Mittal ³³	Garhwal Region	121	Mandible 100%	21-30 (43.8%)	RTA 37.1%	Female 60.3%
21	Sawhney CP ³⁴	Chandigarh	262	Mandible 100%	16-45 (75%)	RTA 100%	Similar in both
22	Bither S ³⁵	Loni	324	Mandible 100%	21-30 (19.1%)	RTA 42.9%	Male 80.9%
23	Rajput D ³⁶	Aligarh	1202	Mandible 64.6%	21-30 (32.36%)	RTA 56.73%	Male 88%

Table 2. The Haddon matrix applied to a road traffic crash Factors

Phases	Human	Vehicle	Environment	
			Physical	Social
Pre -event	Attitudes Knowledge Use of alcohol Driver experience	Vehicle condition Speed	Roadway design Traffic calming Pedestrian facilities	Traffic laws Cultural norms
Event	Use of seat belts Wearing fastened helmet	Seat belts Helmets	Shoulders, medians Guardrails	Helmet and seat belt laws
Post- event	First aid Medical treatment	Fire risk	Availability of trauma equipment care in hospitals Traffic congestion	Standards of trauma care

Figure 1 - PRISMA flow diagram depicting the study selection process



DISCUSSION

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The studies included covered considerable cities in India. The consensus was that RTAs caused maxillofacial trauma more than any other cause. The reason for this is multifactorial. Bad road conditions, poor

road lighting along with lack of adequate public transport systems all contribute to increased trauma. A primary reason for the increase in fatalities and injuries from traffic crashes in developing countries is simply the rising number of motor vehicles. Economic growth is associated with increased mobility and demand for personal transportation services [7]. In developing countries various reasons contribute to increased road traffic accidents. These include need to travel for employment, lack of traffic police manpower to implement existing laws, sudden urbanization as well as availability of easy loans for middle and low socio-economic population and lack of awareness of use of helmets [8]. Additionally, ever increasing volume of traffic as a result of rapid economic expansion, urbanization, active night life in metros, may also be contributory factors [9].

The primary cause of maxillofacial fractures throughout the world is road traffic accidents and assaults [10]. Telfer MR et al (1991) conducted a study in United Kingdom, and reported that total number of patients with facial bone fractures had risen from 79 per annum in 1977 to 94 per annum in 1987, an increase of 20% which was statistically highly significant [11].

The mandible was commonly involved bone in maxillofacial trauma in 19 out of 23 studies. The prominent position on face is primary reason for its involvement. Here, again, use of helmet with mandibular component and which is properly secured can help save the mandible from injury [12]. The instances of facial fractures between helmeted and non-helmeted individuals were 14 % and 53 % respectively [13].

Mandible is the only mobile bone of facial skeleton, and there has been significant increase in the number of cases in recent years. Though a very strong bone, mandible has several areas of weaknesses [1]. Mandible fractures if not identified or inappropriately treated may lead to severe consequences both cosmetic and functional [14]. Ashok K Gupta, from Punjab, Prasad B Rajendra from Manglore, Dilip Septa, from Indore found zygoma to be main bone involved in maxillofacial region, while, Sukhminder Jit Singh Bajwa, from Patiala, Punjab, found maxilla and nasal bones to be main bones involved in maxillofacial trauma. Sandeep Pandey, New Delhi, mentions mid-face fractures as main area involved.

It was common consensus of all the selected studies that young (21-30 years age group) males were more involved in maxillofacial trauma. Study by Ruchi Pathak from New Delhi , mentions 31-40 years age group to be more involved in maxillofacial trauma, Sukhminder Jit Singh Bajwa from Patiala states 15-40 years as commonly involved age group. Rajasekhar Gali from Nellore and Sawhney CP from Chandigarh, mention a wider age group, i.e, 18-40 and 16-45 years, respectively. This age predilection can be due to the freedom males enjoy in our society to move freely and more use of two wheelers by them [15]. This can also be explained by the fact that males of this age group are more mobile, go out for work and take more risks [16]. In the Indian society, mostly males bear the burden of earning and hence are more prone to accidents due to increased outdoor activity. The crash rate of a two- wheeler is four times and the likelihood of being injured in a road traffic accident is 10-20 times higher compared to four-wheelers [12].

Younger motorcyclists believe that risky riding is a way to have fun and to gain the attention and acclamation of their friends [17]. The other causes of increased incidence of accidents in younger age group may be their risk taking behaviour along with lack of knowledge or mostly, violation of traffic rules [18]. Another epidemic in younger drivers is use of mobile phones while driving. There are many types of distractions that can lead to impaired driving, but recently there has been a marked increase around the world in the use of mobile phones by drivers that is becoming a growing concern for road safety. The distraction caused by mobile phones can impair driving performance. Drivers using mobile phones may have: slower reaction times (notably braking reaction time, but also reaction to traffic signals), impaired ability to keep in the correct lane, and shorter following distances [17].

William Haddon, Jr was the first to do road safety research when he combined the host-agent-environment triad with the concepts of primary, secondary and tertiary prevention to create the Haddon Matrix (Table 2). This matrix provides a framework for understanding the cause of injuries and identifies potential interventions at each step in the injury process [8]. The developed countries have made use of this matrix to reduce RTAs, but various factors like constrains on resources, lack of awareness and even social barriers seem to increase difficulties in implementing this method.

India accounts for more than 200,000 deaths because of road accidents, according to the Global Road Safety Report, 2015 released by the World Health Organisation (WHO). The report states that the Indian road safety laws do not meet the best practice requirements for four out of five risk factors: enforcing speed limits, prevention of drunk driving, and safety of children and use of helmets. Even for seat-belts, where the Motor Vehicles Act, 1988, is in consonance with the WHO standards, the enforcement is poor and India has a low score of four out ten. With respect to vehicle safety, India meets only two out of the seven vehicle safety standards. A big gap still separates high-income countries from low and middle-income ones where 90% of road traffic deaths occur in spite of having just 54% of the world's vehicles.

Human factor also contributes to increasing number of road accidents in India. Most drivers continue to be acting like maniacs in a great hurry and error in judgment often leads to a lot of accidents. Reckless driving, over speeding, not following traffic rules, and drunken driving are main reasons for road accidents [13]. The unhelmeted motorcyclists are more likely to suffer fatal head trauma and other maxillofacial injuries than helmeted riders when involved in a road traffic accident [16].

One "Disability-Adjusted Life Year (DALY)" can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population is the burden of disease on the population. Lower middle income group countries like India, Pakistan and Bangladesh are accumulating 55 percent of injury costs. These countries have a loss of DALY almost one third injury mortalities (31%). These also have loss the highest proportions of DALYs due to injuries (29%) and 27 percent of the proportions of economic value of DALYs. High income countries have reported for 16 percent injury deaths [19]. Road traffic injuries not only affect the individuals and families by means of personal and economic losses but also have an effect on country's economy and health system facilities. Severe and fatal injuries require the best medical team support including trauma care facilities in effort to save lives. Injury as a whole consumes a significant amount of resources of a country. In lower middle income countries, like India injury treatments consume a very high proportion of personal resources mainly due to out-of pocket payment and also affects societal resources [19]. It is estimated that every year RTAs costs billions of rupees globally and nationally. An RTA injury puts significant strain on health care budgets [13].

According to a study carried out by Hans-Joerg Oestern, Bhavuk Garg and Prakash Kotwal comparing trauma care in Germany and India, the prehospital care and in-hospital care in India is in infancy stage and mostly unorganised [20]. According to them, besides improving vehicle safety and stricter laws, the institution of a trauma registry to understand trends and assess the impact of interventions and trauma network with different hospital levels will lead to improvement of patient care and lower morbidity [6]. Equally important is the availability of back-up services like intensive care unit (ICU) and trauma team so that the necessary interventions are carried out at the earliest [21].

Only a few injuries are as challenging as those in the maxillofacial region. Oral and maxillofacial surgeons who undertake treatment of facial injuries have a dual responsibility: repair of the aesthetic defect (restoration of the pre-injury appearance) and restoration of function. A third goal is to reduce the period of disability. Therefore, the complete assessment and diagnosis, during the primary survey, of these injuries is mandatory [22]. Facial fractures can have long-term residual effects both functionally and aesthetically, irrespective of nature and accuracy of treatment. It has also been seen that techniques for the treatment of facial fractures have evolved over the years to reduce if not preclude associated morbidity [23].

CONCLUSION

The main causative factor in all selected studies in India is RTAs. Young Indian males in their productive years seem to suffer maxillofacial injuries, specially involving mandible. This causes functional and aesthetic disabilities to varying extent.

The use of helmets is not clarified in most of the studies. This needs to be addressed to derive conclusions for increased number of RTAs in recent years.

Better road conditions, improved road lighting, stricter laws for use of helmets as well as increase in awareness of use of helmets may help reduce the road traffic accidents and subsequently maxillofacial trauma in India.

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