

# Pattern and Prevalence of Maxillofacial Fractures in Rural Children of Central Maharashtra, India. A Retrospective Study

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**Abstract** The aim of this study was to review the pattern and prevalence of maxillofacial fractures occurring in rural children, at Rural Dental College and Hospital, Loni, Central Maharashtra, India. A retrospective analysis of patient records and radiographs was conducted during the 5 year period between January 2005 and December 2010. Data were identified and analysed based on age group, gender and anatomic site. During the 5 year period, 156 patients with 163 maxillofacial fractures were reviewed, males formed 70 % and females formed 30 % of studied population with the peak incidence rate occurring in 10–12-year old age group. The most common fracture site in maxilla was dentoalveolar component (70 %) and in mandible common fracture site was condyle (40.9 %). Of the fractures, 43 % were from accidental fall, 24.3 % from assaults, 16 % from road traffic accidents, 13.5 % from sporting injuries and 3.2 % from other causes such as animal injuries. Our results exhibit that accidental falls were the leading cause of maxillofacial fractures, and males were three times more affected than females. There

is variation of incidence and pattern of maxillofacial injuries from region to region.

**Keywords** Dentoalveolar trauma · Children · Etiology

## Introduction

Data on the etiology and incidence of dentoalveolar and maxillofacial trauma is essential to reflect the effectiveness of preventive measures, such as the introduction of seat belt legislation [1, 2]. The etiology of maxillofacial fractures differs from one country to another because of social, cultural and environmental factors [3–6]. The greatest incidence of trauma to the primary dentition occurs at 2–3 years of age, when motor coordination is developing. The most common injuries to permanent teeth occur secondary to falls, followed by traffic accidents, violence, and sports. The reported incidence of primary tooth avulsion ranges from 7 to 13 % and in permanent dentition the tooth avulsion ranges from 1 to 16 % [7]. All sporting activities have an associated risk of orofacial injuries due to falls, collisions, and contact with hard surfaces [2, 8]. Children are also frequently susceptible to maxillofacial trauma because of their greater craniofacial mass to body ratio [9]; example, in Europe, the rate of facial fractures in children ranged from 10 % in Sweden [4] to 30 % in United Kingdom [5]. The rate was 14 % in United States [12] and 15 % in Libya [10]. Several studies [11–14] confirmed that falls continued to be the leading cause of facial injuries among children.

Of facial fractures in children, mandibular fractures were most common, with the condylar region being most frequently affected site [11, 13, 15, 16]. Most studies have shown that males were most frequently affected than females, with ratio of 2:1–6:1 [11, 15, 17].

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According to the Census 2011, in India, out of the total population of 1,210 million, about 396 million live in urban areas and 814 million in rural areas. Maharashtra has the largest share of rural population of the country (49.6 %) and is located in central part of India. In Maharashtra, out of a population of 11,23,72,972 there are 52.1 % males and 47.9 % females. The percentage of rural population between the age group of 1–15 years comprises of 54.1 % males and 45.9 % females [18].

The Departments of Pediatric Dentistry and Oral & Maxillofacial Surgery, Pravara Rural Dental College, Loni, Maharashtra provides coverage for dental, dento alveolar and maxillofacial injuries in rural children. Few reports can be found on the incidence and etiology of dento alveolar and maxillofacial fractures in children in Asian countries. The purpose of this retrospective analysis was to determine the incidence of dentoalveolar and maxillofacial fractures among children; to determine the age group in which the injury occurred most often; and to examine the etiology, in rural children, over a 5-year period from January 2005 to December 2010.

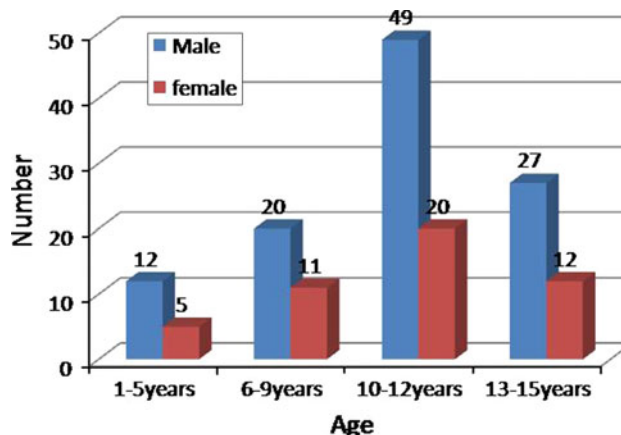
**Materials and Methods**

A retrospective analysis of 156 pediatric patients with oral and maxillofacial fractures reporting to Department of Pediatric Dentistry and Oral Surgery, Rural Dental College and Hospital, Loni, Maharashtra—a tertiary institution, over a period of 5 years from 2005 to 2010 was performed. The rural dental college and hospital being a tertiary centre, receives patients from entire region. Patient information was collected on basis of well documented in-patient and out-patient records and radiographs. The data concerning age, gender, etiology and anatomic location were collected. All patients, whether admitted to the hospital or treated as outpatients in pediatric dentistry and oral surgery clinics, were included in this study. Patients with extensive head injuries, frontal sinus fractures, with infections and other pathologies like cysts were excluded from the study.

The fractures were classified according to the maxillary–midface system of Le Fort [19] and the mandibular zygomatic complex system of Killey [20]. If more than one facial bone fracture occurred in a single patient, it was classified as a combination fracture.

**Statistical Analysis**

Statistical analysis software SYSTAT for Windows version 12 was used to calculate or determine the absolute and relative frequencies of qualitative variables, proportion/percentage.



**Fig. 1** Age and gender distribution of children with maxillofacial fractures

**Table 1** Gender distribution of maxillofacial fracture

Gender	No. of cases (%)
Male	108 (70)
Female	48 (30)
Total	156 (100)

**Results**

**Age and Gender Distribution**

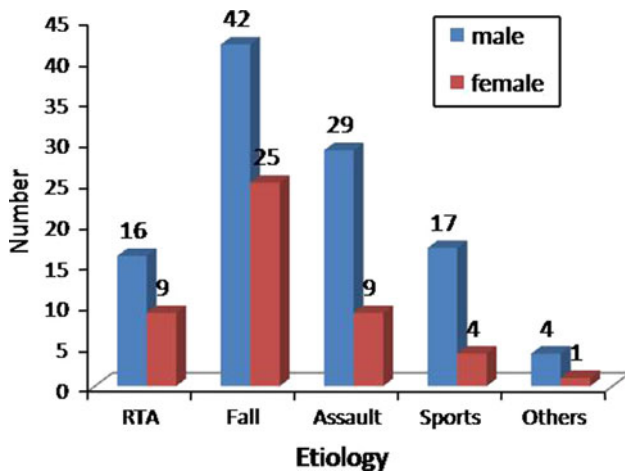
During a 5-year period, 156 patients reported with 163 different types of maxillofacial fractures. Patients’ age at the time of injury ranged from 1 to 15 years, with a mean age of 11.2 years. Most of the cases (108, 69.23 %) were between the ages of 10 and 15 years, with a peak incidence at 10–12 years of age accounting for 69 cases of the sample (44.23 %). Only 19.8 % (31 patients) were aged between 6 and 9 years, and 10.9 % (17 patients) were aged <5 years. Most of the patients were males (108, 70 %), with male to female ratio of ~3:1 (Fig. 1; Table 1).

**Etiology**

The most common cause of maxillofacial fracture was accidental fall (67, 43 %), followed by injury associated with assault (38, 24.3 %), road traffic accident (25, 16 %), and sporting injury (21, 13.5 %). The causes of injury distributed by gender showed that fractures from falls and assaults were significantly more in males (Fig. 2; Table 2).

**Site of Fracture**

There were 98 (60.1 %) mandibular, 52 (31.9 %) maxillary, 7 (4.3 %) zygomatic and 6 (3.6 %) nasal injuries.



**Fig. 2** Causes and gender distribution

**Table 2** Analysis of etiologic factors of maxillofacial fractures

Cause	No. of cases (%)
Fall	67 (43)
Assault/violence	38 (24.3)
Road traffic accident	25 (16)
Sports	21 (13.5)
Others	5 (3.2)
Total	156 (100)

Regarding the distribution of mandibular fractures, most fractures occur in the condyle (40.9 %), 24 % in the parasymphysis, 14 % in the body and 10 % dentoalveolar. The ramus (4.08 %) and coronoid process (1 %) showed lower occurrence rate. The distribution of maxillary fractures was 71 % (37/52) dentoalveolar, 17.3 % (9/52) Le Fort I, and 9.6 % (05/52) were Le Fort II (Table 3).

**Month Wise Distribution**

The monthly incidence of maxillofacial fractures was fairly constant. The largest number was in August (35, 22.4 %) and least in October (5, 3.2 %) (Table 4).

**Discussion**

Different studies on the incidence and etiology of maxillofacial fractures tend to vary from one country to another, perhaps because of the differences in social, cultural, and environmental factors [3–6]. The incidence of craniofacial trauma is higher in children than in adults; however the incidence of maxillofacial fractures is lower accounting for the 8–11 % of all pediatric facial injuries [21].

**Table 3** Site of maxillofacial trauma in 156 patients (163 fractures)

Site of fracture	Number	%
<i>Mandible (98 fractures)</i>		
Condyle	40	40.9
Parasymphysis	24	24.5
Body	14	14.2
Dentoalveolar	10	10.2
Angle	5	5.10
Ramus	4	4.08
Coronoid process	1	1.02
<i>Maxilla (52 fractures)</i>		
Dentoalveolar	37	71.1
Lefort 1	09	17.30
Lefort 2	05	9.61
Combination of Lefort 1 and 2	1	1.92
Zygoma	7	4.3
Nasal	6	3.68

**Table 4** Number of maxillofacial fractures by month

Month	Number of patients (%)
January	6 (3.84)
February	8 (5.12)
March	6 (3.84)
April	8 (5.12)
May	7 (4.48)
June	10 (6.5)
July	25 (16.02)
August	35 (22.4)
September	22 (14.1)
October	5 (3.2)
November	10 (6.5)
December	14 (8.9)

The reasons cited for this lower incidence are the larger craniofacial ratio of 8:1, lack of pneumatization of paranasal sinuses, as well as the large tooth to bone ratio, larger fat pad, and decreased bone mass [22].

Accidental falls were found to be the most common cause of maxillofacial fractures in children as shown in many studies [11–14]. This corresponded to the findings of our study that the accidental falls were responsible for 43 % of maxillofacial fractures, usually from normal playing activities. In infants and preschool children (up to age of 5 years), falls at home were most common. With increasing age and outdoor exposure, falls tends to occur outside the protected area of home and parental supervision [15]. Bamjee et al. [16] reported a similar trend in their study but also reported violence as a common cause in their teenage group. In this study the patient population was

prepubertal and violence was reported in 38 cases. Interpersonal violence in schools and assaults among the youth accounted for 24.3 % of maxillofacial fractures in our study. Of these 38 cases reported due to assault, the perpetrators were older children striking younger children with blunt objects such as rocks or bricks. There was no report of children struck by abusive parents.

Other studies [9, 15] confirmed that road traffic accidents were the leading cause of facial fractures, and in our study, they caused 16 % of the injuries. Road traffic accidents (RTA) were found to be the known cause of injuries as the age increases. Involvement in RTA as a pedestrian or bicyclist is a common cause of fractures in children of 10 or above. Facial fractures seem to be less common in children younger than 5 years of age. It is believed that young children are less active and lighter in weight, and therefore, fall less frequently and less heavily, which may explain the lower incidence in children younger than 5 years of age [9].

The preponderance of males in the age group of 10–15 years is consistent with the findings of previous studies [5, 6, 8]. Previous published work showed lower incidence rate of maxillofacial fractures in females, with male-to-female ratios ranging from 2:1 to 6:1 [13, 15, 17]. In our study, most patients (76, 48.7 %) were between the ages of 10 and 15 years, and the male-to-female ratio was 3:1, which was consistent with previous figures. The reason being boys are generally more boisterous than girls and spend more time outdoors.

The literature indicates that as patients increase in age the patterns of fractures progressively resemble that of the adult patient [11, 15, 17]. Patterns of fractures in children are determined to a large extent by the stage of development of their anatomical features. With the established cephalo-caudal growth gradient in humans, the forehead and midface are more prominent facial features of the younger child. Therefore they are more easily traumatized. Further features of elasticity of the bone, sinus development and stages of development of the dentition influence the fracture patterns [11, 15, 17].

McGraw and Cole [23] report that fractures shifted from the upper to the lower region of the face with increasing age and midface injuries were common in younger children and mandibular fractures in the older age group.

In our study, dentoalveolar component showed the highest incidence of fractures (33/52, 63.4 %) in midfacial region in the age group of 1–5 years. These findings are consistent with the previous studies [17, 24] with regard to the predominance of the dentoalveolar component being fractured.

Different studies [13, 15, 16] showed that the mandible was the most commonly involved bone in facial fractures, condylar region being the most commonly affected site.

Our study showed that mandibular fractures were noted to account for 60.25 % of facial fractures, and the condylar involvement occurred in 40.9 % of mandibular fractures. The findings of our study were consistent with the findings of previous studies.

The monthly incidence of maxillofacial fractures was fairly constant with seasonal variations, as reported in several studies [9, 10, 17]. The maximum rainfall in India is experienced between August and September. These months are known for the slippery and poor condition of the roads which increases the incidence of accidental falls and road traffic accidents. There was also slightly higher in December, when good weather and vacations provide greater opportunity for outdoor activities and travel.

This study indicates that maxillofacial fractures are not infrequent in rural population. Our findings suggest that both etiology and incidence of maxillofacial fractures appear to vary from one country to another.

## Conclusion

This study revealed that the peak incidence of maxillofacial fractures in rural children occurred in the 10–12 years old age group and the most frequent etiology was accidental fall (43 %). The predominant site of fracture was the mandible (60.1 %), in which 40.9 % of fractures were found in the condylar region and 24 % in the parasymphyseal region. Accidental falls were the leading cause of maxillofacial injuries and were three times more common in males than females. Opportunities for prevention are limited when it is considered that little can be done to prevent a fall. Preventable measures such as early correction of malocclusion and the wearing of mouthguards during contact sports should be recommended. Wearing a helmet which covers the face during biking and bicycle riding activities can be also recommended.

**Conflict of interest** None

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