Original Article

PAEDIATRICS MANDIBLE FRACTURES: THE CONCRETE COGNITIVE CONTENT OF LAST 10 YEARS (RURAL HOSPITAL OF CENTRAL MAHARASHTRA)

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ABSTRACT

Incidence of facial bone fractures has increased globally in past few years because of changing life styles, increase number of vehicles, more assaults and same increase has been seen in Paediatrics facial bone fractures as they are also part of our advance world. This research aims to evaluate incidence, etiology, pattern and treatment given to paediatrics mandibular fracture patients in last 10 years at rural hospital of Central Maharashtra. The current retrospective observational research was conducted between 2015 and 2024, which is the last ten years. A total of 276 cases constituting 334 paediatrics mandibular fractures were included for patients between age ranges of 0 to 15 years comprising both the genders. The data extraction was done for demographic variables, etiology, pattern, treatment. The mean (SD) age for incidence of mandibular fractures was 12.6 years comprising 73.18% males. According to our research, the largest rate of mandible fractures occurred in those aged 12 to 15 (40%) and dentoalveolar fractures were the most common. On evaluation it was obfuscated that major etiological factor for trauma leading to facial fractures was history of fall (32%). The pattern of fractures in children as well as their treatment varies lot from adults because of anatomy, presence of deciduous/ mixed dentition, growth spurt. Since long-term consequences may impact skeletal development, which may impact face symmetry and occlusion, treating youngsters can be extremely difficult. When caring for children, the biggest worry is how a treatment or injury may affect how they develop and grow.

Key words: Paediatric fractures, Traumatic injuries, Mandibuar fractures, Maharashtra.

Introduction

Mandible fractures account for around 5-8% of all maxillofacial injuries and are far less common in children than in adults [1-3]. Each nation has a different pattern and frequency of facial bone fractures, state to state, from city to village as the etiology for these fractures varies a lot according to the place. Also, the incidence of these fractures had increased in past few years because of the changing life styles and fast life. Traffic accidents, assaults, falls, and sports-related injuries are the leading causes of maxillofacial injuries globally, but falls and sports-related injuries are the most prevalent causes among children, followed by RTA.

More cases of RTA are being noticed because of large number of vehicles on roads, more cases of personal assaults are noticed because of tense and unhealthy relations [4-8]. In paediatrics patients also, the incidence of fracture has increased during last one decade. In children the etiologies are lack of motor coordination in early age, sports injuries, RTA, violence, falls etc. Literature suggests that boys are effected almost twice as common as girls [9].

The pattern of fractures in children as well as their treatment [10-14] varies a lot from adults because of anatomy, presence of deciduous/ mixed dentition, growth spurt. Children are particularly difficult to treat because long-term consequences might alter skeletal development, which can alter face symmetry and occlusion [1].

The impact of the therapy or damage on growth and development is the main worry while caring for a young patient. This is significant from an anatomical and psychological standpoint, and it might have a variety of implications for the way the various phases of psychological development are managed [15].

Long period of close reduction may leads to chances of ankylosis so Mono mandibular fixation with help of splints, arch bars are preferred, open reduction is very much challenging due to the existence of permanent tooth buds. Also, placement of mini-plates or other implants may hamper their growth. In most of the paediatric patients close reduction, cap splint is the preferred option, but few cases which are severely displaced,cannot be managed by close reduction, ORIF is the option left. Introduction of bio-resorbable plates had made management of displaced facial fractures easy. So, in this study we evaluated our paediatrics trauma cases of last one decade about what was the pattern of fractures, age groups and the treatment given to them.

Aim & objectives

Aim: To evaluate the incidence, pattern and treatment given

to paediatrics mandibular fracture patients in last 10 years at a rural centre of central Maharashtra.

Objecties

1. To evaluate the etiology for fractures in children
2. To evaluate the incidence of fractures in different groups of age for children
3. To evaluate for the sites of fracture involved in mandible
4. To evaluate the type of treatment given to paediatrics patients during last 10 years.
5. To look for post-operative complications

Materials and Methods

The study followed the Strengthening the reporting of Observational studies in Epidemiology (STROBE) reporting guideline. We performed the single institute retrospective cohort study. The study was conducted at Department of Oral & Maxillofacial Surgery, Rural dental college, Loni. The study included International classification of diseases Ninth revision (ICD-9) codes 802.xx, or ICD 10 code SO2.6XX. Paediatrics mandible fractures data for last 10 years between January 2015 to December 2024 was included for patients between age ranges of 0 to 15 years comprising both the genders. The anonymousity of patient personal details was maintained.

The study was initiated after obtaining institutional ethical approval. Exediate review was obtained from the review board with ethical approval number PIMS/DR/RDC/2022/494.

Study type: Observational

Study design: Retrospective Cohort

Study setting: Department of Oral and Maxillofacial Surgery, RDC, Pravara institute of medical sciences, Loni

Study duration: 2015-2024 (duration of study may be increase in case of e size)

study population: All paediatrics patients who have been operated for mandible fractures in Department of Oral and Maxillofacial Surgery.

The data extraction was done electronically for the demographic variables, etiology of fracture, pattern of fracture, treatment and complications are charted study in **Table 1**.

Statistical analysis was performed using SPSS 22.0 for Windows (IBM Corp) using multivariate analyses. Two-tailed P value < 0.05 indicated statistical significance.

Table 1. Variables assessed for the study are discussed below

Variable	Scale of measurement	Measurement method
Age group	Ratio	0- 3 years 4-7 years 8-11 years 12-15 years
Gender	Nominal	Male Female
Etiology	Ordinal	Reason of fracture was evaluated
Pattern	Ordinal	Site of mandible involved, Unilateral/bilateral Diplaced/undisplaced
Treatment	Ordinal	No treatment Closed reduction Open reduction ORIF With resorbable plates

Results and Discussion

The research's retrospective analysis comprised 276 instances, or 334 pediatric mandibular fractures. The mean (SD) age for incidence of mandibular fractures was 12.6 years. Two hundred two (73.18%) patients were male; and 74 (26.72%) were females. In our study, the greatest rates of mandible fractures were found in the age ranges of 12 to 15 years (40%) and 0 to 3 years (30%), whereas the ages of 4 to 7 and 8 to 11 years had the same frequency (15%). In our study children the mean age of 12 years had highest incidence of mandible fracture.

On evaluation it was obfuscated that the major etiological factor for trauma leading to facial fractures is the history of fall (32%), road traffic accidents (28%), sports and play injuries (22%), assaults (12%) and various other miscellaneous factors (6%). Dentoalveolar fractures were

the most frequent location of fracture, followed by parasymphysis fractures **(Table 2, Figure 1)**.

Table 2. Variables assessed for the study are discussed below

Variable	Scale of measurement	Measurement method
Age group	Ratio	0- 3 years 4-7 years 8-11 years 12-15 years
Gender	Nominal	Male Female
Etiology	Ordinal	Reason of fracture was evaluated
Pattern	Ordinal	Site of mandible involved, Unilateral/bilateral Diplaced/undisplaced
Treatment	Ordinal	No treatment Closed reduction Open reduction ORIF With resorbable plates

Figure 1. Site Involved In Paediatric Fracture

With regard to condylar or subcondylar fractures, multivariate analysis revealed that falls were statistically more likely to be the cause than other mechanisms (falls versus assault: difference of means, 0.89 [95% CI, 0.15-1.30]; falls versus traffic accidents: difference of means, 0.56 [95% CI, 0.15-0.97]; falls versus sports: difference of means, 0.85 [95% CI, 0.41-1.30]; P < .001 for all). Angle or ramus fractures are more likely to be caused by assault (assault vs. falls: difference in means, 0.37 [95% CI, 0.01-0.84]; P = .03; assault vs. road traffic accidents: difference in means, 0.44 [95% CI, 0.01-0.84]; P = .04); and injuries from sports and play are more likely to be caused by sports and play (sports and play injuries vs. falls: difference in means, 0.42 [95% CI, 0.02-1.15]; P = 0.04; sports and play injuries vs. road traffic accidents, 0.72 [95% CI, 0.02-1.15]; P < .001).

The number of sites involved were mostly single (63%), more than one unilateral fractures of mandible (17%) and bilateral fractures (20%) **(Figure 2)**.

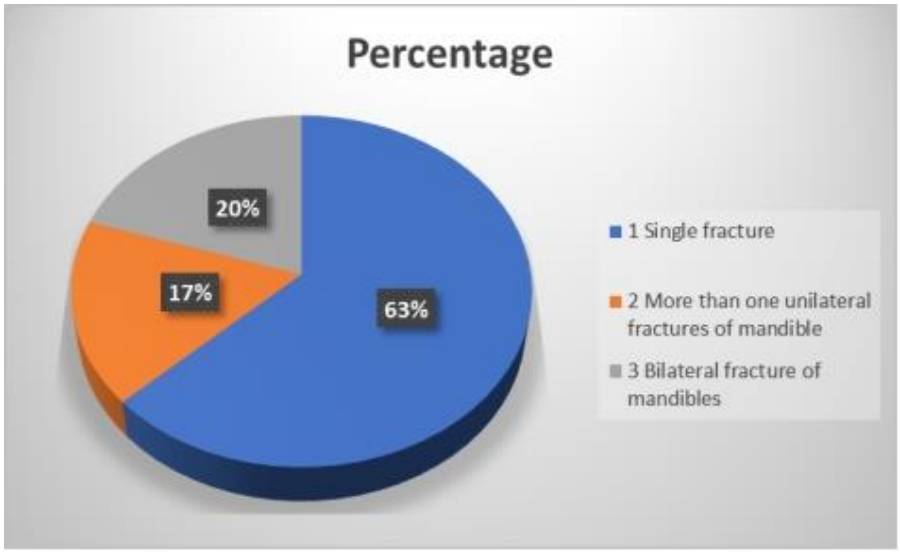

Figure 2. Number of sites involved

Treatment option for fractures was dental wiring and placement of arch bars (inter maxillary fixation) which was carried out in 15% of cases, closed reduction (cap splints) was done in 35% cases, open reduction including miniplates was carried out in 22%, open reduction with trans osseous wiring in 9% open reduction with resorbable plates included 4% and no treatment was done for 15% of cases **(Figure 3)**.

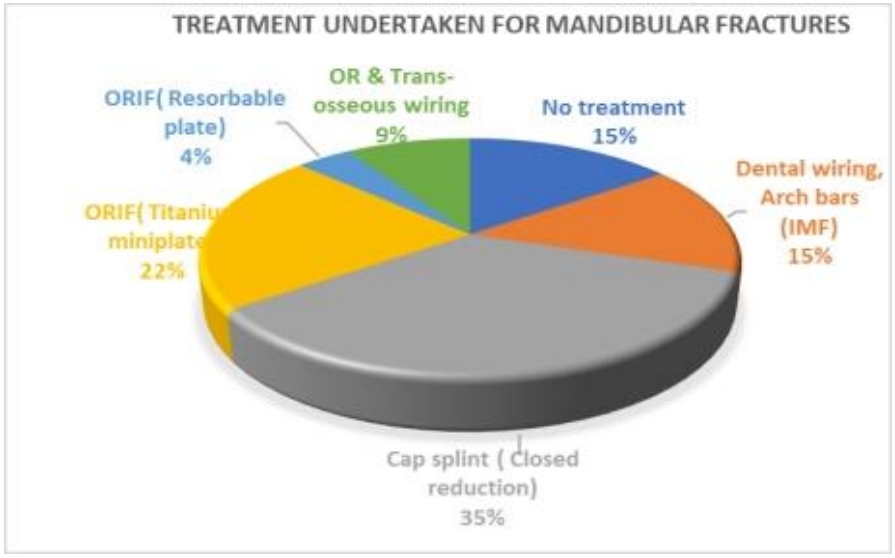

Figure 3. Treatment undertaken for paediatric patients

Mandibular fractures are an extremely common facial skeletal injury among pediatric trauma patients admitted to hospitals (56%) [16, 17]. Child welfare violations, falls, automobile collisions, assaults, and hyperactivity are the most prevalent causes of facial bone fractures in children, and they are associated with serious face injuries [18]. A short, thick condylar neck that tends to resist fracture; implanted tooth buds that hold the parts together "like glue"; and the suppleness of the jaw, however, mean that most children's body and symphysis fractures stay undisplaced. [19]. In situations when the fracture segments are either non-displaced or slightly displaced, closed reduction and immobilization are employed; open reduction and fixation are used in a small number of patients when the fracture segments are severely displaced and cannot be kept in a reduced position with splints. The majority of fractures can be conservatively treated using dental splints, rubber elastics, and occlusal cap splints with circummandibular wires instead of any therapy at all (soft diet) [2].

Gender distibution

In our study for last 10 years peadatric mandible fractures incidence was almost 73.18% in boys, while, female children had mandible fractures 26.72% in our study. The reason for difference might be that boys are more into aggressive sports and games. Also, boys are more exposed

to outside environment in comparison to girls. Haug *et al*. (2000) published their study and their results showed that majority of facial fractures in United States of America were encountered by boys only (54-80%) [15]. Posnick JC *et al*. (1993) concluded that boys develop twice facial fractures in comparison to girls [9]. In the other study facial fractures by Fortunato *et al*. (1982), the incidence was 70% for boys and results accords with our study in the incidence of fractures distribution among males and females [20].

Distribution in age groups

In our study, the age groups of 12 to 15 years had the highest incidence of mandible fractures (40%) and 0 to 3 years (30%), whereas the ages of 4 to 7 and 8 to 11 had the same frequency (15%). Children in our research who were 12.6 years old on average had the greatest incidence. The reason could be related as mandible at this age group starts developing and transforming its anatomy like that of adults and also in this age group children are very much energetic and are involved in multiple activities and are eager to explore new adventures things.

Children have a lower risk of face fractures than adults do. Between 1.5% and 8% of all facial fractures (adult and pediatric) treated in trauma centers occur in children younger than 12 years old [21-27]. 12–15-year-olds are included in the pediatric age group in our study.

Kaban *et al*. (1977) found 26.8% of these children were younger than 5 years [28] and in our study also children younger than age 5 years (0-3age group) had 30% of incidence. Reason for high incidence might be less developed motor coordination in this age group.

While on contrary, study by Fortunato *et al*. (1982) included 2-15 yrs patients in their study and found no age group more susceptible to maxillofacial injuries [20].

Site involved

Among juvenile trauma patients admitted to hospitals, Mandibular fractures are an extremely frequent bone injury to the face [9, 29]. The different studies are there related to site of fracture in mandible in paediatrics patients. In a study by Anderson *et al.* (1995) the highest incidence was of condylar fracture followed by body fracture [30], while, in our study para- symphysis fracture was involved in 25.15% cases followed by dentoalveolar fracture (19.16%) followed by condylar fractures (16.77%). Literature suggests high incidence of condylar and angle fractures along with para symphysis fractures for adults, as adults have long and thin neck of condyle in comparison to children who lacks neck of condyle and presence of third molar in angle area for adults makes condylar and angle fracture common in adults.

Number of fractures

In our evaluation of last 10 years, 63% cases had single mandible fracture, while in 17% of cases there were more than one fracture on same side while in 20% of cases had fractures involving both sides of mandible .it was observed that more than on fractures were involved when patient had history of fall and Road traffic accidents, while in sports injury cases and assaults most of the time the impact is from lateral side, so single/multiple unilateral fractures were more common.

Etiology

Our study result showed falls to be the biggest reason for the peadatric fractures followed by followed by Road traffic accidents and sports and play injuries, which accords with the results in study by Kaban *et al.* (1993). Falls from bicycle, steps, climbing apparatus had highest incidence of 30% followed by sports injuries (blunt trauma by basketball, hockey stick) 23% while, road traffic accidents were 17% [31]. While, Kaban (1993) showed that the traffic on roads is incresing day by day, and vehicles are also increased many folds with high speed motor vehicles, fast life styles are the reason behind high incidence of RTA in 20th century. Our study results were majorly like the study by Goth *et al*. (2012), where also 3 main etiological factors were RTA, falls and sports injuries [32-36], their result also showed 40% RTA, 25% Sports Injury and 25-30% falls related injuries.

Treatment of mandibular fractures

For a surgeon, treating pediatric mandibular fractures is extremely difficult. The development of a treatment strategy for children who have suffered facial injuries requires careful consideration of several factors. These include the age of the patient (to maximize growth and development), the anatomic site (to maximize form and function), the complexity of the injury (displacement, comminution, and number of sites), the time since the injury (it is best to treat it within 4 days), any concurrent injuries (suitability of anesthesia and length of surgery), and the surgical technique (closed versus open). Depending on the age, anatomic site, complexity, and method, the fixing preference will be determined. Using the teeth for fixation is more challenging in youngsters because permanent teeth may not emerge fully, and the quantity of deciduous teeth may be insufficient, or their roots may have resorbed. Due to its bell-shaped form and small undercut area, the deciduous crown is not the best for splints and wire retention.

Cases where green stick fractures are there can be managed by conservative treatment like patient advised to have soft diet for few days without any intervention and 15% of our cases were managed by this approach. For minimal displaced fracture cap splints / dental wiring worked very well (mono mandibular fixation) as paediatrics patients don't tolerate IMF, also transition of dentition and growth of bone continued so, the occlusion gets settled at later stage at its own, so immobilization of fracture segment with the help of splints, dental wiring is a preferred method in paediatrics mandibular fracture cases, 35% cases in our study at our centre were managed by using splints, also in one of the study by Amartunga *et al*. (1998), 32% cases were

managed using acrylic splints using circummandibular wiring's [37].

In 15% of our cases Inter maxillary fixation (IMF) was done and most of the patients treated by this method were in 12-15 years of age who tolerated IMF. The period of IMF in all cases were from 2-3 weeks to minimize chances of Ankylosis.

In 35% of our cases Open Reduction was done and out of these 9% cases were managed by trans-osseous wiring at the inferior border as there was no scope of placing miniplate because fracture line was in the area where exactly tooth buds of permanent teeth were lying at inferior border. 22% of case were manged by miniplate fixation. At our centre our protocol is to place single 1.5mm or 2mm titanium miniplate at inferior border by safeguarding tooth buds.

Nevertheless, due to worries about growth limitation, plate migration, and the lack of knowledge regarding the fate of miniplates in pediatric craniofacial surgery, there is a propensity to remove hardware in youngsters. Over the past ten years, it has become standard practice to keep children's hardware in place unless otherwise directed.

Four recent cases at our centre were treated by using bioresorbable plates, advantages of using these plates are they get resorbed after 6-months minimally hampering growth of mandible, also avoiding the need of second surgery for implant removal. The disadvantage of resorbable plates are that these implants are not cost effective and are technique sensitive to use. If force while bending plates and placing screws is not proper there are chances of plate breakage and screw fracture, resulting in additional costs.

Conclusion

Compared to adult fractures, mandibular fractures in children are rare, right from incidence, sites involved, etiology and treatment given to paediatrics mandible fractures vary totally from that of the adult's fractures. Incidence, etiology, age among mandible fracture patients vary from country to country, urban to rural areas and also with different demography of the area.

Treatment of these fractures is quite challenging. Decision should be taken after proper evaluation of the case. Displaced/undisplaced segments, age of the patient are very important elements in deciding the treatment strategy. Use of Resorbable plates can be encouraged in cases where open reduction is suggested.

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