ORIGINAL ARTICLE

CAUSES, PATTERN AND MANAGEMENT OF PAEDIATRIC MANDIBULAR FRACTURES

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ABSTRACT

Paediatric mandible serves as a foundation for future aesthetics and function. Fracture of paediatric mandible institutes asymmetry, occlusal discrepancies and can lead to TMJ ankylosis. Hence paediatric mandibular fractures should be dealt with utmost care. The objective of current study was to record and compare the causes, pattern and management options of mandibular fractures among different age groups of children, reporting to tertiary care centres in Punjab.

It was an analytical study carried out from 1st August 2018 to 31st July 2019. The study was carried out on 116 patients who were divided into 2 groups. In group A, 72 patients of age 10 years or less and in group B, 44 patients of age between 11-16 years were included. They were compared for the causes, patterns and management of paediatric mandibular fractures. Paediatric mandibular fractures in both groups have tendency to be bilateral and mostly favourable. Condylar fractures were the most common type of paediatric mandibular fracture. There were statistically significant differences between both groups regarding cause (P=0.043) and management (P=0.02). It was concluded that the causes and management of mandibular fractures change with the age of children.

Keywords: *Paediatric trauma, mandibular fracture, open reduction, close reduction.*

This article may be cited as: Nazir A, Imtiaz M, Gull A, Pervaiz R, Zahra T, Kiran S, Jawa ZA, Akhtar MU. Causes, pattern and management of paediatric mandibular fractures. Pak Oral Dent J 2020; 40(3):139-44.

INTRODUCTION

Facial trauma in children can often be challenging to manage and has its long-term consequences.[1] The most common mandibular fracture in children is condylar fracture, followed by angle and parasymphysis region while the body fracture are comparatively rare.[2] The high tooth to bone ratio predisposes the mandible to fracture compared to the midface.[3] As the paediatric mandible is more malleable, a fracture involves significant force, with fall injuries consistently being the most frequent mechanism of injury.[4]

In infants, skull-to-face ratio is 8:1. By early adolescence, this ratio is 3:2, and by adulthood, it is 2:1. The relatively larger cranium and forehead as well as elasticity of paediatric mandible with short condylar neck effectively shield the smaller lower and middle thirds of face from injury.[5] These factors contribute to unique fracture patterns observed in children.[6] As the child grows, facial skeleton and mandible become more prominent and consequently injuries to these regions become more common.[7]

There are various treatment approaches for management of paediatric patients with mandibular fractures but follow-up is relatively difficult in paediatric patients. The traditional treatment methods of open reduction with internal fixation have little applicability in children. Treatment options include soft diet, maxillo-mandibular fixation (MMF) with eyelet wires or arch bars and circum-mandibular wiring with acrylic occlusal

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Received for Publication: Sept 17, 2019
First Revision: Nov 15, 2019
Second Revision: Dec 23, 2019
Approved: Dec 24, 2019

splints. Alternative treatment options include open reduction through either intra or extra-oral approach and internal fixation with miniplate or microplates and/or resorbable plates.[8,9] There are too many publications about paediatric mandibular trauma in international literature but a few in national journals. The rationale of the current study was to sort out causes, pattern of paediatric mandibular fractures in local population and to set parameters towards the favoured methods of management for different paediatric mandibular fractures.

MATERIALS AND METHODS

This analytical study was conducted at Oral and Maxillofacial Surgery Departments of Nishtar Institute of Dentistry, Multan, Fatima Memorial College of Medicine and Dentistry, Lahore and de'Montmorency College of Dentistry, Lahore from 1st August 2018 to 31st July 2019. Ethical approval was taken from ethical committees of the institutions. This study consisted of 116 patients with paediatric mandibular fractures. Patients were divided into two groups based on age after stratification. Group A ranging from 0-10 years age comprised of 72 patients and group B ranging from 11-16 years age comprised of 44 patients. Sampling was done using non-probability purposive sampling technique. All the paediatric trauma patients from 0-16 years of age with either gender presented at Out Patient Departments of Oral and maxillofacial Surgery Units of the above mentioned institutions were included in the current study. Patients with isolated soft tissue and hard (tooth) tissue injuries, old treated cases of fractured paediatric mandible and patients with some pathological fractures of mandible were not included in the study. Assessment of patients was done by detailed relevant history, clinical and radiographic examination. The status of paediatric mandibular fractures was assessed by extra-oral and intra oral clinical evaluation and panoramic as well as posterior-anterior radiograph of mandible. A written informed consent from every patient was taken before treatment. A structured proforma was used to record all the data e.g. patient's demographics like patient's name, age and gender, cause and site of fracture and treatment option.

All records of patients were kept confidential and entered in SPSS version 25 to analyze and find out distribution of different variables in terms of proportions and percentages. The variables were presented in tables to show their relative distribution in terms of frequency and percentage. Mean and standard deviation (mean±SD) were calculated for age of patients. Frequency and percentages were calculated for gender, causative factors (fall, road traffic accidents, interpersonal violence, sports injuries and other factors) and treatment options. Chi-square test was applied to compare causative factors and treatment options in different age groups as well as in male and female patients. P value of < 0.05 was considered significant.

RESULTS

A total of 116 paediatric patients with mandibular fractures were included in the current study and the participants were divided into two groups. Group A consisted of 72 (62.1%) whereas Group B had 44 (37.9%) patients. Paediatric mandibular fractures were more common in males than females and the compound fractures were more common than simple fractures. The relative distribution of these variables for both groups is detailed in Table 1 and 2.

Unilateral fractures were present in 44.8% (n=52) patients and bilateral fractures were found in 51.7% (n=60) patients. Multiple fractures in mandible were rare 3.4% (n=4). The relative distribution of different favourable and unfavourable paediatric mandibular fractures in horizontal and vertical direction in both groups is shown in Table.3

A total of 176 fractures were managed in 116 patients. The relative distribution of fractures in different areas of paediatric mandible in both groups is shown in Table 4. No fracture was seen in symphysis, ramus and coronoid region.

The data for cause of injury distributed by age showed that fracture due to fall were common in group A and road traffic accidents were common in group B. The causes of paediatric mandibular fractures and their relative distribution for both groups are shown in Table 5 and their management options in Table 6.

DISCUSSION

Maxillofacial region, due to its prominent anatomy, is one of the most common regions to be injured in any type of accident.[10] Injury to this region is also important because it may be associated with partial or complete; temporary or permanent loss of one of the important functions of the oral cavity such as speech, aesthetics, or mastication.[11] Of all maxillofacial fractures, incidence of paediatric facial fractures ranges from 1% to 15%.[12] Incidence of paediatric facial fracture differs from one country to another because of social, cultural and environmental factors. Mandibular fractures are less common in children than in adult but still mandibular fractures are the most common paediatric facial fractures, among them mandibular condylar fractures are the most common[13] Low incidence of paediatric mandibular fractures may be due to thick adipose tissue in maxillofacial region, elasticity of bone and protective nature of guardians (teachers and parents).

It is generally accepted that children under the

TABLE 1: GENDER DISTRIBUTION OF PATIENTS

Gender	Frequency	Percentage	Group A	Group B
Male	100	86.2%	62	38
Female	16	13.8%	10	06
Total	116	100.0%	72	44

TABLE 2: DISTRIBUTION OF SIMPLE AND COMPOUND FRACTURES

Type of Fracture	Frequency	Percentage	Group A	Group B
Simple	32	27.6%	26	6
Compound	56	48.3%	28	28
Simple & Compound	28	24.1%	18	10
Total	116	100.0%	72	44

TABLE 3: FAVOURABLE AND UNFAVOURABLE FRACTURES IN HORIZONTAL AND VERTICAL DIRECTION

Type of Fracture		Frequency	Group A	Group B	Chi square (P value)
Horizontal favourable fracture n=24	Unilateral	22	14	8	0.545
	Bilateral	2	2	0	0.46
Vertical favourable fracture n=28	Unilateral	22	12	10	0.141
	Bilateral	6	4	2	0.70
Horizontal unfavourable fracture n=6	Unilateral	4	2	2	0.750
	Bilateral	2	0	2	0.386
Vertical unfavourable fracture n=0	Unilateral	0	0	0	-
	Bilateral	0	0	0	-

TABLE 4: DISTRIBUTION OF AREAS INVOLVED IN PAEDIATRIC MANDIBULAR FRACTURES

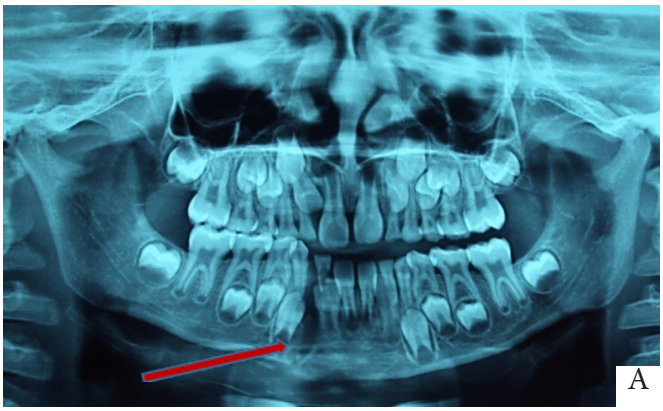
Fracture	Frequency	Percentage	Group A	Group B
Condylar	72	41%	50	22
Parasymphysis	39	22%	15	24
Dentoalveolar	32	18%	24	8
Angle	17	10%	8	9
Body	16	9%	8	8
Total	176	100%	105	71

TABLE 5: DISTRIBUTION OF CAUSES OF PAEDIATRIC MANDIBULAR FRACTURES

Cause of Fracture	Frequency	Percentage	Group A	Group B
Fall	64	55.2%	53	11
Road traffic accident	36	31%	14	22
Sport injury	8	6.9%	2	6
Farm accident	6	5.2%	2	4
Assault	2	1.7%	1	1
Total	116	100%	72	44

TABLE 6: MANAGEMENT OPTIONS FOR PAEDIATRIC MANDIBULAR FRACTURES

Treatment	Frequency	Percentage	Group A	Group B
Observation	38	32.8%	32	6
Close Reduction	44	37.9%	22	22
Open Reduction	14	12.1%	4	10
Other	4	3.4%	4	0
Not Treated	16	13.8%	10	6
Total	116	100.0%	72	44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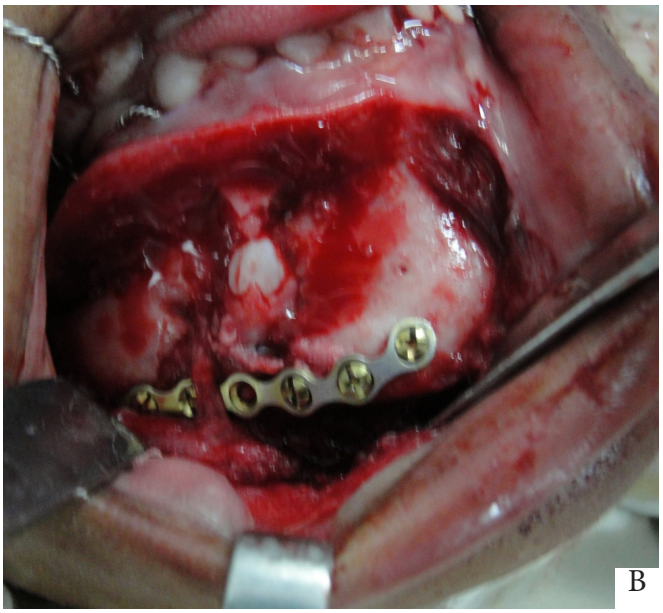
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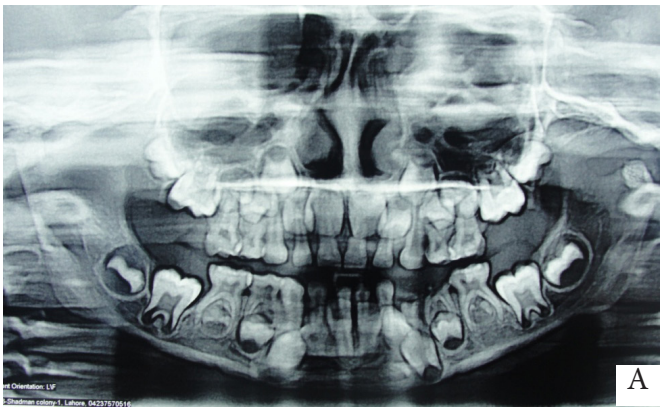
Fig. 1: A&B Panoramic Radiograph Showing Right Parasymphysis Fracture.
Open Reduction and Internal Fixation of Right Parasymphysis Fracture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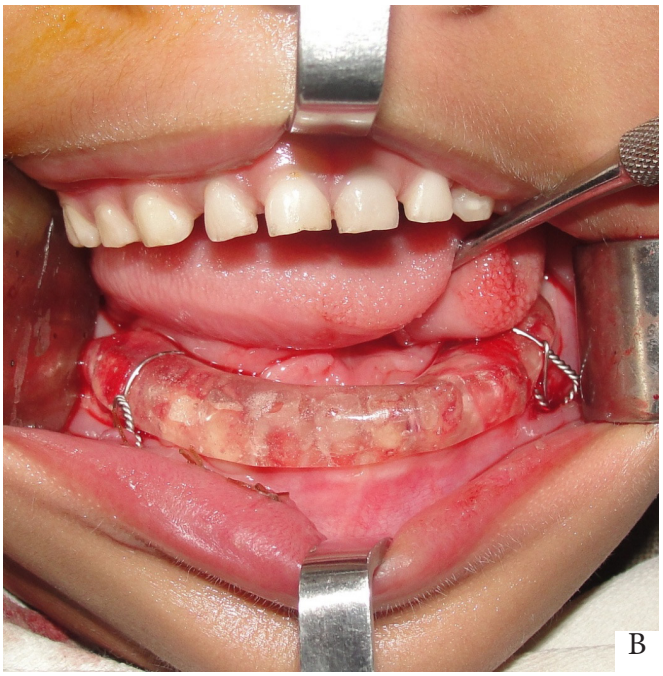
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Fig. 2: A&B Panoramic Radiograph Showing Left Condylar Fracture.
B. Acrylic Splint Fixation for Left Condylar Fractu

age of 5 spend more time in supervised environments and are least likely to sustain serious facial injuries.[14] In our study, the mean age of paediatric patients with mandibular fractures was 9.2 + 4.2 years. Paediatric mandibular fractures were more common in group A. The ratio of patients with mandibular fractures in group A and B was 1.63:1. There was more male predilection of paediatric mandibular fractures in the current study which reflects the more aggressive and risk taking behaviour of preteen and adolescent boys. These findings are consistent with a study conducted in United States about the patterns of paediatric mandibular fractures which had also reported more male predilection and fall as leading cause of fractures in younger age group.[15] Fall from height, road traffic accidents and sports injuries have been reported to be the most common causes of maxillofacial injuries amongst children.[16,18]

Patients having compound fractures were more common than patients having simple fractures. All condylar fractures were of simple variety as force of impact is dissipated by dentition or soft tissues. Whereas fractures occurring in body, parasymphysis, angle, and dento-alveolar region were of compound variety, as it directly communicates with oral cavity through break in mucosa or periodontium. Comminuted fractures were not observed in this study and these findings were similar with study carried in Turkey.[17] Bilateral condylar fractures were significantly high in group A whereas parasymphysis in combination with condylar fracture were most common in group B. Dento-alveolar fractures were more common in group A. Neither ramus nor coronoid as well as symphysis fractures were seen in any patient in the current study. These findings were consistent with a study conducted in Peshawar, Pakistan which also had no patients with ramus or coronoid fractures.[18] Left and right sides of mandible were fractured in equal proportions in the current study.

In this study, fall (55.2%) was the leading cause of paediatric mandibular fractures followed by RTA (31%). Sport related accidents (6.9%), farm injuries (5.2%) e.g. equestrian kicks to face of children and assaults (1.7%) were the other predominant causes for paediatric mandibular fractures in this study. Injuries due to fall were more common in group A and due to RTA were common in group B. But with increasing age of children, there was a trend in decrease in number of mandibular fractures due to fall and an increase in fractures due to RTA, sports activities and farm injuries. This shift in etiological factors could be due to more involvement of teenage children in outdoor and risk taking activities. These findings of the current study are in agreement with many of the national and international studies.[2,4,6,14-19] But certain findings of our study are not in agreement with the studies conducted in Turkey and India where RTA was the major cause than fall.[20,21]

Most of the patients reported to our institutions were in stable condition. Only emergency treatment was provided in the case of dento-alveolar fractures. Closed reduction (37.9%) was the most common modality of treatment in paediatric mandibular fractures in this study. This was followed by observation (32.8%), open reduction and internal fixation (12.1%--Fig. 1) and other means (3.4%) such as extraction of involved tooth in case of dento-alveolar fractures.

Generally the traditional treatment of paediatric mandibular fractures has centred on a closed approach.[22] With the advent of modern methods of osteosynthesis, open approaches have replaced closed reduction.

Paediatric condylar fractures in the current study were treated by observation and close reduction methods. For all the patients with isolated condylar fractures and normal occlusion, no surgical intervention was done and only jaw exercises were prescribed. These patients were followed and excellent remodeling was seen. This treatment was similar to a study in India in which conservative approach was used.[23]

Some of the patients had condylar fractures in combination with body, angle or parasymphysis fractures. They had disturbed occlusion and ipsilateral deviation of jaw on opening. These patients were treated with short period of MMF with arch bars and elastics or MMF done with lvy eyelet loops. After two weeks, MMF was opened and a regime of guiding elastics was started. These treatment regimens were in accordance with a study conducted in Baltimore.[24] A few patients in group A had intra-capsular type of fractures with a risk of ankylosis. In these patients, usual regime was fixation of acrylic occlusal splint (Fig. 2) with circum-mandibular wiring left in place for three weeks.[25] No condylar fracture was treated by open reduction.

Dento-alveolar fractures are common in children and are often treated in outpatient setting. In the current study, dento-alveolar fractures were managed in three ways. One subset where deciduous teeth were present and adjacent teeth were not sound enough for the placement of arch bar, extraction was performed. In the second subset where there was subluxation or avulsion of teeth, arch bars were placed for 3 to 6 weeks.[26] In the third subset where green stick fracture of alveolar bone was present, observation was advised.

CONCLUSION

From this study, it can be concluded that the causes(P=0.043) and management(P=0.02) of mandibular

fractures in children show a change with age of patients and both variables showed statistically significant difference in both age groups. However, patterns of fractures did not show a statistically significant difference in both groups.

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7 Zehra Azher Jawa:	Data collection, Literature search, Conception/Drafting of article.
8 Muhammad Usman Akhtar:	Supervised the whole research work, Data analysis, Final proof reading and review of manuscript.