

## **PATTERN OF PAEDIATRIC MAXILLOFACIAL TRAUMA: A RETROSPECTIVE STUDY**

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### **ABSTRACT**

**Background:** The fractures that occur in the pediatric age are unusual in risks, treatment and possible side effect. The intervention for children with maxillofacial trauma must consider the variances in structure and morphology between pediatrics and adults, the occurrence of associated damage, the particular grade in growth and improvement and the specific damages and anatomic locations that the damage disturbs.

**Objective:** To carry out a retrospective descriptive manuscript on facial trauma in pediatrics patients who presented to the Department of Maxillofacial and Plastic Surgery, Alexandria University in order to study the epidemiology, analyze the different patterns of trauma and their management.

**Subjective:** The database of pediatric trauma patients younger than 18 years of age at the Department of Maxillofacial and Plastic Surgery, Alexandria University during a period of 5 years (2014-2019) was reviewed and examined.

**Results:** This study examined 236 patients aged under 18 years of age. Of 236 patients with a mean age of  $7.93 \pm 4.25$  years, there were 141 males (60.1%) and 95 females (40.2%). The ratio of male to female was 1.4:1. The most frequent reason of injuries were falls (54.2%) and road traffic accidents (29.8%). Incidence of falls decreased significantly with age ( $P < 0.001$ ). Dentoalveolar injuries (52.4%) and soft tissue injuries (47.2%) were higher than facial fractures (42.7%). Mandibular fractures (78.8%) were the most frequent facial fractures. There was a significant relation amongst facial fractures and soft tissue injury ( $P < 0.01$ ).

**Conclusion:** Falls stayed the principal reason of maxillofacial injury in pediatric patients in this study, and the most frequent site of fractures was the mandible. Slightly displaced fractures in young patients could be achieved by non-intervention methods, but displaced breaks may need open methods and rigid fixation.

**KEY WORDS:** maxillofacial trauma - pediatric - retrospective study –management.

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## INTRODUCTION

The trauma is considered the main reason of death or inability in pediatrics. Approximately 11.3% of an overall pediatric emergency comprises of craniofacial injuries. Though, general facial bone fractures are noticeably less frequent in pediatrics than adults due to the immature facial skeleton and paranasal sinuses and also an extra strength of maxilla and mandible due to unerupted dentition.<sup>(1)</sup>

The low occurrence of maxillofacial trauma in pediatrics has been credited to the springiness of facial bones, more cranium to face ratio, denser layer of adipose tissue, and absence of pneumatization of paranasal sinuses in pediatrics. In addition, young children obtain additional parent attention and are less independent than elder children. Though, the occurrence of facial trauma increases as children age and become more exposed to outside activities.<sup>(2)</sup>

The rise in the occurrence of facial fractures combined with skull fractures in pediatric reproduce the growth of the face to down and forward way that make it more vulnerable to trauma. Children facial fractures comprise 25% of all maxillofacial trauma.<sup>(3)</sup>

The highest known cause of facial fractures in young children patients are accidental falls (58.2%) with falling on the floor during playing, falling from bed and stairs, and falling from height, followed by violence (12.7%), bicycle (10.0%), and motor car accidents (8.2%). Sporting harms was only 7.3% and others 3.6%. Nasal fractures are considered the most frequent (69.0%) and condyle was the highest affected site of mandibular fractures (63.0%).<sup>(4)</sup>

The mandible was the highest frequent bone to injury (65%) and the body of the mandible was the highest affected site to be involved by fracture (27%). Only 10% of children involved both jaws. The zygomatic bone seemed to be the most common bone intricate in mid-face fractures (45%).<sup>(5)</sup>

Most common cause of injury in younger age group is due to falls, while road traffic accidents, sports and fight are associated with older age group. Nearly 22 million children are injured annually worldwide and 12% occurred as a result of trauma. Incidence and etiology of craniomaxillofacial trauma depends on social, cultural and environmental factors of particular country. Facial fractures in pediatric group comprise less than 15% of all facial fractures. The incidence of facial fractures in paediatric age less than 5 years was rare with a low percent ranged from (0.6% - 1.4%).<sup>(6)</sup>

Trauma also occurs more through adolescence with enlarged unverified physical motion and sports. In summer incidence of trauma increased. Occurrence of facial fractures is higher in male than females in all age groups. Male to female ratio ranged from 1.1:1.0 to 8.5:1.0.

It was found that the most common reason of facial fractures in paediatric age was falls from a height, training during sports and accidents on the road. In children (up to 6 years age) the most frequent cause of facial fractures was falling at home.<sup>(7)</sup>

## PATIENTS AND METHODS

The database of paediatric maxillofacial trauma patients less than eighteen years at the Maxillofacial and Plastic Surgery department, Alexandria University during a period of 5 years (2014-2019) was reviewed and examined.

Data collected from clinical records included age, sex, cause of injuries, type of injuries (facial fracture, dentoalveolar fracture and soft tissue injury), and fracture sites, and finally the management of fractures.

The etiology of trauma was categorized as road traffic accident, falling from a height or other causes. Finally the management of fractures was recorded.

Type of bone plates is titanium plates and screws. Absorbable plates were not used due to high cost.

All patients were scheduled for removal of plates and screws.

This retrospective study was approved by the department's review board.

#### Statistical analysis:

The analysis of the data was conducted by program Statistical Package for Social Sciences (IBM SPSS), Version 25.0 for Windows 10. Descriptive statistics such as proportions, frequencies, and percentages were obtained. The chi-square tests were used for categorical variables, and for all analyses, a two-sided P-value was considered with significance level set at 5% ( $P < 0.05$ ).

#### RESULTS

A total number of 236 pediatric patients were reviewed. Majority of patients were males (59.7%) (Table 1). More than the half of the patients was in age group 12-18 years (56.8%). There was no significant difference between age distribution in the gender group.

The most frequent reason of maxillofacial injury was falling from height (FFH) with 128 (54.2%) patients, followed by road traffic accident affecting 70 (29.7%) patients, and other causes were 38 patients (16.1%) (Table 2). It was discovered that there was a significant increase in number of patients falling from height in young age (<6 years) significantly higher than the other two reasons ( $P < 0.01$ ).

The type of injury showed an equal number in each type which include facial fracture, soft tissue injury and dentoalveolar fracture without significant difference in age groups.

There were 232 fracture sites in 101 patients who had facial fractures. Mandibular fractures were the most common fractures with 79 subjects (Figure 1,2), followed by 43 maxilla fractures (Figure 3), 42 zygoma fractures; then the orbital fractures found in 39 patients, and the least common fractures were nasal fractures by 29 fractures (Table 2).

The majority of the patients with facial fractures were managed by open reduction (47 cases), followed by conservative management (29 patients) and closed reduction in twenty five patients (Table 2).

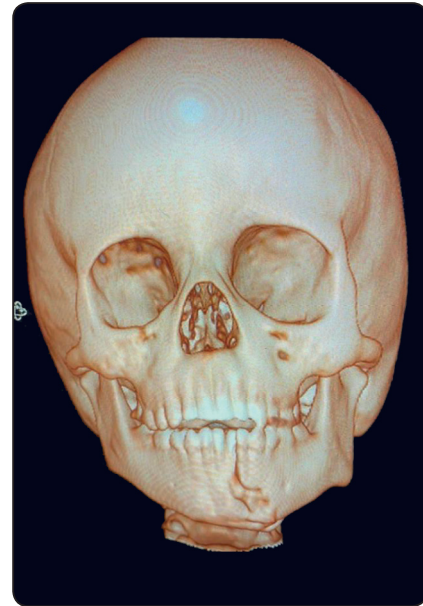


Fig. (1): Facial CT scan with 3D reconstruction showing a left parasympheseal fracture of the mandible.

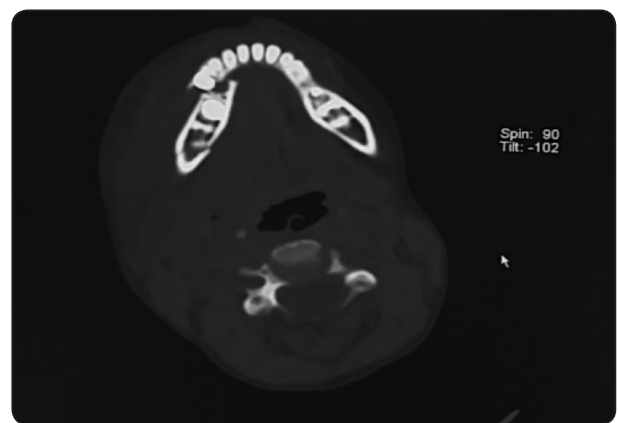


Fig. (2): Facial CT scan axial view showing a right body fracture of the mandible.

TABLE (1): Distribution of the studied cases regarding their age in relation to sex.

Age group	Male		Female		Total "n=236"	
	No.	%	No.	%	No.	%
<6 years	32	22.5	17	17.9	49	20.8
6-12 years	25	17.6	28	29.5	53	22.5
12-18 years	84	59.9	50	52.6	134	56.8
<b>Total</b>	<b>141</b>	<b>59.7</b>	<b>95</b>	<b>40.3</b>	<b>236</b>	
<b>X<sup>2</sup></b>	<b>4.59</b>					
<b>P value</b>	<b>0.1001</b>					

TABLE (2): Distribution of the etiology, type of injury, site of facial fractures and management of fracture in relation to age group.

	Age group						Total "n=236"	X <sup>2</sup> P value
	<6 years "n=49"		6-12 years "n=53"		12-18 years "n=134"			
	No.	%	No.	%	No.	%		
<b>Etiology</b>								
Falls	40	81.6	30	56.6	58	43.3	128	21.77
RTA	5	10.2	16	30.2	49	36.6	70	0.001*
Other	4	8.2	7	13.2	27	20.1	38	
<b>Type of injury</b>								
Facial fracture	19	28.8	21	24.1	61	33.2	101	2.958
soft tissue injury	24	36.4	29	33.3	59	32.1	112	0.564
dentoalveolar fracture	23	34.8	37	42.5	64	34.8	124	
	<6 years "n=19"		6-12 years "n=21"		12-18 years "n=61"		Total "n=101"	X <sup>2</sup> P value
<b>Site of facial fracture</b>								
Mandible	14	73.7	16	76.2	49	80.3	79	10.62
Maxilla	9	47.4	12	57.1	22	36.1	43	0.223
Nasal	4	21.1	8	38.1	17	27.9	29	
Zygoma	2	10.5	7	33.3	33	54.1	42	
Orbital	6	31.6	5	23.8	28	45.9	39	
<b>Management of facial fracture</b>								
Open reduction	5	26.3	9	42.9	33	54.1	47	7.34
Closed reduction	6	31.6	8	38.1	11	18.0	25	0.118
Conservative management	8	42.1	4	19.0	17	27.9	29	



Fig. (3): Facial CT scan with 3D reconstruction showing a Le Forte maxillary fracture in a 3-yrs-old child.

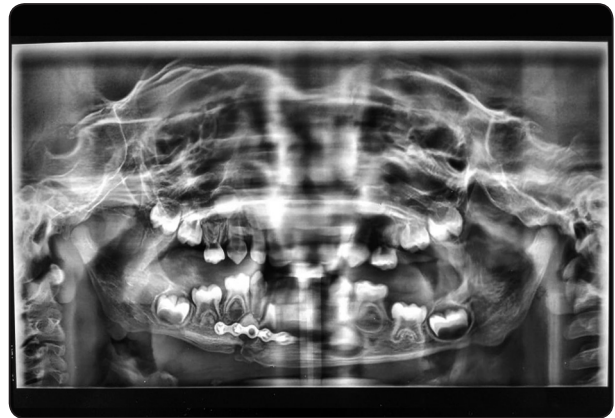


Fig. (4): Postoperative panoramic X-ray showing fixation of a right parasymphseal mandibular fracture by plates and screws



Fig. (5): Postoperative X-ray showing fixation of a right parasymphseal and a left angle mandibular fractures by plates and screws

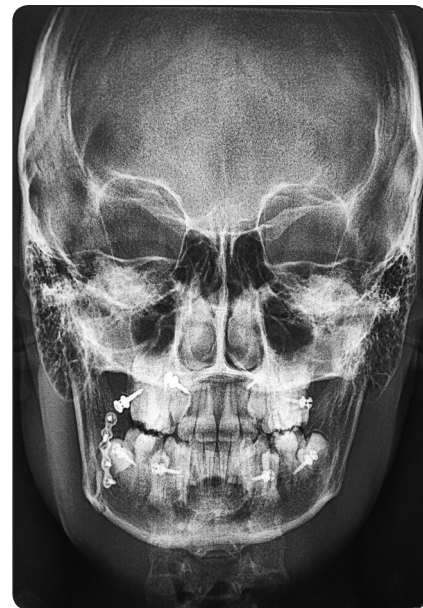


Fig. (6): Postoperative X-ray showing fixation of a right angle mandibular fracture by plates and screws

## DISCUSSION

The injuries in children are considered an emergent universal public health worry. Thousands of pediatrics' mortality each year is attributed to trauma or violence worldwide, and millions of others suffer the consequences of non-fatal injuries.

The present study comprised complete medical records of pediatric patients (n=236) with maxillofacial injuries who had been admitted and treated in the Department of Maxillofacial and Plastic surgery, University of Alexandria.

Out of 236 patients, 141 (59.7%) were males and 95 (40.3%) were females, the majority of our patients (56.8%) were in the age group 12-18 years. In partial agreement with our results, Blankson et al., (2020), studied the paediatric maxillofacial fractures and the study carried out on 253 patients, they found that boys constant more maxillofacial injury in comparison with girls (at a ratio of nearly 2:1).<sup>(8)</sup>

Mishra et al. (2020), study comprised of complete medical records of pediatric patients (n=57) 38 (66.67%) were males and 19 (33.33%) were females. A total of 51% (n=29) were adolescents between 12 to 16 years followed by 35% (n=20) were children between 2 to 12 years.<sup>(9)</sup>

The results of our study showed that the most common cause of maxillofacial trauma was falling from height (FFH) with 128 (54.2%) patients, followed by road traffic accident affecting 70 (29.7%) patients, and others causes were 38 patients (16.1%). It was found that there was a significant increase in number of patients falling from height in young age (<6 years) significantly higher than the other two causes. The facial fracture increase by age but this increase was insignificant. In agreement with our results, Bhutia et al., found that the majority of paediatrics with facial fractures increased significantly positively with age, which approves other study.<sup>(10)</sup>

Comparable to earlier manuscripts, mandible fracture was the most common fracture subtype overall and occurred most frequently in school-age

(6–12 years) and less commonly among the infants and school age subjects. This lesser incidence among the youngest age group is likely a result of the increased comparative strength of immature mandible since the unerupted dentition and relative micrognathia and also indifference in the mode of injury among the different age groups.<sup>(11)</sup>

The cause of maxillofacial fractures in children seems to differ from one country to another. It was described that falls are the most common cause of maxillofacial injury among children, which matches other studies. This can be credited to their lack of direction and uncertainty of motion, which avoids them from sufficiently shielding themselves from sudden motions. Similarly, terraces of the households in the pastoral villages of India are built without proper-barred-boundaries on the walkway where children tend to play without good parent direction. Consequently, plans to reduce the incidence of falls by counseling parents to increase their control of play actions and to keep children from playing unsubstantiated on the terrace and stairs should be developed.<sup>(12)</sup>

The majority of facial fractures in our study were managed by open reduction (47) cases, followed by conservative management (29 patients) and closed reduction in 25 patients. Gupta et al. studied the pediatric facial trauma, in this study all condylar fractures were management by closed technique.<sup>(13)</sup>

For non-displaced condylar fracture minimal mouth opening was suggested and easy going food recommended. Patient reserved underneath opinion and reviewed after one week. Afterward one week patient was requested to do dynamic physiotherapy to sidestep the incidence of TMJ ankylosis. Intermaxillary fixation was done for 7- 14 days for displaced fractures followed by active physiotherapy. All the children had satisfactory outcome with enough mouth opening and motion. Open reduction through stainless steel plate fixator is problematic in children due to complete perpendicular tallness of bone is engaged by enduring tooth buds. Placing

stainless steel screws in fractured bone will increase the chances of damage to the permanent tooth buds. Furthermore, continuing growing of mandible poses hazard of translocation of metallic plates and screws within the bone which will limit possible growing of bone and perpetual teeth. Furthermore if the plates are removed after union of fractured bone, resurvey will be needed.<sup>(14)</sup>

Regarding the method of management, Mishra et al., (2020), study the pattern of maxillofacial injuries in pediatric patients – a hospital based retrospective study, In the this study, open reduction and internal fixation (ORIF) was done in 45.7% of the patients with mandibular fractures followed by circum-mandibular wiring (CMW) in 33.3%. Most of the patients with mandibular fractures were adolescents (51%) of age group 12 to 16 years. So, the choice of treatment was ORIF with manipulates as there are no developing tooth buds inside the bone in this age group. For the patients in mixed dentition period, the most preferred treatment was CMW with the fabrication of an acrylic cap splint.<sup>(15)</sup>

## CONCLUSION

Falls are considered the principal reason of maxillofacial injury in our study sample of paediatrics and the greatest affected site of fractures was the mandible. Some expatriate fractures in young patients can be managed conservatively, while displaced fractures may require open approaches and rigid fixation.

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