Original Article

The incidence of facial injuries in children in Indian population: A retrospective study

Ashrafullah^a, Ramesh Kumar Pandey^b, Apurva Mishra^{b,*}^a Department of Dentistry, G.S.V.M. Medical College, Kanpur, India^b Department of Pediatric and Preventive Dentistry, Faculty of Dental Sciences, King George Medical University, Lucknow, 226003, U.P., India

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ABSTRACT

Objective: To determine the incidence and pattern of facial fracture in children of age 0–16 years of age. **Material & methods:** Patients with trauma reporting to department of paediatric and preventive dentistry and department of oral & maxillofacial surgery from January 2011 to December 2011 were selected for the present study. The records of patients treated for maxillofacial injuries were retrospectively retrieved and analyzed for prevalence, pattern, etiology, and management of maxillofacial trauma. The data collected were subjected to statistically analysis. SPSS software version 16.0 was used for the data analysis.

Results: Total 5049 patients were screened and fifty one was reported to have facial injury. The incidence of facial trauma was 1.01% for the present study. The age wise distribution of the fracture amongst groups (I, II and III) were found 17.65%, 54.9% and 27.45% respectively. The sex-wise distribution of facial fracture was reported twice in male than females. The mandibular fracture was found the most common fracture (0.59%) followed by dento alveolar (0.30%) and midface (0.12%) fractures. Most of the mandibular fractures were found in the para symphysis region. Compound fractures seem to be commonest in the mandible.

Conclusion: The fall was the predominant cause for most of the facial fractures in children followed by road traffic accident. The pattern of facial injury is influenced by the age and the growth of facial skeleton.

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1. Introduction

The past few decades has witnessed the increased in frequency of motor accidents and violence. The most common causes of injury for the young people up to the fourth decade of life include motor vehicle accidents, physical aggression and sports trauma.^{1,2} Facial trauma in children have a devastating effect both on child as well as on family. Children are more prone to facial fracture because on greater cranial mass to body ratio (8:1). One to fifteen percentage of the total facial fractures occur in children.^{3–6} The presence of unerupted tooth, lack of pneumatization of the para nasal sinus, low mineralization of bone, flexible suture lines makes children more vulnerable to green stick fractures when compared to adults.⁷ In addition to this, the prominence of buccal fat pad disperse the impact over a wider region, hence more force is required to fracture the bone in child when compared to adults.

The retruded position of face with respect to cranium in children less than 5 years of age shows less incidence of mid face fractures. As the facial growth progress, the downward and

forward growth of the maxilla makes face more prone for midface injuries.

The aim of the present study was to determine the incidence and pattern of facial injuries in children, reporting in outpatient door at a tertiary health center.

2. Material and methods

Children with facial trauma attending the out-patient department of Paediatric and preventive dentistry and Oral & Maxillofacial Surgery from January 2011 to December 2011 were selected for the present study. The study design was approved by the institutional ethical committee. Detailed information consisting of age, sex, socio-economic status, chief complaint, history of present illness, past medical history, dental history, duration of injury, etiological factor and associated injuries were recorded. A thorough clinical examination as well as radiological interpretation was done for every patient for establishing the diagnosis.

Child patients were divided into three groups according to dentition:

Group I Deciduous dentition (0–5 years)

Group II Mixed dentition (6–11 years)

* Corresponding author.

E-mail address: apurvamishra7@gmail.com (A. Mishra).

DISTRIBUTION OF PATIENTS

Fig. 1. Age wise distribution of patients in each group.

Group III Permanent dentition (12–16 years)

Clinical and investigational examination of the patients was done to see the status of intraoral or extra-oral swelling, facial lacerations or abrasions, bleeding, CSF discharge, soft tissue injuries, deformities of face, ophthalmic involvement, open bite/cross bite, midline deviation, mouth opening, occlusion, avulsed/fractured tooth etc. Child patients with suspected mandibular fracture were advised for PA View of mandible, lateral oblique 30° of mandible right and left. Those suspected condylar or sub condylar fractures were advised for transpharyngeal right/left radiograph. Orthopantomograph and occipitomental view of skull 30° of midface, and computerized tomography were advised in cases of complicated injuries/fractures.

On the basis of clinical and radiographic findings management of injury was done by open or closed reduction and immobilization, wiring, mini bone plate fixation, splinting and replantation, elevation and fixation of zygoma etc. These patients were kept on post-operative follow up for one to six months and data collected was subjected to statistical analysis.

3. Results

This study comprised of 51 child patients with facial injuries attending outpatient Department of Paediatric and preventive dentistry and Oral & Maxillofacial Surgery, Faculty of Dental Sciences, King George's Medical University, Lucknow.

Amongst 5049 children reported to outpatient department only 51 (Fig. 1) were afflicted by facial trauma, thus the incidence being 1.01%. In the present study each site considered as one fracture, thus making total of 77 fractures in 51 children. Pattern of facial fractures occurred in different age groups are given in Table 1. There was no midface fracture found in this age group I patients. From the Table 2, it is evident that out of 49 mandibular fractures, 41.56% of mandibular fractures occurred in male children and 22.08% in female. Nine fractures of the midface occurred in male children only. There was no midface fracture in female. Total number of fractures in male children was 66.23% whereas in female it was 33.77%. Statistically these values are significant ($p < 0.05$).

Hence number of male children involved in facial fractures is much higher than female children (66.23% vs 33.77%). Number and different sites of mandibular fractures are depicted in Table 3. Maximum number of mandibular fractures occurred in Group II (66%) as compared to Group I (18%). Statistical analysis showed significant number of mandibular fractures in Group II as compared with Group I and Group III ($p < 0.05$). However on comparing Group I with Group III, no statistically significant result could be obtained ($p > 0.05$) (Fig. 2).

Table 1

Type/Pattern of Fracture in Different Age Groups.

Group	Midface		Mandible		Dentoalveolar		Total	
	No.	%	No.	%	No.	%	No.	%
I	–	–	9	11.69	3	3.9	12	15.58
II	3	3.9	33	42.86	6	7.79	42	54.55
III	6	7.79	8	10.39	9	11.69	23	29.87
	9	11.69	50	64.94	18	23.38	77	100

$\chi^2 = 14.77$ (df=4); $p = 0.005191$.

Table 2

Sexwise Distribution of Type/Pattern and Number of Different Fractures.

Site	Male		Female		Total	
	No.	%	No.	%	No.	%
Midface	9	11.69	–	–	9	11.69
Mandible	32	41.56	17	22.08	49	63.64
Dentoalveolar	10	12.98	9	11.69	19	24.67
Total	51	66.23	26	33.77	77	100.00

$\chi^2 = 6.178931$ (df=2); $p = 0.045526$.

Table 3

Site of Mandibular Fracture in Different Age Groups.

Location	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Parasymphysis	3	6	18	36	5	10	26	52
Condyle	3	6	9	18	3	6	15	30
Angle	2	4	3	6	0	0	5	10
Body	1	2	2	4	0	0	3	6
Symphysis	0	0	1	2	0	0	1	2
Total	9	18	33	66	8	16	50	100

Table 4 shows midface fractures occurred in different age groups. There were 11.69% total midface fractures which consisted of 55.5% of zygomatic complex fractures (33.33% in Group III and 22.22% in Group II), 33.33% of orbital blow out fractures in Group III and 11.11% of nasal complex in Group II. Statistical comparisons among the three groups could not be made as no case was recorded in Group I.

Table 5 shows that out of 77 total fractures, dento alveolar fractures contributed 18 fractures i.e. 23.88%, most of dento alveolar fractures were seen in maxilla i.e. 61.1%. However, the differences were statistically not significant ($p > 0.05$).

It is evident from Table 6 that 46% mandibular fractures are of compound type, 38% are of simple type and 16% are of greenstick type ($p < 0.05$).

Etiological factors responsible for facial fracture in children were depicted in Table 7. From the table it is evident that fall (58.4%) was the major etiological factor responsible for fracture of facial skeleton in children followed by RTA (24.68%), sports injuries and hit by object resulted 6.49% and 5.19% respectively. While assault and miscellaneous were responsible for 1.3% and 3.9% of fractures respectively. It is also evident from Table 7 that in group I patients fall was responsible for 15.58% of fractures and it was only etiological factors.

In Group II fall was responsible for 32.47% facial fractures, RTA 11.69%, hit by object 3.9% and 2.6% by sports, assault and miscellaneous 1.3% and 2.6% respectively.

RTA was responsible for maximum fractures in Group III patients (12.99%) followed by fall 10.39%, 3.9% by sports and 1.3% hit by object and 1.3% fractures by miscellaneous.

Fig. 2. Gender wise distribution of patients in each group.

4. Discussion

The incidence of facial injuries in children up to 16 years in the present study was recorded to be 1.01%. These findings are in agreement with the Rowe⁸ who stated that in children the incidence of mid facial fracture is less because of prominence of cranium and more elasticity of facial bone than the adults. This can be the reason for the absence of mid face fracture for the group I in the beside sample size in the present study. The incidence of facial fracture in the present study was less than that reported from other countries^{9–12} but was in agreement with the findings of McLennan¹³, Donaldson¹⁴. Posnick¹⁵ stated that the decreased incidence and unique pattern of facial fractures in children are also influenced by the protected environment and developing facial anatomy of the child. The development of antra and paranasal sinuses increases with growth. Frontal prominence decreases and the facial skeleton emerge from protection of cranial base. The mandible occupies a much more vulnerable position and prone to fracture.

The facial injuries are suggestive of parental care in the age group of 1–5 years. In the present study the low incidence of middle third of facial fracture was observed which is in agreement with the findings of McLennan¹³ 0.25% and Schuchardt¹⁶ 0.96%. The flexible suture line and ample amount of buccal fat provides a cushioning effect, transferring the force of impact rendering low incidence of mid face fracture in children.

The present study confirmed that male children were approximately affected twice than female children. This may be attributed due to higher level of physical activity among male children. Our findings are in concurrence with the findings of Hall¹⁷ who depicted the ratio of fracture 2:1 in male/female. Cultural, customs and socioeconomic conditions also plays a vital role therefore it is a universal finding that maxillofacial injuries are common in males compared to females.^{18–20}

In the present study the dento alveolar fracture were observed 24.67% of the total fracture. The upper incisor region is more prone to injuries due to its forward position, so most of the dento alveolar fractures involved anterior region of maxilla. This finding is in contrary to Posnick¹⁵ which might be due to difference in life style and much social protection in childhood by Indian society.

The present study reported that fall from height was the most common cause of facial fractures in children younger than three years of age and after five years of age the leading cause of facial fracture is vehicles or collision with hard object. This finding of the present study is in agreement with the findings of Scariot et al.²¹

Table 4

Site of Midface Fracture in Different Age Groups.

Group	Zygomatic Complex		Nasal Complex		Orbital Blow out		Total	
	No.	%	No.	%	No.	%	No.	%
Group I	0	0	0	0	0	0	0	0
Group II	2	22.22	1	11.11	0	0	3	33.33
Group III	3	33.33	0	0	3	33.33	6	66.67
Total	5	55.55	1	11.11	3	33.33	9	100.00

Comparisons could not be made as all the values in Group I come out to be 0.

Table 5

Age wise Incidence of Dentoalveolar Fracture.

Fracture Site	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Maxillary	2	11.11	4	22.22	5	27.28	11	61.11
Mandibular	1	5.56	2	11.11	0	0	3	16.67
Both	0	0	0	0	4	22.22	4	22.22
Total	3	16.67	6	33.33	9	49.5	18	100

$\chi^2 = 7.0909$ (df = 4); $p = 0.1311$ (NS).

who also observed that accidental fall (38%) is the most common cause of these injuries. However, Holland²² reported that road traffic accident is the most common cause of injury in children. Researchers have found that road traffic accident doubles one's risk for facial fractures compared with other mechanisms, and lack of appropriate restraints (either seat belts or child safety seats) also increases facial fracture risk by 16%.²³

Table 6

Types/Pattern of Mandibular Fracture.

Location	Green Stick		Simple		Compound		Total Fractures	
	No.	%	No.	%	No.	%	No.	%
Parasymphysis	2	4	5	10	19	38	26	52
Condyle	6	12	9	18	0	0	15	30
Angle	0	0	4	8	0	0	4	8
Body	0	0	1	2	2	4	3	6
Symphysis	0	0	0	0	2	4	2	4
Total	8	16	19	38	23	46	50	100

$\chi^2 = 31.53626$ (df = 8); $p = 0.000$.

Table 7
Etiological Distribution of Injuries.

Factor	Group I		Group II		Group III		Total	
	No.	%	No.	%	No.	%	No.	%
Fall	12	15.58	25	32.47	8	10.39	45	58.44
RTA	0	0	9	11.69	10	12.99	19	24.68
Sports	0	0	2	2.6	3	3.9	5	6.49
Hit by object	0	0	3	3.9	1	1.3	4	5.19
Assault	0	0	1	1.3	0	0	1	1.3
Miscellaneous	0	0	2	2.6	1	1.3	3	3.9
Total	12	15.58	42	54.56	23	29.88	77	100.00

$\chi^2 = 17.0421$ (df = 10); $p = 0.07344$ (Non-Significant).

The literature indicates that as the age of patients increases, the patterns of fractures progressively resemble that of adult patients.²⁴ This is in concurrence with the findings of the present study.

Mandible was the most common fractured site in the present study and was in agreement with the findings of the study of epidemiology of facial injuries in children and adolescents in United States done by Imahara et al.²³ and Karim et al. in India.²⁴ The present study depicted that para-symphysis was most commonly affected fracture in pediatric patients. The fragility of mandible is due to high tooth to bone ratio (presence of permanent tooth bud), bony thinness and curvature of mandible. This finding is in disagreement with the findings of Posnick¹⁵ who reported that condyle was the most common site of fracture.

Trauma is the leading cause of mortality and morbidity among child population.²⁵ With in the limitations of study it can inferred that pattern and site of facial injury is influenced by the age of the children. Road traffic accidents, second most common cause of facial injury can be avoided or minimized by illustrating the importance of proper restraint (seat belt) use in India.

5. Conclusion

The present study led to the conclusion that fall was the predominant cause for most of the facial fractures in children followed by road traffic accident. The mandibular fractures were usually found in para-symphysis region. The incidences of facial fractures were reported twice in male than female.

Conflict of interest

None.

References

- Shultz RC, Decamara DL. Athletic facial injuries. *JAMA*. 1985;252:3395–3398.
- Bochlogyros P. A retrospective study of 1521 mandibular fractures. *J Oral Maxillofac Surg*. 1985;43:597–601.
- Haug RH, Foss J. Maxillofacial injuries in the pediatric patient. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2000;90:126–134.
- Gassner R, Tuli T, Hächl O, et al. Cranio-maxillofacial trauma: a 10 year review of 9,543 cases with 21,067 injuries. *J Craniomaxillofac Surg*. 2003;31:51–61.
- Gassner R, Tuli T, Hächl O, et al. Craniomaxillofacial trauma in children: a review of 3,385 cases with 6,060 injuries in 10 years. *J Oral Maxillofac Surg*. 2004;62:399–407.
- Hatef D-A, Cole P-D, Hollier Jr. L-H Jr. Contemporary management of pediatric facial trauma. *Curr Opin Otolaryngol Head Neck Surg*. 2009;17:308–314.
- Gassner R, Tuli T, Hachi O, et al. Craniomaxillofacial trauma in children: a review of 3,385 cases with 6,060 injuries in 10 years. *J Oral Maxillofac Surg*. 2004;62:399–407.
- Rowe HL. Fracture of jaws in children. *J Oral Surg*. 1969;27:497–507.
- Brasileiro BF, Passeri LA. Epidemiological analysis of maxillofacial fractures in Brazil: a 5-year prospective study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2006;102:28–34.
- Gassner R, Tuli T, Hächl O, Rudisch A, Ulmer H. Craniomaxillofacial trauma: a 10 year review of 9,543 cases with 21,067 injuries. *J Craniomaxillofac Surg*. 2003;31:51–61.
- Al-Khateeb T, Abdullah FM. Craniomaxillofacial injuries in the United Arab Emirates: a retrospective study. *J Oral Maxillofac Surg*. 2007;65:1094–1101.
- Adekeye EO. Pediatric fractures of the facial skeleton: a survey of 85 cases from Kaduna, Nigeria. *J Oral Surg*. 1980;38:355–358.
- McLennan WD. Fracture of mandible under age of 6 years. *Br J Plastic Surg*. 1956;9:125.
- Donaldson KI. Fracture in facial skeleton. *N Z Dent J*. 1961;57:55.
- Posnick JC, Wells M, Pron GE. Pediatric facial fracture evolving pattern of treatment. *J Oral Maxillofac Surg*. 1993;51:836–844.
- Schuchard, Rowe, Williams. Quoted in Rowe & Williams (1985). *Maxillofac Inj*. 1960;1:387–402.
- Hall RK. Injuries of the face and jaw in children. *Int J Oral Surg*. 1972;1:65.
- Subhashraj K, Ramkumar S, Ravindran C. Pattern of mandibular fractures in Chennai, India. *Br J Oral Maxillofac Surg*. 2008;46:126–127.
- Erol B, Tanrikulu R, Görgün B. Analysis of demographic distribution and treatment in 2,901 patients (25-year experience). *J Craniomaxillofac Surg*. 2004;32:308–313.
- Cavalcanti AL, Bezerra PKM, Moraes de Oliveira DDM, Granville-Garcia AF. Maxillofacial injuries and dental trauma in patients aged 19–80 years, Recife, Brazil. *Rev Esp Cir Oral Maxillofac*. 2010;32:11–16.
- Scariot R, Olliviera IA, Passeri LA, Rabellato NL, Muller PR. Maxillofacial injuries in a group of Brazilian subjects under 18 years of age. *J Appl Oral Sci*. 2009;17:195–198.
- Holland Andrew JA, Broome C, Steinberg A, Cass DT. Facial fractures in children. *Paediatr Emerg Care*. 2001;17:157–160.
- Imahara SD, Hopper RA, Wang J, Rivara FP, Klein MB. Patterns and outcomes of pediatric facial fractures in the United States: a survey of the national trauma data bank. *J Am Coll Surg*. 2008;207:710–716.
- Karim T, Khan AH, Ahmed SS. Trauma of facial skeleton in children: an Indian perspective. *Indian J Surg*. 2010;72:232–235.
- Singaram M, Sree Vijayabala G, Udhayakumar RK. Prevalence, pattern, aetiology, and management of maxillofacial trauma in a developing country: a retrospective study. *J Korean Assoc Oral Maxillofac Surg*. 2016;42:174–181.