

Original Research Article

Epidemiological characteristics of pediatrics fracture at tertiary care hospital, Malaysia

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ABSTRACT

Background: Childhood fracture resulting from trauma has become a major cause of morbidity, disability and socio-economic burden worldwide as well as Malaysia. So, we aim to assess the various epidemiological parameters that influence the etiology of fracture among the pediatrics population at Melaka, Malaysia and to establish data to develop effective preventive strategies.

Methods: A hospital based cross sectional study was conducted at Melaka General Hospital, Melaka from January 2013 to December 2013. There were total 369 pediatrics fracture cases admitted to MGH during study period.

Results: Among 369 cases, (64.2%) of cases were found among school going age followed by (30.9%) among toddler and (4.9%) of cases among infant. (69.6%) of cases were males and most of them were Malay (87.3%) The incidents occurred mostly in evening around 6pm most significantly in between 10 am to 11 pm. The most common place of injury was at home (40.4%) and fall (77.2%) is the most common mechanism of injury. Left upper extremity involved majority of fracture and common site of injuries were around elbow. Epiphyseal injuries account for (9.4 %) and among them distal radius epiphyseal injury account for (68.6 %) which is statically significant (P=0.00).

Conclusions: We concluded that the common mechanism of fracture was fall, (low energy trauma) occurred at home involving left upper extremity around elbow. We believed that community based education by health care professionals and paediatricians on prevention strategies can be instrumental in reducing the incidence of paediatric fractures.

Keywords: Fracture, Malaysia, Pediatrics trauma

INTRODUCTION

Childhood fracture resulting from trauma is a major cause of mortality and morbidity, disability and socio-economic burden.¹ According to WHO it is expected to be the number one disease by 2020.² The World Health Organization estimates that over 20% of deaths worldwide in children over the age of 4 years old are due

to injury. Most of the burden of injury occurred in low- and middle-income countries, where approximately 95% of all childhood injury deaths occur.³

Pediatric fracture is not only a significant cause of mortality, but also result in long term disability and can pose a significant burden on families. It is estimated in the USA, trauma is the leading cause of death in children

after the first year of life, accounting for nearly 50% of mortality, with an injury occurring every 4 minutes and death every 6 minutes.⁴ Fractures are among the most common adverse events in their lives in USA. However there have been few epidemiological studies on pediatric fractures in a developing country.^{5,6} Present study aims to determine the frequency of different types of pediatric injuries among different gender and age groups and to identify the various modes and place of trauma with respect to their distribution according to the age and gender.

METHODS

A hospital based cross sectional study was conducted at Melaka General Hospital (MGH), Melaka, Malaysia from January 2013 to December 2013. The inclusion criteria were children up to 14 years of age presented to the accident and emergency or orthopaedic out-patient departments of MGH. Exclusion criteria were presence of any specific pathologic process known to affect bone and mineral metabolism and presence of any specific treatment known to affect bone and mineral metabolism.

Data was collected in the form of questionnaires by the resident doctors on duty who recorded the characteristics of all patients and their fracture patterns in the prescribed performa. This consisted patient's details including mechanism and details of injury. A detailed history was taken from parents or relatives accompanying the children and the examination was done by the orthopaedic registrar and all children were assessed in accordance to their age, sex and ethnicity. The details of the trauma were recorded with regards to time, place, mode of injury, type of injury, site of trauma, place of trauma, and plan of treatment. All the study patients were explained about the purpose of the study and informed consent obtained. All the registered cases were taken as sample to fill up in Performa with the help of responsible/assigned staff nurses.

All the collected data were screened for accuracy. Incompleteness and inconsistency was corrected by examining answers to all questions at the same time. Data were analysed by using SPSS, version 18.0. Means and standard deviation (SD) were found out for continuous variables and proportions for categorical variables. Chi square value was calculated for the significant difference between groups and the corresponding 95% confidence interval (CI) was also be computed.

RESULTS

There were total 369 cases during study period and among them, (4.9%) of cases were infant (less than 1 year), (30.9%) among toddler (1-4 year) and (64.2%) of cases were occurred among school going age (5-14years). Among them (69.6%) were males and most of them were Malay (87.3%) followed by Chinese (5.7%), Indian (6.0%), and Others (1.1%). The socio-demographic

character of patients was shown in Table 1. The incidents occurred mostly in evening 6pm followed by 10 am respectively (Figure 1) most significantly in between 10 am to 11 Pm.

Table 1: Socio-demographic character of patients.

		Frequency	%
Age group	Infant	18	4.9
	Toddler	114	30.9
	School going	237	64.2
Gender	Male	257	69.6
	Female	112	30.4
Ethnicity	Malay	322	87.3
	Chinese	21	5.7
	Indian	22	6.0
	Others	4	1.1
Education	Preschool	138	37.4
	School	231	62.6

The most commonly encountered fracture site among all age-groups was the elbow (28.5%), followed by the distal radius (19.5%), shaft of forearm bones (16.8%), and clavicle (7.6%), Foot and ankle (6.2%) and tibia and femur (5.1%) each. (Figure 2)

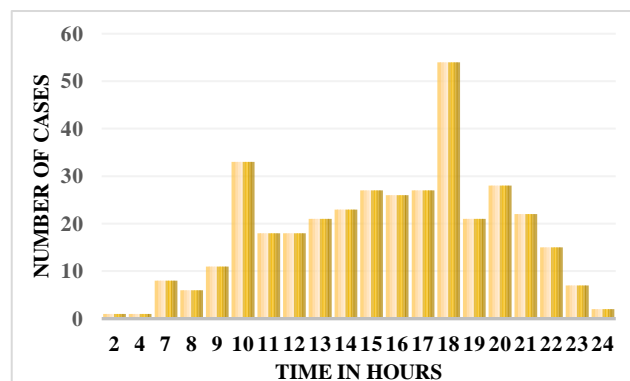


Figure 1: Pattern of time that injury occurred.

The injuries were more prone to occurred at left side (54.2%) compare with right side (45.3%). Majority of the fracture were closed fracture (95.7%). Fractures in upper extremity were more common than lower extremities (86.14%).

Table 2: Radiological findings for elbow fracture.

Elbow fractures	Frequency	%
Supra-condylar fracture	67	63.9
Fracture lateral condyle of humerus	16	15.2
Fracture radial head	10	9.5
Fracture olecranon process of ulnar	4	3.8
Fracture medial epicondyle of humerus	8	7.6
Total	105	100

At elbow region, supracondylar fracture was the more common (63.9%) followed by fracture of lateral condyle of humerus. It was observed that supracondylar fracture was common in boys (64.2%) in the school going age group (49.3%).

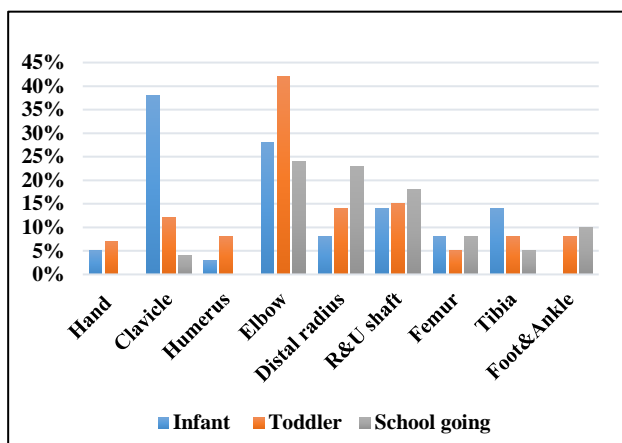
The left side fracture was more common than the right (58.2%) and mechanism of injury was fall (92.5%) which occurred at home (49.3%) followed while playing sports in playground (20.9%). Epiphyseal injuries account for (9.4 %) and among them distal radius epiphyseal injury account for (68.6 %) which is statically significant

($P=0.00$). Most of distal radius epiphyseal injuries (80%) of cases were observed in school going age and 7 (20%) of them are toddlers.

Regarding mechanism of injury for the paediatric trauma cases, the commonest mode of injury was fall (77.2%) followed by road traffic accident (RTA) (10.8%), athletic injury (7.0%) and fight among others (0.8%) (Figure 3). The environmental aetiology of paediatric fractures were shown in (Table 3), the commonest place of injury was at home (40.4%), followed by playground (24.9%), road traffic accident (13.3%) and school (16.0%).

Table 3: Place of injury.

	RTA	Sport	Home	School	Others	Total	
Infant	(0.0%)	(0.0%)	(100.0%)	0(0.0%)	0(0.0%)	18(100.0%)	DOF=8
Toddler	(7.9%)	(17.5%)	(63.2%)	(4.4%)	(7.0%)	114(100.0%)	Chisquare=81.7
School going	(16.9%)	(30.4%)	(24.9%)	(22.4)	(5.5%)	237(100.0%)	P=0.000
Total	(13.3%)	(24.9%)	(40.4%)	(15.7%)	(5.7%)	369(100.0%)	

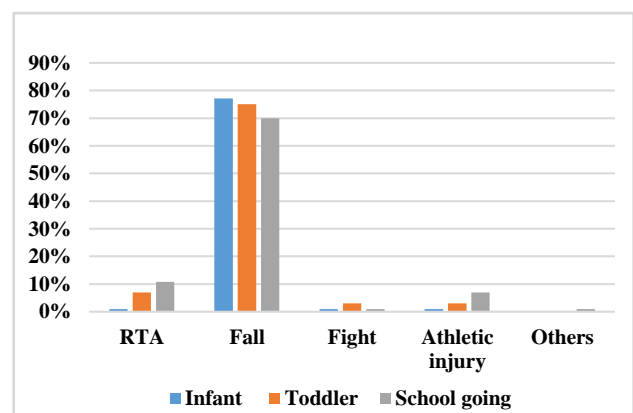


Infant – less than 1 year, Toddler – 1-4 years, School going- 5-14 years.

Figure 2: Relation between site of injury and age group, chi square value =59.5, $P=0.000$.

At the home environment, fracture cases among infants and toddlers were common and the commonest cause were related to falls from cots, beds, tripping over furniture, or fall from heights. Injuries from playground happened near the house. Scuffles or fights among siblings or friends were more commonly seen in elder children. Among vehicular accidents, (81.6%) involved school going children whereas passenger accident being the most common, which contributed to (57.1%) of the injuries, bicycle accident (22.4%), vehicle versus pedestrian (16.8%). At the school environment, fractures were mainly due to athletic activities or fights. There were no cases of child abuse documented. Sports and playground injuries commonly occurred at football field (29.3%), fall from monkey bar (18.4%), fall from swing

(14.1%), Basketball (3.26%), long jump (3.26%), Badminton, running, bicycling and others at playground (30.38%). Regarding the type of fracture, most of the fracture were closed (95.3%) compare to open fracture (4.3%). Among the fracture cases, only one fracture was associated with neurovascular injury. Most of the fractures (75.3%) were managed conservatively and (24.7%) of cases needed to undergo surgery. Most common mode of the conservative treatment was reduction and POP application (83.8%) while surgical treatment involved fixation of fracture with K-wire (69.3%) followed by plating (9.9%) and external fixation (4.4%). Total duration of hospital stay among the cases were one day (39.2%), three days (22.9%). Majority of the cases (96.7%) were duration of hospital stay less than a week.



Infant – less than 1 year, Toddler – 1-4 years, School going- 5-14 years.

Figure 3: Relation between mechanism of injury and age group, chi square value =24.2, $P=0.000$.

DISCUSSION

Fractures are common and comprises of about 10-25% of all paediatric injuries and cause significant morbidity.^{7,8} In our study, we described fracture distribution, mechanism of injuries and their differences in distinct age groups and gender among the paediatric population. The observation suggested that there was an overall predominance of males over females with the ratio of 2:1 and was highest among the school going children. This was consonant with other studies reporting similar findings. This predominance is attributed to biological and social active and risk taking behaviour among males with increasing age.⁹⁻¹¹ The majority of children belong to Malay ethnicity similar to study by Asim et al.⁷

The majority of fractures occurred at home 148 (40.1%) which was similar results with a further study.^{6,9} In the home environment, among infants and toddlers, most fractures were related to falls from cots, beds, tripping over furniture, or from heights.¹ Injuries are reported from playground fixtures near the houses.⁹ This highlights the importance of parental supervision in the prevention of injuries.

Among road traffic accidents, 81.6% involved school-age children. In this study, passenger accident being the most common followed by bicycle accident. Most of the fracture cases were caused due to fall (77.2%) and it was similar with the results of other studies.^{2,7,12} Globally road traffic accidents are the foremost cause of unnatural deaths in children that is estimated to contribute to an annual loss of more than 260,000 lives in the 0-19-year age group.¹³ The increase in road traffic accidents is a major problem in Malaysia attributed to the carelessness and disregarding of traffic rules by the drivers. In Ministry of health report 2004, it is identified that more than half of unintentional injuries in children are due to road traffic accidents.¹⁴ The physical vulnerability, the innate curiosity to experiment and inability to comprehend to dangers are some of the characteristics that place the children vulnerable to accidental injuries. With the introduction of exclusive motor cycle lanes, a 27% reduction in crash rates has been recorded. However, UNICEF reiterates there is still a need for shared responsibility between daily practices in homes and communities for injury prevention.¹⁵

In the school environment, fractures were associated with sport activities or peer fights. This calls for educational intervention in the schools on the causes, safety and prevention of fractures that can result in life long disability.^{16,17}

The time of the day fractures in our study appears to be increased in the evening. This is related to high activity observed among children in the evenings. This is in contrast to study from Sweden and Texas that reported increased incidence in the mornings related to favourable climatic conditions.^{16,17} Further, studies from Africa and

Tehran also reported high rate of injuries during the day that is explained by heavy traffic and excess human activities in the city during the day time.^{18,19} One study reported no variation in the time of the day for fracture and is evenly distributed in the morning, afternoon and evening.⁹ This signifies that there is environmental influence in the occurrence of injuries that can be adopted for prevention strategies.

The most common site of injury among all age-groups was the elbow, followed by the distal radius, forearm shaft, and clavicle. Our study confirms that the upper limb is more frequently involved representing about 80% of fractures as confirmed in previous epidemiological studies.²⁰ The fact that majority of our injuries are related to fall in home, suggestive of low impact trauma with arm being commonly involved as confirmed by other studies. There are studies reporting age-related differences of the upper limb fractures. The sites described include humeral fractures that are common in the first 6-7 years in both genders and followed by radius-ulna fractures in 10-11 years in girls and 12-13 years in boys.²¹

Regarding left and right upper limb involvement, most of the injury happened at left site (54.2%) and it was similar with other studies predicting that the non-dominant side is more likely to be injured in children.^{22,23} When exposed to simple indirect trauma the non-dominant hand is more likely to strike the ground than the dominant one which is holding on to the object.

Limitation of the study was conducted at one hospital (MGH) among Malaysia. So that the results cannot be generalized because our interpretation of the results applies to this study population. However, we believe that our data will further contribute to the development of appropriate prevention and treatment strategies in the future.

Implication of study to provide local epidemiological references of paediatric trauma profile for the orthopaedic and trauma surgeons involved in managing paediatric trauma injuries.

CONCLUSION

In conclusion, our study provided valuable epidemiological data about paediatric fractures, their differences which existed in the prevalence, characteristics, circumstances of the injury that is related to the age and gender in Malaysia. Health care professionals and paediatricians can be instrumental in reducing the incidence of paediatric injuries by participating in child education, research, and programs that promote safe play. Paediatricians and health care professionals should be involved in preventive measures like safe home design and child education programs that advocate's safe playing environment.

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