

## **Childhood injuries seen at an Emergency Department**

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### **Abstract**

**Objective:** To determine the relative frequency and pattern of injuries in children less than 15 years of age.

**Methods:** We conducted a retrospective study of all children aged 15 and below seen with injuries and poisoning in an Emergency Department (ED) during 2000 and 2001, and reviewed their records. Patterns of injury among all children were examined by location of occurrence, circumstances, anatomy and mechanism of injury, injury type, and patient disposition.

**Results:** A total of 1412 children were seen in an ED with injuries and poisoning, with a mean of  $7.5 \pm 3.2$  years. Boys experienced significantly higher rates than girls. Most injuries occurred at home. Playing was the leading context of injury in both genders. The most common mechanisms of injury were falls (44.5%), road traffic injuries (14.0%), and foreign body ingestion/ inhalations (10%). In children up to the age of 5, head and face, while in older children, extremities were more frequently involved. Eighty seven patients (6.2%) were admitted to the hospital, and six patients died (0.42%).

**Conclusion:** A large proportion of falls, along with low proportion of road traffic injuries and foreign body ingestion/ inhalations, is characteristics of childhood injury profile in our country (JPMA 58:114;2008).

### **Introduction**

Injuries have historically been neglected as a public health issue. Childhood injuries are the leading cause of death and disability for children over the age of one year in many developed countries and also in some developing countries. Childhood injuries account for 16 million ED visits, 600,000 hospitalizations, and 20,000 deaths per year in US.<sup>1</sup> Deaths in childhood from injuries exceed childhood deaths from all other causes combined.<sup>2</sup> Injury related death

and disability-adjusted life years (DALY's) in 1990 for children aged 0-14 years accounted for 49% of all Injury related DALY's, although this age group makes up only about 30% of the population.<sup>3</sup>

In developing countries the contribution of injuries to childhood morbidity and mortality is overshadowed by the prominence of childhood communicable diseases.<sup>4</sup> The research on injuries in Pakistan remains limited. While children aged <15 years constitute about 43% of the population, information about their injuries is scarce.

Although the epidemiology of childhood injuries has been studied in some developed countries, no such study had been done in Pakistan. The paucity of reliable and valid data on injury frequency, cause, and outcome has hindered the formulation, implementation, and evaluation of effective injury prevention programs.<sup>5</sup> This study was carried out with an objective to know the pattern and outcome of childhood injuries and to discuss the possible preventive measures that may be adopted in developing countries.

### Methods

The study was conducted at The Aga Khan University Hospital (AKUH), a 550-bed-acute care urban centre with an annual census of about 38,000 emergency section visits.

We carried out a retrospective study of injured children (defined as age  $\leq 15$  years) presented at the Emergency Department of AKUH, Karachi from 1 January 2000 to 31 December 2001.

The information collected included the victim's record number, age, gender, injury intent, nature of injury, place of injury, mechanism of injury, and patient disposition. Clinical summaries were extracted for every patient and in many cases telephone calls were made to derive "essential" data, for example: use of child restraints/seat belts in vehicle collisions. Age was stratified into four groups, as from 0-1, 2-5, 6-10 and 11-15 years. Age up to 5 years represents the pre-schoolers and 6 to 12 years are the school-going children. This was to allow easier analysis of data. The data collected is based on World Health Organization core minimum data set.<sup>6</sup> The study protocol was approved by the Institutional Ethical Review Committee.

Statistical Package for Social Sciences v 10.0 was used for simple calculation of frequencies, percentages and means. Statistical analysis was performed using the Chi-Square test for non-parametric data. Fisher's exact test was used for small samples. The sub-analysis was performed to compare mechanisms of injury in pre-schoolers ( $\leq 5$  years) against school-going children (6 to 12 years).

### Results

A total of 1412 children were seen in the ED with injuries, representing 6% of the total number of children seen within the period of this study. The ages ranged from 1 month to 15 years, with a mean of  $7.5 \pm 3.2$  years. There were 930 males and 482 females, representing about 66% and 34%, respectively, with the ratio of 2:1. Table 1 provides detailed information regarding the injuries by age group, sex and mechanism.

A total of 629 patients (44.55%) were involved in

**Table 1. Injuries by age group, sex and mechanism.**

Age & Sex	Sub-total		Sub-total		Total		Both Sexes (%)
	0-5 yrs		6-15 yrs				
Activity	M	F	M	F	M	F	
Fall	219	104	198	78	247	182	629 (44.55)
Traffic injury	42	17	56	47	130	64	194 (13.74)
F.B	27	21	20	18	53	39	92 (6.51)
Stab/cut	34	27	44	48	122	75	197 (13.96)
Gun shot	2	1	1	0	4	0	5 (0.35)
Burns	43	18	21	25	66	43	109 (7.71)
Bites	8	5	18	26	37	31	68 (4.82)
Assault	0	0	6	4	10	4	14 (0.99)
Poisoning	24	15	1	5	27	20	47 (3.33)
Other	13	9	16	14	34	23	57 (4.04)
Total (%)	412 (65.5)	217 (34.5)	381 (33.9)	265 (65.8)	930 (65.8)	482 (34.2)	1412 (100)

**Table 2. Injury type by age group.**

Age & Sex	0 - 5 Yrs		6-15 Yrs		Total (0-15 Yrs)		P-value
Type	(%)		(%)		(%)		
Head and face	214	34.0	178	22.8	392	27.8	<0.001
Upper limb	130	20.6	229	29.2	359	25.4	<0.001
Lower limb	160	25.5	267	34.1	427	30.3	<0.001
Trunk/multi-trauma	12	1.9	25	3.2	37	2.6	<0.001
Others	15	2.4	18	2.3	33	2.3	0.67
Foreign bodies	48	7.6	44	5.6	92	6.5	0.03
Poisoning	50	8.0	22	2.8	72	5.1	<0.001
Total	629		783		1412		

falls. Falling on ground level while running or playing or both accounted for 503 patients (80%). Falling from heights accounted for 126 patients (25%). About 60% of this group fell from low height such as furniture, stairs, and fences, whereas 18 patients, mainly infants, fell from beds. The percentage of injuries associated with walkers was 6.5%, and most (86%) resulted from falls down the stairs. There were 230 cases of playground injuries in this study. The more common ones were falls from the monkey bars, swings, slides and seesaw, mostly with injuries to the upper limb and head.

There were 194 road traffic accidents (13.8%). After the age of three years, the pedestrian injury was more than that of motor vehicle occupant, and remained higher for all subsequent age groups. The pedestrians hit by automobiles, motorcycles, and bicycles accounted for 77.3%. Forty five passengers in automobiles and motorcycles (22.7%) were injured. Those in passenger vehicles were more often seated at the rear (66%), and almost no child was protected in any way.

There were 92 patients with foreign bodies recovered from bodily orifices. In 44 cases, the foreign bodies were recovered from the ears, accounting for 48% of all patients and 31 foreign bodies (33.6%) were recovered from the nostrils. Twelve foreign bodies were swallowed, mainly coins, accounting for 13%. In 5 (5.4%) patients, the foreign bodies were inhaled into the larynx.

Injuries due to inedibles were more frequent than those due to edibles (60% versus 40%). Among inedible, small parts of toys, coins, artificial jewelry and office supplies were the foreign bodies most frequently ingested or aspirated. As for those injuries related to edibles, betel nuts were involved in the majority of ingestions and aspirations (68%), followed by fish bones (20%).

Burns occurred in 109 patients, accounting for about 8% of all patients involved. All burns occurred at home, with more than 80% resulting from scalding. Most of these occurred in children reaching out and spilling cups or kettles containing hot water. Bites were present in 68 patients (5%). Dog bites accounted for 74%, followed by cat bites in 12%, bee stings in 8% and snakebites in 6%. Forty seven patients were seen for accidental ingestions (3.3%). Locally available households drugs and chemicals such as diazepam and antiseptic solutions occurred in half of the patients; the other cases involved other chemicals. These were seen in patients working or playing with sharp objects or implements such as razor blade and kitchen knives. Lacerations occurred in 197 patients (14%) and assault in 14 patients (1%), while the gunshot injuries were seen in five patients (0.4%).

The anatomic injury description and nature of injuries are described in Table 2.

The frequency of head or face injury was more in children up to five, while injury to the extremities was most common in children more than five years age. Preschool children sustained a higher proportion of head and face injuries, foreign bodies, burns and poisoning. The school-going children sustained more limb, trunk and multi-trauma. Skull fractures occurred in 3% of all head injuries. Musculoskeletal injuries were accounted for about 40% of the injuries. Almost 75% of the cases consisted of lacerations, superficial abrasions, bruises and inflammations. There were 54 cases of fractures; 38 fractures involved the lower extremities, 14 occurred in the upper extremities, and 2 involved other bones.

The place of occurrence of injuries is illustrated in Table 3. Homes were the most common place of injury, accounting for 742 patients (52.6%), followed by injuries on the playground and street in 414 patients (29%) and in schools in 226 patients (16%); about 2% at miscellaneous sites.

**Table 3. Injuries by age group and place of occurrence.**

Age & Sex	0 - 1 Yrs	2 - 5 Yrs	6-10 Yrs	11-15 Yrs	Total
Place					Both Sexes
Home	71	426	196	49	742 (52.55%)
School	0	19	155	52	226 (16.0%)
Street	0	37	101	46	184 (13.03%)
Playground	3	64	111	52	230 (16.29%)
Others	5	4	13	8	30 (2.13%)
Total	79	550	576	207	1412

Of the total, 1325 patients (93.8%) were treated as outpatients, while 87 patients (6.2%) were hospitalized. School-going children were more likely to be admitted ( $p=0.02$ ) or referred to a consulting clinic ( $p<0.0001$ ) while pre-schoolers were more likely to be discharged ( $p<0.0001$ ). There were 28 patients with severe injuries and six patients died (0.42%); five due to multiple injuries resulting from road traffic accidents and one due to a fall.

## Discussion

The data suggest that descriptive injury information collected using computerized ED logs is useful in describing the mechanisms and types of injuries, as well as determining the patterns of injury. Injuries accounted for 6% of presentations to the ED in children 15 and under during the study period. Overall, there was disproportionately large number of boys in the study population. Whether this is because of increased frequency of injury among boys, or because of a greater tendency for injured boys to be brought by their parents to ED is unclear. The male predominance noted has been similarly reported in other countries. Most of the patients seen had mild to moderate injuries while 28 patients had severe injuries, with six deaths. This is in contrast to a study reported from the same city.<sup>7</sup> We believe that the ambulance-based data are likely to be representative of more severe injuries, as the pattern of ambulance use in Karachi shows that people only use ambulances when they are in extreme distress.<sup>8</sup>

Our data revealed that a large number of children are injured during the summer months. Injuries presenting to the ED peaked during June to August, when schools were closed for summer holidays. This is consistent with the findings of other studies. In Toronto, the highest numbers of presentations were recorded in August and September.<sup>9</sup> This phenomenon may be explained by longer playing times.

Pre-school children were more likely to sustain home injuries, compared to school-going children, as they spend more time at home. They also have a higher proportion of head injuries, due to their relatively larger head to body ratio. They are more prone to foreign bodies, burns and poisoning due to lower awareness. School-going

children were more likely to sustain injuries in road accidents, sports, at playgrounds or schools, as this is where they spend more time, with more limb, trunk and multi-trauma.

Home injuries were the commonest (52.6%) in our study. This is consistent with previous studies.<sup>10</sup> It was followed by injuries at playgrounds, schools, and the street. The commonest mechanism of injury was a fall, as reported in other studies.<sup>9,11</sup> It was categorized as a fall down the steps, a fall from a height, a fall from an object, and others. An infant walker was a contributor to falls from stairs.<sup>12</sup> Specific prevention messages for this age group should include the use of stair gates and the elimination of infant walkers. Accidental falls from windows are uncommon in our study. However, we recommend legislation requiring all high-rise buildings to have suitable grills for the windows and balconies. There were many cases of rollover falls from beds in infants. We usually nurse our infants in adult beds rather than cots, and more public education is needed to stop this dangerous practice and encourage the use of cots. Injuries from slamming doors are another area of concern, especially in the under-two-year-olds. We recommend all doors at home to have latches or self-closing hinges to prevent slamming.

Injuries resulting from traffic collisions are a major cause of childhood death, hospitalization, and disability throughout the world.<sup>13</sup> In urban areas, the children are at increased risk especially for pedestrian injuries.<sup>14</sup> Our study, like other studies, showed pedestrian injuries to be more common and more severe than the injuries to vehicle-occupants.<sup>15</sup> Supervision and preventing access of young children to areas used by vehicles are essential prevention measures. Environmental measures are additional strategies for the prevention of paediatric pedestrian injuries. Our study seems to indicate that use of appropriate child restraint devices is very low. This is due to the absence of the legislation requiring mandatory child restraints. We feel it is high time to put this legislation in effect.

Playground safety appeared to be a big problem in our study, as apparently there are no standards for playground safety. Injuries sustained during play are common. Epidemiologic data indicate that playground-related injuries most often are equipment-related. It is found that 34% of playground injuries were related to climbers, 30% from slides, and 22% from swings.<sup>16</sup> We recommend the upgrading and maintenance of existing playgrounds. Our study reports most cases with falls from monkey bars and swings. Rubber or bark surfacing is associated with a low rate of injuries and we support their use in all public playgrounds.<sup>17</sup> We believe that playing on monkey bars increases the risk of injury in playgrounds and they should

generally not be installed.<sup>17</sup>

Our results regarding the unintentional poisoning showed that it continues to be a major health problem in the paediatric population. Similar to previous studies, we found that most of the children exposed to poisons were younger than 5 years; the majority were boys, and most of the poisoning occurred at the child's own home.<sup>18</sup> Similarly, household products and medication (mainly minerals, analgesics, anti-inflammatory drugs, and insecticides) were the most common poisoning agents.<sup>18</sup> However, the lack of legislation of the use of safety caps and containers for medicines also contributes to poisoning exposure in children. The only prevention effort shown to be effective has been mandating child resistant packaging of poisonous substances.<sup>19</sup>

Our findings are similar to previous studies that found foreign body aspirations and ingestions a significant problem, and continues to represent an important cause of childhood morbidity and mortality.<sup>20</sup> We found the nuts (ground/betel nuts and "supari") have a high injury potential, causing suffocations more often to young children aged 1-4 years old, but also to infants and older children. We strongly suggest that, compulsory safety labeling should be endorsed that it must not be given to children less than 7 years old.<sup>21</sup> Indeed, small objects should be kept out of reach of children, and care should also be taken to choose age appropriate toys, avoiding those with small parts that can become foreign bodies.

Home scalding usually occurs in children reaching out and spilling cups or kettles containing hot water.<sup>22</sup> Care should be taken not to leave hot water on readily accessible tabletops and appropriate child guards used for cookers-hoods and ovens. A recent review described risk factors of burns, and that included lapses in child supervision, storage of flammable substances in the home, low maternal education, and overcrowding, and also several treatment modalities and preventive efforts.<sup>23</sup>

Drowning fortunately was not an issue in our cohort. However, we found that many families keep pails of water at home, and toddlers may accidentally drown in it. More public education is required to ensure that children do not have unsupervised access to them. Similarly, no child was brought from a swimming pool after drowning/ near drowning, as children do not commonly go to the pools. However, legislation regarding fencing of all private pools to prevent unsupervised access has been found to be helpful and should be considered.

Public education efforts regarding child safety could involve the media. We also note that in our study, injuries were frequent in the school-going age. Safety talks should be arranged for school children and their parents. Recently

an intervention trial demonstrated the effectiveness through a home visit aimed at improving the home safety practices of families with young children in Karachi.<sup>24</sup>

There are several limitations to our study: it is not population based, only injuries presented to the ED are included, absence of denominators needed for a direct calculation of injury rates in children for a given city or region, and injury severity is not recorded. There were also inherent deficiencies due to retrospective nature of the study. Despite these limitations, we feel that injury-related visits were reliably ascertained from computerized ED logs. However, there is a need for more complete documentation of circumstances surrounding injuries and for standardization of data elements on ED logs and treatment records. Therefore we recommend an ED-based injury surveillance system to collect injury data. With the increasing number of ED becoming computerized, existing ED systems can be tailored to collect injury data. This can then be collated in a National Registry for regular analysis.<sup>25</sup> With the co-ordination even data from primary health care providers can be included. This will greatly help in promoting injury prevention.

### Conclusions

Childhood injuries contribute significant morbidity and mortality in Pakistan. Falls were the commonest type of injuries in the study at all locations - home, outside the building and in school. We advocate the establishment of an ED-based injury surveillance that may lead to a national injury surveillance database. Injury prevention strategies have been suggested and it is hoped these may contribute to addressing preventable childhood injuries in Pakistan, and other similar countries.

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