

Pattern and risk factors of childhood injuries at Emergency Department of Suez Canal University Hospital

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Abstract

Injuries are a leading cause of death among children and young adults. Most of these injuries are caused by motor vehicle crashes, falls, and burns. Intentional injuries in all its forms account for over 1.5 million deaths a year. To determine the pattern and characteristics of childhood injuries and to explore the risk factors for such injuries at the emergency department of Suez Canal University Hospital. A cross-sectional study at the emergency department in Suez Canal University Hospital targeted children aged ≤ 18 years presented with an injury from June 2013 to April 2014. The tool in the study was Global Childhood Injury Surveillance Instrument to interview the parents or guardians arriving with injured children. Of the total of 402 injured children, 264 (65.7%) were males and 138 (34.3%) were females. 188 cases (47%) were below 6 years of age. Children travelled an average of 10.5 km to the hospital. Most common type of injuries were falls (29.4%) followed by motor car accidents (17.4%), struck or hit by an object (15.7%), burn (10.4%) and poisoning (8.2%). 44% of childhood intentional injury arrived at the emergency department caused by their friends or acquaintance, 30% by a child, 13% by the unrelated caregiver and 4% by teachers. There were 402 childhood injury-related emergency department visits in Suez Canal University Hospital between June 2013 and April 2014, 152 injury-related inpatient hospitalizations (37.8%) and 21 childhood injury-related deaths (5.2%). 94.3% of them were due to unintentional injuries. Raise public awareness of speeding, seat-belt wearing and home safety.

Keywords: Risk factors, childhood injuries, emergency department of suez canal university hospital

Introduction

Injuries are considering the main cause of morbidity and mortality among children and young adults. Most of these injuries are caused by motor vehicle crashes, falls, and burns; many are preventable [1]. Report from the United Nations Children's Fund, childhood injuries decreases by 50% in high-income countries (HIC) between 1970 and 1995. Over 875 000 children less than 18 years of age die every year in the world as a result of injuries, mostly in middle and low-income countries, where injuries account for 13% of the total burden of morbidity among children less than 15 years of age. Unfortunately, several reports from low-income countries have shown the opposite trend [2].

Intentional injuries "violence" in all its forms responsible for over 1.5 million deaths a year, some 90% of which occur in middle and low-income countries. This total can

be divided into 52% due to suicide, 35.5% due to homicide, and just over 12% as a result of war or another form of conflict. In 2008, over 16 million cases of non-fatal injuries due to violence were severe enough to require medical attention [3]. For each young person killed, 20-40 more sustain injuries requiring hospital treatment [4].

Injury surveillance provides an understanding of the incidence, magnitude, and trends of injuries identify populations that have a higher incidence of injuries. Surveillance can help identify injuries on which to focus prevention efforts. Priority can be given to the most prevalent injury causes, those that show an increasing incidence, or those that affect a population of special interest, such as children [5].

The process of risk factor assessment helps identify individual or community factors that increase the risk for injury. Risk factors can be intrinsic, such as age or gender; behavioral, such as drinking and driving; or environmental, such as a poorly maintained roadway. Injury events are usually influenced by many risk factors. An intervention strategy is defined following careful surveillance and risk factor assessment. However, many interventions are

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implemented in the absence of such information. Identifying independent risk and protective factors for childhood injuries is necessary for the development of prevention strategies. The overall importance of a risk or protective factor is a function of both the magnitude of the risk imposed by the factor and the prevalence of the risk factor in the population [5]. This study sheds new light on the scale of the problem as well as on risk factors of childhood injuries and to draw attention to the preventability of these injuries.

There is considerable variation in injury rates among children, depending on their age group, location of residence, gender, family income, race/ethnicity, and other factors. For example, motor vehicle crashes are more common in rural countries. Also, males have higher rates of injuries compared to females, though this gender gap is narrow in early childhood and steadily widens throughout later childhood and adolescence. Some demographic characteristics, such as race, may be a marker for other underlying related factors, such as poverty or education [6].

As injury is a leading cause of death and disability among children worldwide, preventing child injury is closely connected to other issues related to children's health. Tackling child injury must be a central part of all initiatives to improve the situation of child mortality and morbidity and the general well-being of children. In recent decades, programs related to child survival targeted infectious diseases and nutritional deficiencies in infants and children. Campaigns were conducted for breastfeeding, growth monitoring, immunization and oral rehydration therapy. Millions of lives were saved, and the lives of many more children were improved. However, unless injury prevention is included in such programs, as these children grow up and are subjected to injuries, the impact of the large investments in immunization, nutrition and maternal and child health care may be lost [7].

Extremities trauma is extremely common in the pediatric age group. If all musculoskeletal tissues are considered, they would constitute 40% of all childhood injuries. Such injuries include, bone fractures, dislocations, strains, sprains, tendon disruption, muscle tears, and joint pain from injuries such as bone bruises. It has been reported that fractures are a common event in childhood with considerable variations in the incidence rate from 1.2% to 5% among different studies. This variability may depend on the child's condition, age, and social and environmental factors [8].

Injury surveillance provides an understanding of the incidence, trends, and magnitude of injuries, identifies specific populations that have a higher incidence of injuries. Surveillance can help identify injuries on which to focus prevention efforts. Priority can be given to the most prevalent injury causes, those that show an increasing

incidence, or those that affect a population of special interest, such as children [9].

The burden of injury on children falls unequally. It is heaviest among the poor with the burden greatest on children in the poorer countries with lower incomes. Within all countries, the burden is greatest on those from low-income families. Overall, more than 95% of all injury deaths in children occur in low-income and middle-income countries. Although the child injury death rate is much lower among children from developed countries, injuries are still a major cause of death, accounting for about 40% of all child deaths [10].

Goal of the study

To control childhood injuries in order to minimize its impact and raise public awareness about magnitude, risk factors, and prevention.

Objectives of the study

To determine the pattern and characteristics of childhood injuries and to explore the risk factors for such injuries at the emergency department of Suez Canal University Hospital.

Subjects and methods

Type of the study: The study was a cross-sectional study.

Setting: Emergency Department in Suez Canal University Hospital.

Target population:

Children aged ≤ 18 years presented with an injury to the emergency department of the Suez Canal University hospital seeking care.

Inclusion criteria included: Children aged ≤ 18 years suffered from any unintentional or intentional injuries

Sample size: All cases of childhood injuries during six months duration starting from June 2013 to April 2014 were included in the sample of the study.

Study tool: The tool in the study was Global Childhood Injury Surveillance Instrument (interview questionnaire) to interview the parents or guardians arriving with injured children [11]. The intent of the forms was to describe: the size and characteristics of injuries; the population at risk; the risk factors; and the trends in time and space. The questionnaire included: age, gender, education level, occupation, intent, and place of occurrence, mechanism, nature of injury, seat belt/helmet usage, date/time of injury and residence.

Data Analysis

Quantitative data was expressed as mean $\pm$ standard deviation while qualitative data was expressed as numbers and percentages (%). Chi-Square and Fisher's Exact tests were used to test the significance of difference for qualitative variables. A probability value (p-value) less than 0.05 was considered statistically significant.

Ethical Considerations

Permission was granted from the director of Suez Canal University Teaching Hospital. Children and their caregivers were approached by the researcher to receive a verbal and written explanation of the purpose and benefits of the study. Those who were eligible to participate in the study were asked to review and sign the consent form.

Results

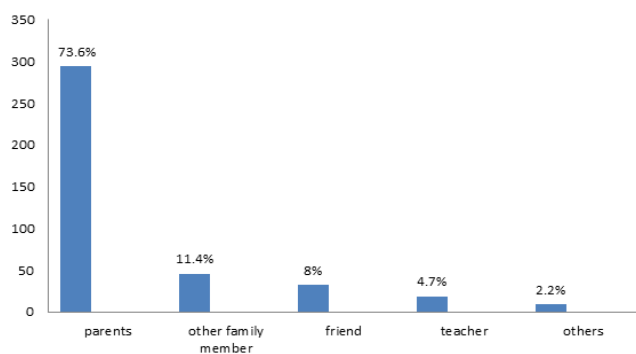
The study sample consisted of 402 Children aged ≤ 18 years presenting with an injury to the emergency department of the Suez Canal University hospital seeking care between June 2013 and April 2014. About 70% of cases arrived hospital after 12:00 pm and the time of injury occurred after 12:00 pm in about 65% of cases with mean time $\pm$ standard deviation was about 14:00 $\pm$ 4:00.

Table 1. Distribution of injured children according to their age and gender (N=402).

Variables	No.	%
Age (years)		
< 6	188	46.8
6 –	89	22.1
12-18	125	31.1
Mean $\pm$ SD	7.93 $\pm$ 5.055	
Range	3 months-18 years	
Gender		
Male	264	65.7
Female	138	34.3
Total	402	100

This study focuses on an analysis of pooled data by type of injury. Of the total of 402 injured children, 264 (65.7%) were males and 138 (34.3%) were females. The mean age $\pm$ standard deviation was 7.93 $\pm$ 5. 188 cases (47%) were below 6 years of age. The majority of injured children (63.4%) arrived at the emergency department at a distance from injury site ranging from 5 to 15 Km. Children travelled an average of 10.5 km to the hospital. the majority of children arrived at the emergency department by private car (28%), public ambulance (27%) or taxi (27%) accompanying their parents (73.6%) or other family members (11.4%). Children who injured in the school were brought by their teachers.

Figure 1. Frequency distribution of injured children according to accompanying person (N=102)



Site of injury was inside the home in most cases (43%), road (19.5%), own home outside (13.2%) and school or education area (6.5%). More than 60% of injuries occurred mainly while children were at play, 15% during activity of daily living, 6.2% during unpaid work and 3.5% during educational activity. Most common type of injuries were falls (29.4%) followed by motor car accidents (17.4%), struck or hit by an object (15.7%), burn (10.4%) and poisoning (8.2%).

Table 2. Distribution of injured children according to place of injury and their activity at the time of accident (N=402).

Variables	No.	%
Place of injury		
1.Own home inside	173	43
2.Own home outside	53	13.2
3.Other home inside	6	1.5
4.Other home outside	6	1.5
5.Road/street/highway	80	19.9
6.Farm, excluding home	38	9.5
7.Market/Shopping center	3	0.7
8.Industrial/Construction area	5	1.2
9.School/Education area	26	6.5
10.Other public building	3	0.7
11.Sports and play area	2	0.5
12.Countryside (water, sea)	7	1.7
Type of the child's activity at the time of injury		
1.Sports	9	2.2
2.Leisure/play	246	61.2
3.Traveling	33	8.2
4.Paid work (including traveling)	9	2.2
5.Unpaid work	25	6.2
6.Educational activity	14	3.5
7.Activity of daily living (i.e. Cooking or Bathing)	60	15
8.Others	6	1.5
- neglect	1	0.2
- Protest	1	0.2
- Quarrel	3	0.7
- Suicide	1	0.2
Total	402	100

Of the 70 children involved in motor vehicle crashes, 44.3% were pedestrians, 17.1 % were motorcycle riders. 20% were car passengers, and 5.7% were minibus. The table shows also child activity near the vehicle, which were 22.9% drivers, 37.1% passengers, 20% pedestrians, 8.6% boarding the vehicles, 5.7% riding outside of the vehicles. The striking objects were passenger car in the majority of injuries (48.6%), followed by heavy vehicle (21.4%), 3 wheelers (11.4%) and motorcycle (5.7%). Of 118 injured children due to fall, 33.9% of them occurred mainly from ladders or stairs, 27.1% from beds or other furniture, off playground equipment (10.2%), out of windows/ off balconies (6%) and from attendants arms (5.9%). Of 42 injured children due to burn, about 43% of the cases were due to fire/flame and also about 43% of the cases were due to hot liquid. Other causes of burn were electric (11.9%) and chemical (2.3%). Of 33 injured children due to

poisoning, 45.2% of them were due to ingestion of insecticides, 30.3% due to household cleaning detergents, and 24.2% due to pharmaceutical.

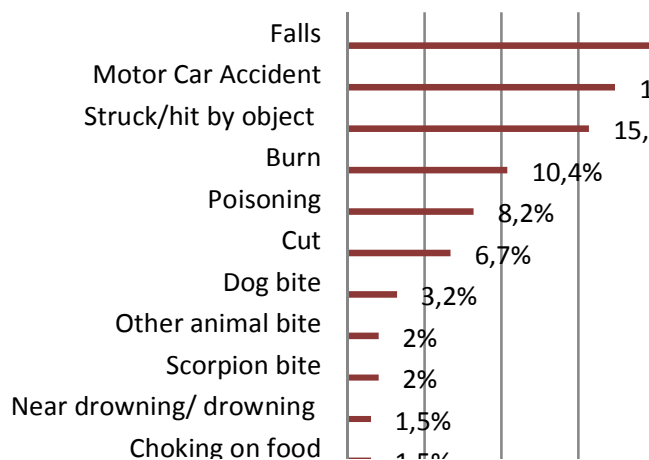


Figure 2. Percentage distribution of injured children according to type of accident (N=402).

Table 3. Characteristics of injuries due to motor vehicle accidents (N=70).

Variables	No.	%
Type/ mode of transport		
1.Passenger car	14	20
2.3 wheeler	4	5.7
3.Pickup/LDV/van/jeep/minibus (< 10 people)	4	5.7
4.Motorcycle	12	17.1
5.Animal or animal drawn vehicle	4	5.7
6.Bicycle	1	1.4
7.Walk/Run	31	44.3
Child's activity in, on, or near the vehicle		
1.Driver	16	22.9
2.Pedestrian	14	20
3.Passenger	26	37.1
4.Boarding the vehicle	6	8.6
5.Riding outside of the vehicle	4	5.7
6.Missed information	4	5.7
Type of striking vehicle/object		
1.Passenger car	34	48.6
2.3 wheeler	8	11.4
3.Bus/Van	1	1.4
4.Truck/Heavy vehicle	15	21.4
5.Motorcycle	4	5.7
6.Animal or animal-drawn	1	1.4
7.Fixed or stationary object	7	10
Total	70	100

Only about sixty% of the families used to store medication away from children, and about 48% of them used to supervise children during bathing or swimming. 80% of injured children were treated under governmental welfare, 14% of them were treated by health insurance and 3% pay for service. The average length of stay in the emergency department was 3 hours, ranging from 0.25-12 hours.

About twenty six% of cases was cut wound, followed by fractures (17.4%), bruise or superficial injury (14.7%), organ system injury (13.9%) and concussion (10.4%). Most cases (54%) treated and discharged home without a disability, (18.9%) admitted to the ward, (7.2%) admitted to the ICU, (4.5%) admitted for emergency surgery and (4.5%) died in the emergency room. According to physician's estimation of long-term effect of injuries, about 61% of cases had no significant disability, (15.2%) had long-term temporary disability and (7.7%) had a permanent disability.

Table 4. Characteristics of injuries due to falls (N=118).

Type of fall	No.	%
1.From bed, sofa, furniture	32	27.1
2.Down Stairs/Steps/Ladder	40	33.9
3.From attendants arms	7	5.9
4.Off Playground equipment	12	10.2
5.Off rooftops	3	2.5
6.Out of windows/ off balconies	7	6
7.From a tree	4	3.4
8.Others	13	11
Slipping from ground	12	10.2
during diving	1	0.8
Total	118	100

Forty four% of childhood intentional injury arrived at the emergency department caused by their friends or acquaintance, 30% by a child, 13% by the unrelated caregiver and 4% by teachers. 30% of the assailant had a secondary/technical level of education while 43.5% of them were students. The instrument used by the assailant was a sharp object in 39% of cases, blunt object (35%), biting or hitting (17%) and firearm (9%).

Table 5. Characteristics of burn injuries (N=42).

Type of burn	No.	%
1.Fire/Flame	18	42.9
2.Hot liquid(scald)	18	42.9
3.Chemical	1	2.3
4.Electric	5	11.9
Total	42	100

Table 6. Characteristics of injuries due to poisoning (N=33).

Type of poisoning	No.	%
1.Medicine/ Pharmaceutical	8	24.2
2.Fertilizer or insecticide	15	45.2
3.Household cleaning detergents	10	30.3
Total	33	100

Table 7. Distribution of injuries in different anatomical regions according to emergency physician's estimation of injury severity score (N=402).

Anatomical region	Injury severity score No. (%)						
	No injury	Minor	Moderate	severe but not life threatening	life threatening but survival likely	critical with uncertain survival	Fatal
General	196 (48.8)	75 (18.7)	57 (14.2)	36 (9)	6 (1.5)	18 (4.5)	14 (3.5)
Face	312 (77.6)	52 (12.9)	24 (6)	9 (2.2)	1 (0.2)	0	4 (1)
Head & neck	307 (76.4)	31 (7.7)	26 (6.5)	11 (2.7)	6 (1.5)	16 (4)	5 (1.2)
Chest	360 (89.6)	14 (3.5)	12 (3)	10 (2.5)	3 (0.7)	3 (0.7)	0
Abdomen	364 (90.5)	16 (4)	13 (3.2)	8 (2)	1 (0.2)	0	0
Extremities	141 (35.1)	88 (21.9)	103 (25.6)	59 (14.7)	8 (2)	3 (0.7)	0

Table 8. Distribution of injured children according to the nature of most severe injuries (N=402).

Nature of the most severe injury	No.	%
1.Fracture	70	17.4
2.Sprain, strain or dislocation	18	4.5
3.Cuts, bites or open wound	104	25.9
4.Bruise or superficial injury	59	14.7
5.Burn	43	10.7
6.Concussion	42	10.4
7.Organ system injury	56	13.9
8.Others	10	2.5
- Drowning	2	0.5
- Respiratory obstruction	2	0.5
- Rupture globe	1	0.2
- Internal hemorrhage	4	0.9
- Cut in spinal cord	1	0.2
Total	402	100

Discussion

The study describes emergency department- based injury surveillance systems for children in Suez Canal University hospital, based on a standardized method. The results provide insight into the burden of childhood injuries in Ismailia city in Egypt.

Of the total of 402 injured children, 264 (65.7%) were males and 138 (34.3%) were females. Males were at a higher risk of injuries compared to females, which can be attributed to their greater enrollment in sports activities, which was performed on playgrounds that did not meet safety standards and in the streets. Furthermore, the risk-taking behavior of the boys and the greater freedom allowed to boys may be responsible for their higher susceptibility to injuries and this explanation agreed with Pulkkinen, 1995 [12].

188 cases (fourty seven%) were below 6 years of age. Most common type of injuries were falls (29.4%) followed by motor car accidents (17.4%), struck or hit by an object (15.7%), burn (10.4%) and poisoning (8.2%). Hyder et al., 2009 [13] reported also the predominance of fall injuries (58%). Falls were also the most common cause of injury in

a study among school children in Ismailia [14], while in a study in Uganda, falls down were the most common cause of severe injuries in children < 10 years of age [15]. An emergency department study in Trinidad and Tobago showed that falls responsible for 42% of all pediatric injuries [16].

About twenty seven % of fall cases were fall from bed or furniture, and 33.9% was fall from stairs, and this agreed with Hyder et al., 2009 [13] findings of a preponderance of falls from stairs or ladders or from beds and other furniture while children were at play in and around the home. These findings suggest the need for a mixed intervention consisting of safer construction, safer play areas, safer furniture for sleeping and playing, and improved supervision. Motor vehicle injuries accounted for 17.4% of cases in the present study, 44.3% of them were pedestrians. The fact that a high proportion of children suffered road traffic injuries (RTIs) and were either vehicle occupants or pedestrians suggests that children of all ages are Vulnerable to road traffic injuries. In a study conducted by Hyder et al, in 2009 [13] motor vehicle injuries accounted for 22%, 39% of them were pedestrians.

Struck or hit by object accounted for sixteen% of all injuries in the present study compared to Jennifer Dudek, 2012 [17] who showed Struck by/against represented 21% of all injury-related emergency department visits among Pima residents aged 0-19, Arizona and defined struck by/against as being struck by furniture, struck by other people while playing sports, or hit by objects while playing sports. Nature/Environment injury which includes injuries from insects, snakes, dogs, or other animals accounted for 7% by Jennifer Dudek, 2012 [17] which is agreed by the present study that showed Dog bite (3.2%), other animal bites (2%), and scorpion bites (2%). Poisoning accounted for 8.2% of cases, 63.6% of them were females. Most cases were due to insecticides, cleaning detergents and medicines. Hyder et al., 2009 [13] showed males were most commonly involved (65%) and most of these children ingested medicines (32%), followed by cleaning agents (21%).

Unintentional poisoning can be fatal without rapid treatment. Management requires intensive supportive care, provision of appropriate antidotes, if available, and removal of the substance from the body, all of which place substantial demands on the health-care system [18].

Childhood intentional injury represented 5.7% of all injuries in this study (23 cases), all cases were males, 74% of them (17 cases) in age group 12 to 18 years, 26% of those intentional injury (6 cases) were hospitalized (one case admitted to ward and 5 cases admitted for emergency surgery and the nature of injury in about 83% of them (19 cases) were sprain, cuts or bruises. The result agreed with MacKay M and Vincenten J., 2014 [19] who found that Teens, especially males, are at high risk of intentional injury, with boys 15 to 19 years of age having the highest rates of peer violence. The present study found that fights/assaults constituted 96% of the presentations, there was one case of abuse caused by the teacher (4%) but there was no case of self-inflicted injuries. Rosa Gofin et al., 2000 [20] found that Fights/assaults constituted 54.1% of the presentations, abuse and rape, 10.3%, and self-inflicted injuries, 10.8%. Overall rates were higher among 10- to 17-year-olds than at younger ages. Poisoning accounted for 8.2% of cases, 63.6% of them were females. Most cases were due to insecticides, cleaning detergents and medicines.

Hyder et al., 2009 showed males were most commonly involved (65%) and most of these children ingested medicines (32%), followed by cleaning agents (21%). Other studies showed more poisoning among males predominantly with medicines and kerosene [13].

In the developing world, homes often store hydrocarbon, alkali, acid, and medicinal compounds used in cooking, cleaning, pest control and farming, and their improper storage puts children at risk of accidental ingestion [22].

About eighty five% of poisoning cases, in present study, had no significant disability and 12% had long term temporary disability, with one mortality cases (3%). Furthermore, the present study showed that more than 39% of all families did not store hazardous material in safe places, which put children at risk of accidental poisoning that could be fatal without rapid treatment. Unintentional poisoning can be fatal without rapid treatment. Management requires intensive supportive care, provision of appropriate antidotes, if available, and removal of the substance from the body, all of which place substantial demands on the health-care system [23].

Cut wounds as a mechanism of injury (23 cases) accounted for 6.7% of all injuries in the present study, 65% of them were intentional (15 cases). However, in another study conducted by CDC, 2012, cut wounds accounted for 7.7% of all unintentional injuries in year 2013 [24].

Drowning accounted for only 1.5% of cases; all (6 cases) were males. 4 cases admitted to ICU, one case referred to another Centre and one case died in the emergency room. No one of their parent reported Supervision while child bathing/swimming. Less than half of the parents of injured children reported supervising their children while bathing. However, in a previous school-based study in Ismailia in Egypt, the prevalence of near-drowning among school children was 16% [25].

Hyder et al., 2009 found that children who drowned or nearly drowned were almost equally divided among boys and girls [13].

It may be that only a small number of the injured children presented to the emergency department because in low and middle income countries most drowning victims die before reaching health facilities. The small number of parents who reported supervising their children while they bathed suggests a potential point of intervention [26].

In the present study, the burden of severe injuries requiring hospitalization was 37.8%, in comparison to 27 % reported by Hyder et al., 2009 [13].

Perhaps children who sustained only minor injuries did not seek treatment in the emergency department. Community-level data to explore this possibility was not, however, collected in the present study. When parents have to leave work to take their injured children to the emergency department, or when they engage others to do it for them, the social cost is very high [27].

A facility-based surveillance system is advantageous when budgets are limited and time is a constraint, but its results cannot be extrapolated to the entire population, as the data are dependent on how often individuals seek care for injured children and thus subject to a host of financial, social and cultural factors that influence the decision to seek care [28]. Hospital-based data, especially in our developing countries with lower rates of utilization, underestimate the injury burden. The results of the present study were thus never meant to represent population-based morbidity from injuries [28].

Childhood intentional injury represented 5.7% of all injuries in this study (23 cases), all cases were males, 74% of them (17 cases) in age group 12 to 18 years, 26% of those intentional injury (6 cases) were hospitalized (one case admitted to ward and 5 cases admitted for emergency surgery and the nature of injury in about 83% of them (19 cases) were sprain, cuts or bruises. The result agreed with MacKay M and Vincenten J, 2014 who found that Teens, especially males, are at high risk of intentional injury, with boys 15 to 19 years of age having the highest rates of peer violence. The present study found that fights/assaults constituted 96% of the presentations, there was one case of

abuse caused by the teacher (4%) but there was no case of self-inflicted injuries [29].

Conclusions

There were 402 childhood injury-related emergency department visits in Suez Canal University Hospital between June 2013 and April 2014, 152 injury-related inpatient hospitalizations (37.8%) and 21 childhood injury-related deaths (5.2%). Falls were the leading cause of injury-related hospitalizations and emergency department visits among children in Suez Canal University Hospital (29.4%), while motor vehicle traffic crashes were the leading cause of death (57%).

Recommendations

The current study recommended the following:

- 1- Research strengthening is required in hospital and population based settings to identify risk factors for different types of injury causes.
- 2- Raise public awareness of speeding, seat-belt wearing and home safety.

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