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Characteristics and injury severity score of childhood injuries at emergency department of suez canal university hospital

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Abstract

Injury surveillance provides an understanding of the incidence, trends, and magnitude of injuries, identifies specific populations that have a higher incidence of injuries. To describe characteristics of childhood injuries and injury severity score of different types of childhood injuries at emergency department of Suez Canal University Hospital. A cross-sectional analyticstudy at 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, about 68.6% of motor car accidents (MCA) were males, (47.2%) occurred in children aged 12-18 years. MCA had the highest Injury severity score (ISS) which was 29.2±2.6. Most of falls (66.1%) occurred in children aged less than 6 years. 26.2% of burn had permanent disability and ISS of burn was 14.5±1.3. Most of accidental poisoning (78.8%) occurred in children aged less than 6 yearswith female predominance (63.6%). About 85% of poisoninghad no significant disability. Childhood intentional injury represented 5.7% of all injuries and had ISS of 8.5±7.7.Falls are the leading cause of injury-related hospitalizations and emergency department visitsamong children in Suez Canal University Hospital (29.4%), while motor vehicle traffic crashes are the leading cause of death (57%).

Keywords: Characteristics, childhood ınjuries, emergency department of suez canal university hospital, injury severity score

Introduction

Child injuries are a growing global public health problem. They are a significant area of concern from the age of one year, and progressively contribute more to overall rates of death until children reach adulthood.

In 2004, road traffic injuries accounted for approximately 262 000 child deaths among children and youth aged 0–19 years – almost 30% of all injury deaths among children. Road traffic injuries are the leading cause of death among young people aged 15 to 19 years. Globally, these deaths on the roads account for nearly 2% of all deaths among children [1].

The burden and pattern of child injuries are just now being studied in LMIC, where the age distribution of the population compounds the problem posed by child injuries. In 2005, 23% of the world's population of children <5 years of age (i.e. 141 million children) ived in Africa, while only 10% lived in HIC [2]. Injuries affect mainly young people, the economically most productive sector of the population.

The magnitude of the problem can be quantified in terms of the number of years lost due to premature death, and the number of years lived with disability. When disability due to injuries is considered, the societal costs and productivity losses due to injury death and disability, combined with the costs of treatment and rehabilitation of the injured are estimated to run into billions of US dollars [3]. Globally, injury currently accounts for 10% of all disability-adjusted life years (DALYs) lost, and this is expected to increase to 20% by 2020 [4].

Drowning rate in low-income and middle-income countries is six times higher than in high-income countries with rates of 7.8 per 100 000 and 1.2 per 100 000, respectively [5]. In high-income countries, children under the age of five years old are at the highest risk of hospitalization from burns, although 15–19-year-olds, as already stated, are also a group at high risk. Nearly 75% of burns in young children are from hot liquid, hot tap water or steam [6]. Falls are the leading cause of traumatic brain injury, especially in

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young children, with a significant risk of long-term consequences [7]. The risk of a child being poisoned is affected by factors related to the child, the agent and the environment. These factors are interrelated and are highly dependent on the context [5].

Interpersonal violence (IPV), including domestic violence, youth violence and childhood physical and sexual abuse, is a common problem in our society [8]. Violence places a heavy strain on health and criminal justice systems, and social and welfare services [9].

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, programmes 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 programmes, 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 [10].

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 [11].

In high-income countries, an established set of inter¬ventions have contributed to significant reductions in the incidence and impact of road traffic injuries. These include the enforcement of legislation to control speed and alcohol consumption, mandating the use of seat¬belts and crash helmets [12]. This study sheds new light on the scale of the problem as well as on injury severity score of different types of childhood injuries and to draw attention to the importance and preventability of these injuries.

Material and Methods

Type of the study: The study was a cross-sectional analytic 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 starting from June 2013 to April 2014 were included in the sample of 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 [13]. 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.

Injury Severity Score (ISS)

The ISS is based upon the Abbreviated Injury Scale (AIS). To calculate an ISS for an injured person, the body is divided into six ISS body regions (Head, Face, Chest, Abdomen, Extremities (including Pelvis), and External).

To calculate an ISS, take the highest AIS severity code in each of the three most severely injured ISS body regions, square each AIS code and add the three squared numbers for an ISS (ISS = A2 + B2 + C2 where A, B, C are the AIS scores of the three most injured ISS body regions). The ISS scores ranges from 1 to 75 (i.e. AIS scores of 5 for each category). If any of the three scores is a 6, the score is automatically set at 75. Since a score of 6 ("unsurvivable") indicates the futility of further medical care in preserving life, this may mean a cessation of further care in triage for a patient with a score of 6 in any category [14].

Data Analysis

Quantitative data was expressed as mean ± standard deviation while qualitative data was expressed as numbers and percentages (%). Chi Square and Fisher's Exact tests wereused to test significance of difference for qualitative variables.Mann-Whitney test was used to test significance of difference for nonparametric quantitative variables. Chi Square and Fisher's Exact tests wereused to test significance of difference for qualitative variables. Linear regression analysis of variables affecting injury severity score was used. 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 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. Approval from ethical committee of the faculty of medicine was taken.

Results

The study sample consisted of 402 Children. 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 ± standard deviation was7.93±5. 188 cases (47%) 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 object (15.7%), burn (10.4%) and poisoning (8.2%).

Most of falls (66.1%) occurred in children aged less than 6 years. Common in males (61.9%). Most of fall (68.6%) occurred inside home and 11.9% outside home. 85.6% of them occurred during playing. 28.8% of them arrived by private car. 54.2% of falls caused sprain, cut or bruises. 63.6% treated and discharged home without disability. 18.6% of falls had long term temporary disability (≥ 6weeks). ISS 6.28±9.2.

About 68.6% of motor car accidents (MCA) were males, (47.2%) occurred in children aged 12-18 years. 78.6% occurred on the roads, 15.7% outside home and 5.7% in the farm. Most MCA occurred during travelling (47.1%) and playing (31.4%). 74.3% of them arrived by public ambulances. 38.6% of MCA caused concussion and 31.4% caused fractures. 58.6% of MCA admitted to ward. 12 children (57%) of all deaths died from motor vehicle injury. MCA had the highest Injury severity score (ISS) which was 29.2±2.6. Most of burns (54.8%) occurred in children aged less than 6 years. Common in males (59.5%). Most of burns (81%) occurred inside home. 61.9% of them occurred during playing. 35.7% of them arrived by private car. 66.7% admitted to burn unit. 26.2% of burn had permanent disability. ISS 14.5±1.3.

Most of accidental poisoning (78.8%) occurred in children aged less than 6 years. Common in females (63.6%). Most of poisoning (90.9%) occurred inside home. 87.9% of them occurred during playing. 39.4% of them arrived by taxi. Poisoningcausedorgan system injury, 39.4% admitted ward and 84.8% of poisoninghad no significant disability.ISS of Poisoninginjuries was 5.7±1.3.

Injury severity score (ISS): there was no statistical significant difference at p value less than 0.05 regarding means of injury severity scorebetween unintentional (11.9±1.8) and intentional injuries (8.5±7.7)using Mann-Whitney test.Linear regression analysis was done for all injured children to assess the influences of age, gender, general score of injury and type of injury asintentional or unintentional (as independent variables) on injury severity score (as dependent variable).

The result of analysis showed that ISS was significantly associated with gender, general score of injury and type of injury asintentional or unintentionalat p value less than 0.05.

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 ± SD	7.93±5.055	
Range	3 months-18 years	
Gender	264	65.7
Male	138	34.3
Female		
Total	402	100

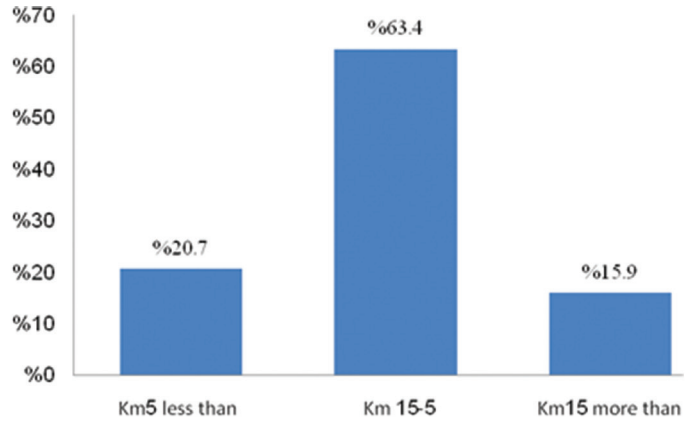

Figure 1. Percentage distribution of injured children according to distance of injury site from hospital (km) according to caregiver estimation (N=402).

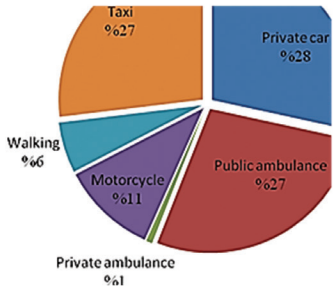

Figure 2. Percentage distribution of injured children according to ways of transportation to hospital (N=402)

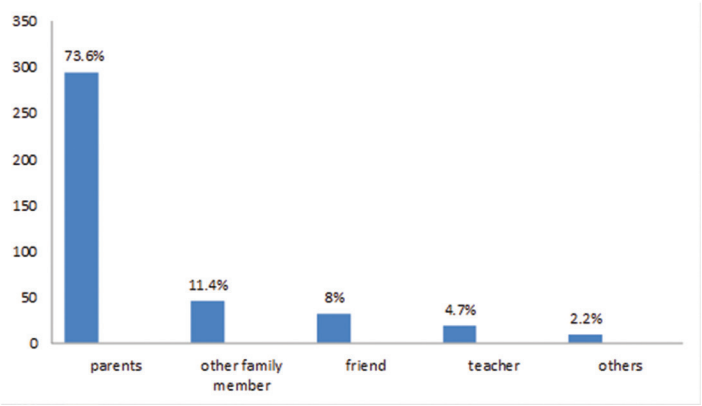

Figure 3. Frequency distribution of injured children according to accompanying person (N= 402)

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
Leisure/play	246	61.2
Traveling	33	8.2
Paid work (including traveling)	9	2.2
Unpaid work	25	6.2
Educational activity	14	3.5
Activity of daily living (i.e. Cooking or Bathing)	60	15
2. Others	6	1.5
- neglect 1	1	0.2
- Protest 1	1	0.2
- Quarrel 3	3	0.7
- Suicide 1	1	0.2

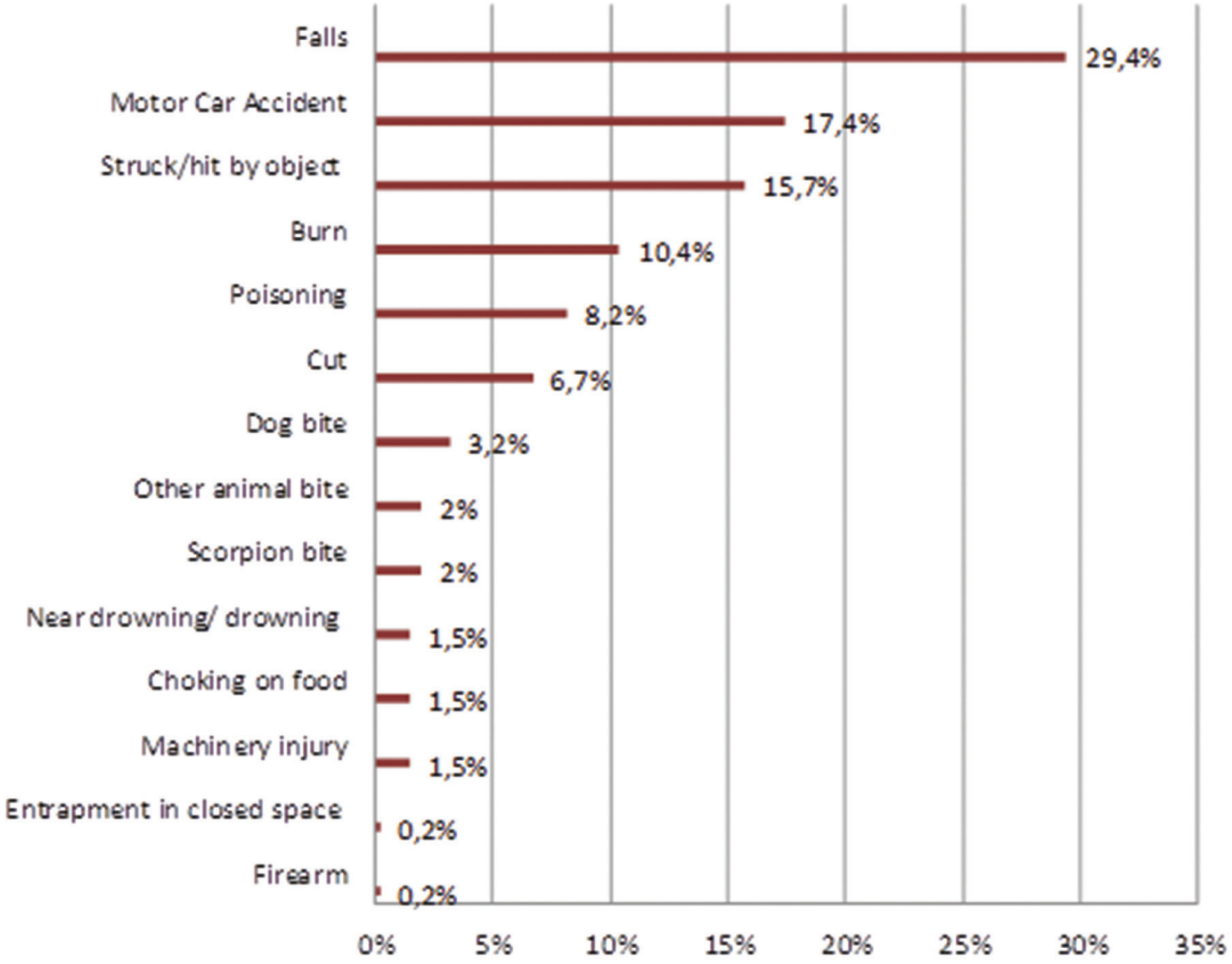

Figure 4. Percentage distribution of injured children according to type of accident (N=402)

Table 3. Distribution of accidents' type according to age groups of injured children (N=402)

Age groups (years)	Type of accidents No. (%)				
	Motor vehicle (n=70)	Falls (n=118)	Burns (n=42)	Poisoning (n=33)	Others (including Intentional Injuries) (n=139)
< 6	22 (31.4)	78 (66.1)	23(54.8)	26 (78.8)	39 (28.0)
6 -	15 (21.4)	13 (11.0)	5(11.9)	5 (15.2)	51 (36.7)
12-18	33 (47.2)	27 (22.9)	14 (33.3)	2 (6.0)	49 (35.3)
X^2	11.80	24.99	2.78	15.46	39.18
(P value)	0.003*	0.000*	0.248	0.000*	0.000*

*Statistically significant at p value less than 0.05.

Table 4. Distribution of accidents' type according to gender of injured children (N=402).

Age groups (years)	Type of accidents No. (%)				
Gender	Motor vehicle (n=70)	Falls (n=118)	Burns (n=42)	Poisoning (n=33)	Others (including Intentional Injuries) (n=139)
Male	48 (68.6)	73 (61.9)	25(59.5)	12 (36.4)	106 (76.3)
Female	22 (31.4)	45 (38.1)	17(40.5)	21 (63.6)	33 (23.7)
X^2	0.316	1.074	0.786	13.698	10.564
(P value)	0.574	0.300	0.375	0.000*	0.001*

*Statistically significant at p value less than 0.05.

Table 5. Distribution of types of injuries according to nature of most severe injury and the outcome of injuriy (N=402)

	MCA (n=70)		Fall (n=118)		Burn (n=42)		Poisoning (n=33)		Others (n=139)	
	No	%	No	%	No	%	No	%	No	%
Most severe injury										
Fracture	22	31.4	39	33.1	0	0	0	0	9	6.5
Sprain, cuts or bruises	8	11.4	64	54.2	0	0	0	0	109	78.4
Burn	0	0	0	0	42	100	0	0	1	0.7
Concussion	27	38.6	10	8.5	0	0	0	0	5	3.6
Organ system injury	12	17.1	3	2.5	0	0	33	100	8	5.8
Others	1	1.4	2	1.7	0	0	0	0	7	5
Outcome of injury										
Treated & discharged home with out disability	11	15.7	75	63.6	13	31	19	57.6	98	70.5
Treated & discharged home with disability	2	2.9	3	2.5	0	0	0	0	8	5.8
Admitted to ward or burn unit or ICU	42	58.6	33	28	28	66.7	13	39.4	19	13.7
Admitted for emergency surgery	5	7.1	4	3.4	1	2.4	0	0	8	5.8
Died in emergency room	11	15.7	1	0.8	0	0	1	3	5	3.6
Referred to another center	0	0	2	1.7	0	0	0	0	1	0.7

MCA: motor car accident ICU: intensive care unit

Table 6. Distribution of types of injuries according to physician's estimation of long term effect of injury (N=402)

Long term effect of injury	MCA (n=70)		Fall (n=118)		Burn (n=42)		Poisoning (n=33)		Others (n=139)	
	No	%	No	%	No	%	No	%	No	%
No significant disability	18	25.7	80	67.8	12	28.6	28	84.8	107	77
Short term temporary disability (< 6 weeks)	14	20	11	9.3	8	19	0	0	10	7.2
Long term temporary disability (≥ 6 weeks)	16	22.9	22	18.6	9	21.4	4	12.1	10	7.2
Permanent disability	10	14.3	4	3.4	11	26.2	0	0	7	5
Death	12	17.1	1	0.8	2	4.8	1	3	5	3.6

Table 7. Injury severity score of different types of injuries (N=402)

Injury severity score (ISS)	MCA (n=70)	Fall (n=118)	Burn (n=42)	Poisoning (n=33)	Others (including Intentional Injuries) (n=139)
Mean	**29.2**	**6.28**	**14.5**	**5.7**	8.2
SD	**2.6**	**9.2**	**1.3**	**1.3**	1.5

Table 8. Comparison of injury severity score (ISS) of unintentional and intentional injuries using Mann-Whitneytest (N=402)

		N	Mean± SD	Mean rank	Sum of Ranks	P value
ISS	**unintentional injuries**	**379**	11.9±1.8	199.99	75796.00	0.285
	intentional injuries	**23**	8.5±7.7	226.39	5207.00	
	Total	**402**				

Table 9. Linear regression analysis of variables influencing injury severity score(ISS):

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
				R Square Change	F Change	Sig. F Change
0.890a	0.793	0.791	8.14079	0.793	380.085	0.000

a- Predictors:(Constant), age of child in years, gender, general score of injury and type of injury asintentional or unintentional.b- Dependent Variable: ISSc- Method: Enter

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error	beta			Lower Bound	Upper Bound
(Constant)	-19.525	4.167		-4.686	.000*	-27.717	-11.334
Age in years	.002	.087	.001	.027	.979	-.168	.173
Gender*	3.281	.900	.088	3.644	.000*	1.511	5.051
General score of injury	9.665	.249	.886	38.759	.000*	9.174	10.155
Intentional or unintentio-nal**	7.124	1.828	.093	3.897	.000*	3.530	10.718

Dependent Variable: ISS
*coded as 1= female, 2= male ** coded as 1= Intentional, 2= unintentional
The equation for the regression line is:
y = .002 (age) + 3.281 (gender) + 9.665 (General score of injury) + 7.124 (type of injury) - 19.525
This model showed that ISS was significantly associated with gender, general score of injury and type of injury asintentional or unintentional at p value less than 0.05.

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. Hyder et al., 2009 reported also the predominance of fall injuries (58%) [13]. Falls were also the most common cause of injury in a study among school children in Ismailia [15], while in a study in Uganda, falls were the most common cause of severe injuries in children < 10 years of age [16]. An emergency department study in Trinidad and Tobago showed that falls accounted for 42% of all pediatric injuries [17].

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 RTIs. In a study conducted by Hyder et al., in 2009 motor vehicle injuries accounted for 22%, 39% of them were pedestrians [13]. A study from Port-Said, Egypt, reported that pedestrians were involved in 81% of road traffic injuries among school children [18]. The fact that a higher proportion of children who suffered motor vehicle injuries were pedestrians instead of vehicle passengers suggests that pedestrians of all ages are made vulnerable by sharing transport space with motorized vehicles. Most of burns (54.8%) occurred in children aged less than 6 years and often required admission. Fire/flame and hot liquid were the main causes. Many studies have cited the risk to older children from cooking. However, Hyder et al., 2009 found that younger children were at risk from playing near hot liquids at home [13].

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 [19].

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, 2014 cut wounds accounted for 7.7% of all unintentional injuries in year 2013 [20].

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 18years, 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 [21]. 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.

Conclusion

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%). Overall ISSs were low across all injury types, except road traffic injuries.

Reccomadition

Implementation and strengthening of existing appropriate injury prevention programmes as safe storage of medicines and road safety.

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