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Original Article

Medicolegal Study of Injuries in Children Attending Emergency Department, Al-Azhar University Hospital, New Damietta

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Abstract

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Background: Children under the age of 18 years is a vulnerable age group. Injuries account for 15% of all morbidities among this age group. This indicated the value of the determination of the injury pattern, especially with insufficient literature describing the pattern of such injuries in our community.

The aim of the work: This work aimed to map the pattern of injuries in children to build up an effective prevention strategies

Methodology: This prospective study included children under the age of 18 years who were presented to the emergency department with any type of injury during a specific duration of time [From January to June 2024]. The total number of recognized cases was 153. Demographic data and injury characteristics were documented in a predefined form.

Results: There was a male sex predominance [69.3%] and the age group [2–12 years] [68.6%]. The majority were accidental [90.8%], occurred at home [44.4%] in the evening. Sex, manner, daytime of injury did not associated with the age group distribution of injury. However, residence and home injuries were significantly and highly represented in infancy [0-2 years]. Contusions were the commonest in infancy and childhood age groups [50.0%, and 47.6%], while fractures were the commonest among adolescence [32.4%]. The majority of injuries were simple [87.6%], with significant increase of dangerous injuries in adolescence. Fall was the commonest cause [37.9%] and highly represented in infancy. 14.4% needed admission, especially adolescents. Injuries of males occurred usually at home, while of females on the road. There was a significant association between place of injuries and each of residence, type and instrument of injury. Road traffic accident was significantly associated with severe injuries.

Conclusion: The current work provided an initial representation of injury pattern in children. It provided a clear picture about the commonest injuries and possible associations.

Keywords: Children; Injury; Pattern; Contusion; Emergency Department.



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INTRODUCTION

Injuries continue to be a significant social and Health concern, especially in light of the significant advancements in the diagnosis, treatment, and prevention of infectious illnesses. Every year, injuries claim the lives of more than 875,000 children under the age of 18, the majority are in low- and middle-income countries. Among children under the age of 15, injuries account for 13% of all morbidity ^[1].

Injury is defined as any harm caused by an act of commission or omission resulting in damage to an individual's body, mind, dignity, right, or a breach of contract ^[2].

The term hurt, injury and wound have almost the same meaning and some differences as well. They usually mean any damage to any part of the body or bodily harm caused by application of violence. Injury also includes any harm to the mind, reputation and property, and hurt includes bodily pain, disease or infirmity. Clinically a wound is produced when there is breach of anatomical continuity of the skin or mucous membrane with or without damage of the underlying tissues. Forensically, it is wound when there is damage of any tissue or organ by a mechanical force irrespective of breach of continuity of the skin or mucous membrane ^[3].

A wound is created when the force applied to the body is greater than the tissue's capacity to adjust or resist the force. The amount of kinetic energy transferred from the relative movement of the weapon and/or the body determines the type of tissue injury ^[4]. Injury may be caused by chemical, thermal, electrical, radiation, and mechanical or kinetic. Mechanical injury is any physical injury brought on by a mechanical force that causes a break in the normal continuity of any body tissue. The mechanical force can be blunt force, sharp force, or firearms. Mechanical forces may lead to different types of injuries according to the type of causative instrument. For example, blunt force injuries include abrasions, contusions [Bruises], lacerations [contused wounds, split laceration or toning skin]. On the other side, sharp force injuries include incised and stab [penetrating] or puncture wounds. Finally, firearms are associated with a specific injury called firearm injury ^[5].

According to the intent, injuries may be intentional or unintentional. Intentional injuries may be self-inflicted [suicide], collective violence [e.g., war] and interpersonal violence [crimes]. Unintentional injuries include road traffics, fires, fall and drowning ^[6].

Because children's anatomy and physiology differ from adult people, injury and trauma in patients under the age of 18 require specific consideration, including unique patterns of damage, investigation, and treatment ^[7].

The recognition of child trauma in clinical settings carries not only medical responsibilities but also clearly defined legal obligations. In many jurisdictions, healthcare professionals are mandated by law to report any reasonable suspicion of child abuse or neglect to the appropriate child protection or judicial authorities ^[8].

In our country, there is no sufficient literature to describe the pattern of different injuries in children. Thus, we designed this work trying to map the picture of these injuries, aiming to provide this to responsible authorities to build up a more effective prevention strategy. This will be associated with the reduction of the complications and mortality associated with these injuries.

SUBJECTS AND METHODS

This was a prospective analytical study. It included population below the age of 18 years with mechanical or other types of injuries. They were selected from the emergency department, Al-Azhar University hospital [New Damietta]. It covered a duration of 6 months [From the first of January 2024 to the end of June 2024]. The total number of recognized cases was 153.

Study Procedure: The study implemented at the emergency department of Al-Azhar University hospital [New Damietta]. An informed consent obtained from the caregivers to collect and use these data in the present study. All the patients who met the inclusion criteria included and examined in emergency department. Demographic data, and the injury characteristics collected in a predefined form.

Inclusion Criteria: a. Population below 18 years old; b. Children with any cause of injury presented to emergency department Al-Azhar University hospital [New Damietta].

Exclusion Criteria: a. Caregiver refusal; b. All the cases who brought dead or died before detailed evaluations were completed ^[9].

The Following Data were collected (age, sex, residence, time of injury, place where injury occurred, cause of injury, manner of injury, type of injury, site of injury, number of injuries, need to hospitalization and severity of the injury).

The following definitions were considered in the collection of data:

Injury: Any physical hurt brought on by the use of force or damage to any portion of the body ^[4].

Age groups determination: Children are defined as a person below the age of 18 years ^[4]. In this study the pediatric age group classified according to **Hardin et al.** ^[10] into: [1] Infancy, between birth and 2 years of age [0-2]; [2] Childhood, from 2 to 12 years of age [>2-12]; and [3] Adolescence, from 12 to 18 years of age [>12-18].

Cause of Injury: Refers to the way a body part [skin, mucosa, or any other tissue: muscles, organs, and bones] is damaged. According to the Centers for Disease Control and Prevention, the direct cause is what produces the actual physical harm and the underlying cause is what started the chain of events that led to the actual physical harm [the injury] direct and underlying causes can be the same or different ^[11].

The Manner of Injury explained the conditions under which the injury was occurred or the injury event happened. The manner can be divided in three types according to the [Nordic Medico-Statistical Committee [2007] Classification of external causes of injuries. NOMESCO, Copenhagen] ^[11]: the accidental trauma [sometimes referred to as non-abusive, non-inflicted, non-intentional, or accidental]. The non-accidental trauma [referred to as: inflicted, intentional, deliberate, abusive, or negligent]. The unexplained trauma [undetermined].

Severity of Injury: According to the legal point of view, injuries can be divided into two categories: minor wounds and severe wounds, which may or may not be fatal ^[4]. The simple injury is defined as an injury which is neither extensive nor serious and which heals rapidly without leaving any permanent deformity or disfiguration. However, the

severe [dangerous] injury is defined as an injury which endangers life or causes the victim to be in severe bodily pain for 20 days ^[12].

Documentation of Injury: Pictures of the injuries were taken after the approval of the caregiver. In addition, after the examination of injury we collected the demographic data, and the injury characteristics on a predefined form.

Statistical Analysis: The collected data were coded, processed, and analyzed using Statistical Package of Social Science [SPSS] program version 23 [IBM ® Inc., Armonk, NY, USA]. The normally distributed data were presented by their means and standard deviations. On the other side, categorical data were presented by their relative frequency and percentages. Appropriate statistical tests were employed according to the data type. P value of less than or equal to 0.05 indicates statistical significance.

Ethical Considerations: Informed consent was obtained from the caregiver to collect and use these data in the present study. The goal and methods of this study were disclosed to the chosen individuals, who were also notified that all data collected were used exclusively for scientific purposes and for private consideration. Ethical approval was obtained from the institutional review board of faculty of medicine /Al-Azhar University. Registration Number: forr_6Med. Research_Medico legal Study. Injuries. Children Emergency Department. Al-Azhar University Hospital. New Damietta_0000006. Approval Date: 3/12/2023.

RESULTS

In the period from January 2024 to July 2024, there were 153 children examined in the emergency department who were achieved inclusion criteria of the study. Results showed that, there was a significant male predominance [69.3%]. The majority were in the childhood age group [2–12 years] [68.6%], with nearly comparable distribution between urban and rural areas [56.2% and 43.8%, respectively]. The majority were accidental [unintentional] [90.8%], mainly occurred at home [44.4%] at evening [62.0%] [Table 1].

Results of the current work showed that, there was no significant association between different age groups and each of child gender,

manner of injury, time of injury, and caregiver brought him/her to ED. However, there was significant differences between age groups regarding residence, place of injury, type, severity and cause of injury; in addition to the need to hospitalizations. For example urban residence was significantly increase in infancy [0-2 years of age], while rural was significantly increased in adolescence [78.6% and 61.8%, respectively]. All injuries in infancy were unintentional and this decreased with increasing age. Injuries due to blunt trauma were significantly represented in infancy, while fractures and cut wound increased in adolescence. Hospitalization also was significantly higher among older age groups [Table 2].

The subject gender was significantly associated with the place of injury as females usually injured at home, while males injured outside doors. Otherwise no significant association was recorded between subject gender and manner of injury, residence, time of injury, cause of injury and need for hospitalization [Table 3].

In the current work place of injury was significantly associated with residence, type of injury and instrument. For example, work and home injuries were significantly increased in urban areas, fractures are significantly increased in schools and roads, while cut injuries increased in work [Table 4]. The intentional manner of injury was significantly associated with injuries due to personal attacks, while the highest unintentional injuries were associated with falling from height [Table 5].

The sites of injury were head, trunk, upper limb and lower limb among 54.2%, 5.2%, 41.2% and 33.3%, respectively. The severity of injury was significantly associated with the cause and number of injuries [for example, the dangerous injuries were mainly due to road traffic accidents and simple injuries were mainly single in number] [Table 6]. In addition, causative instrument [type of trauma] was significantly associated with the cause of injury. However, no significant association was observed between instrument and each of manner or severity of injury [Table 7]. Finally the need to hospitalization was significantly associated with the cause of injury [Table 8]. The most frequent investigation required for cases evaluation was x-ray then CT brain [68 and 31 subjects respectably].

Figures 1 to 12 represented images of documented injuries among study population.

Table [1]: Demographics of the study population.

Variable		N [%]	
Demographics	Age group [n, %]	Mean±SD	8±4.5
		Infancy [0-2]	14 [9.2%]
		Childhood [>2- 12]	105 [68.6%]
		Adolescence [>12-18]	34 [22.2%]
	Sex [n, %]	Male	106 [69.3%]
		Female	47 [30.7%]
	Residence [n, %]	Urban	86 [56.2%]
		Rural	67 [43.8%]
Injury Characteristics [n,%]	Manner	Intentional	14 [9.2%]
		Unintentional	139 [90.8%]
	Place	Home	68 [44.4%]
		Road	62 [40.5%]
		School and Playground	17 [11.1%]
		Work	6 [3.9%]
	Time of injury	Evening	95 [62.09%]
		Morning	58 [37.91%]

Table [2]: Association between age group and sex and residence of study population.

		Age Group								Statistics	
		Infancy [0-2] [n=14]		Childhood [>2- 12] [n=105]		Adolescence [>12-18] [n=34]		Total		χ^2	P
		n	%	n	%	n	%	n	%		
Sex	Male	8	57.1%	70	66.7%	28	82.4%	107	69.9%	4.036	0.13
	Female	6	42.9%	35	33.3%	6	17.6%	46	30.1%		
Residence	Urban	11	78.6%	62	59.0%	13	38.2%	86	56.2%	7.56	0.022*
	Rural	3	21.4%	43	41.0%	21	61.8%	67	43.8%		
Manner	Intended	0	0.0%	9	8.6%	5	14.7%	14	9.2%	2.715	0.25
	Un-Intended	14	100.0%	96	91.4%	29	85.3%	139	90.8%		
Place	Home	13	92.9%	49	46.7%	6	17.6%	68	44.4%	46.98	<0.001*
	Road	1	7.1%	40	38.1%	21	61.8%	62	40.5%		
	School & Playground	0	0.0%	16	15.2%	1	2.9%	17	11.1%		
	Work	0	0.0%	0	0.0%	6	17.6%	6	3.9%		
Time	Morning	2	14.3%	44	41.9%	12	35.3%	58	37.9%	4.13	0.12
	Evening	12	85.7%	61	58.1%	22	64.7%	95	62.1%		
Brought by	Mother	8	57.1%	55	52.4%	14	41.2%	77	50.3%	3.05	0.56
	Father	6	42.9%	39	37.1%	16	47.1%	61	39.9%		
	Others	0	0.0%	11	10.5%	4	11.8%	15	9.8%		
Type of injury	Fracture	3	21.4%	37	35.2%	11	32.4%	51	33.3%	40.535	<0.001*
	Contused	7	50.0%	50	47.6%	5	14.7%	62	40.5%		
	Penetrating	0	0.0%	1	1.0%	3	8.8%	4	2.6%		
	Cut	0	0.0%	8	7.6%	10	29.4%	18	11.8%		
	Crushed	0	0.0%	2	1.9%	4	11.8%	6	3.9%		
	Burn	3	21.4%	5	4.8%	1	2.9%	9	5.9%		
	Abrasion & Contusion	5	35.7%	22	21.0%	7	20.6%	34	22.2%		
Severity of injury	Simple	13	92.9%	98	93.3%	23	67.6%	134	87.6%	15.975	<0.001*
	Dangerous	1	7.1%	7	6.7%	11	32.4%	19	12.4%		
Cause of injury	Fall	10	71.4%	44	41.9%	4	11.8%	58	37.9%	53.72	<0.001*
	Sharp	0	0.0%	8	7.6%	10	29.4%	18	11.8%		
	Bike	0	0.0%	23	21.9%	1	2.9%	24	15.7%		
	RTA	1	7.1%	12	11.4%	13	38.2%	26	17.0%		
	Animal	0	0.0%	4	3.8%	0	0.0%	4	2.6%		
	Thermal	3	21.4%	5	4.8%	1	2.9%	9	5.9%		
	Person	0	0.0%	9	8.6%	5	14.7%	14	9.2%		
Hospitalization	Admission	1	7.1%	9	8.6%	12	35.3%	22	14.4%	16.94	0.02*
	Discharge	13	92.9%	92	87.6%	22	64.7%	127	83.0%		
	Referred	0	0.0%	4	3.8%	0	0.0%	4	2.6%		

Table [3]: Association between child gender and other variables

		Sex						Statistics	
		Male		Female		Total		χ^2	P*
		n	%	n	%	n	%		
Manner	Intentional	9	8.5%	5	10.6%	14	9.2%	0.181	0.671
	Unintentional	97	91.5%	42	89.4%	139	90.8%		
Residence	Urban	57	53.8%	29	61.7%	86	56.2%	0.832	0.362
	Rural	50	46.2%	18	38.3%	67	43.8%		
Place	Home	35	33%	33	70.3%	86	44.4%	19.42	<0.001*
	Road	50	47.7%	12	23.9%	62	40.5%		
	School and Playground	15	14.2%	2	4.3%	17	11.1%		
	Work	6	5.6%	0	0.0%	6	3.9%		
Time	Morning	42	39.3%	16	34.8%	58	37.9%	0.431	0.512
	Evening	64	60.4%	31	66%	95	62.1%		
Cause of injury	Fall	39	36.8%	19	40.4%	58	37.9%	7.989	0.23
	Sharp	9	8.5%	9	19.1%	18	11.8%		
	Bike	20	18.9%	4	8.5%	24	15.7%		
	RTA	21	19.8%	5	10.6%	26	17.0%		
	Animal	2	1.9%	2	4.3%	4	2.6%		
	Thermal	6	5.7%	3	6.4%	9	5.9%		
	Person	9	8.5%	5	10.6%	14	9.2%		
Hospitalization	Admission	19	17.9%	2	4.3%	21	13.7%	5.628	0.06
	Discharged	85	80.2%	43	91.5%	128	83.7%		
	Referred	2	1.9%	2	4.3%	4	2.6%		

Table [4]: Relation between place of injury and study population residence.

		Place										Statistics	
		Home [n=68] [44.4%]		Road [n=62] [40.5%]		School [n=17] [11.11%]		Work [n=6] [3.92%]		Total [153]		χ^2	P*
		n	%	n	%	n	%	n	%	n	%		
Residence	Urban	45	66.2%	25	40.3%	12	70.6%	4	66.7%	86	56.2%	10.79	0.013*
	Rural	23	33.8%	37	59.7%	5	29.4%	2	33.3%	67	43.8%		
Type of injury	Fracture	17	25.0%	25	40.3%	7	41.2%	1	16.7%	50	32.7%	59.07	<0.001*
	Contused	34	50.0%	26	41.9%	8	47.1%	0	0.0%	68	44.4%		
	Penetrating	0	0.0%	3	4.8%	1	5.9%	0	0.0%	4	2.6%		
	Cut	10	14.7%	5	8.1%	0	0.0%	4	66.7%	19	12.4%		
	Crushed	0	0.0%	4	6.5%	1	5.9%	1	16.7%	6	3.9%		
	Burn	9	13.2%	0	0.0%	0	0.0%	0	0.0%	9	5.9%		
	Abrasion & Contusion	13	19.1%	21	33.9%	0	0.0%	0	0.0%	34	33.3%		
Instrument	Blunt	45	66.2%	53	85.5%	16	94.1%	1	16.7%	115	75.2%	31.79	<0.001*
	Sharp	14	20.6%	9	14.5%	1	5.9%	5	83.3%	29	19.0%		
	Thermal	9	13.2%	0	0.0%	0	0.0%	0	0.0%	9	5.8%		

Table [5]: Relation between manner of injury and cause of injury.

		Manner						Statistics	
		Intentional		Unintentional		Total		χ^2	P*
		n	%	n	%	n	%		
Cause	Fall	0	0.0%	58	41.7%	58	37.9%	150.00	<0.001*
	Sharp	0	0.0%	18	12.9%	18	11.8%		
	Bike	0	0.0%	24	17.3%	24	15.7%		
	RTA	0	0.0%	26	18.7%	26	17.0%		
	Animal	0	0.0%	4	2.9%	4	2.6%		
	Thermal	0	0.0%	9	6.5%	9	5.9%		
	Person	14	100.0%	0	0.0%	14	9.2%		

Table [6]: Relation between severity and cause of injury.

		Severity						Statistics	
		Simple		Dangerous		Total		test	P*
		n	%	n	%	n	%		
Cause	Fall	53	39.6%	5	26.3%	58	37.9%	14.75	0.022*
	Sharp	14	10.4%	4	21.1%	18	11.8%		
	Bike	24	17.9%	0	0.0%	24	15.7%		
	RTA	18	13.4%	8	42.1%	26	17.0%		
	Animal	4	3.0%	0	0.0%	4	2.6%		
	Thermal	8	6.0%	1	5.3%	9	5.9%		
	Person	13	9.7%	1	5.3%	14	9.2%		
Number	Single	106	79.1%	11	57.9%	117	76.5%	4.160	0.04*
	Multiple	28	20.9%	8	42.1%	36	23.5%		

Table [7]: Relation between causative instrument and cause of the injury.

		Instrument								Statistics	
		Blunt		Sharp		Thermal		Total		χ^2	P*
		N	%	n	%	n	%	N	%		
Cause of Injury	Fall	54	47.0%	4	13.8%	0	0.0%	58	37.9%	242.5	<0.001*
	Sharp	1	0.9%	17	58.6%	0	0.0%	18	11.8%		
	Bike	22	19.1%	2	6.9%	0	0.0%	24	15.7%		
	RTA	26	22.6%	0	0.0%	0	0.0%	26	17.0%		
	Animal	1	0.9%	3	10.3%	0	0.0%	4	2.6%		
	Thermal	0	0.0%	0	0.0%	9	100.0%	9	5.9%		
	Person	11	9.6%	3	10.3%	0	0.0%	14	9.2%		
Manner	Intentional	11	9.6%	3	10.3%	0	0.0%	14	9.2%	0.980	0.63
	Unintentional	104	90.4%	26	89.7%	9	100.0%	139	90.8%		
Severity	Simple	102	88.7%	24	82.8%	8	88.9%	134	87.6%	0.766	0.682
	Dangerous	13	11.3%	5	17.2%	1	11.1%	19	12.4%		

*Chi square test

Table [8]: Relation between need to hospitalization and cause of injury.

		Hospitalization								Statistics	
		Admission		Discharge		Referred		Total		χ^2	P*
		n	%	n	%	n	%	N	%		
Cause of Injury	Fall	5	23.8%	53	41.4%	0	0.0%	58	37.9%	167.41	<0.001*
	Sharp	4	19.0%	14	10.9%	0	0.0%	18	11.8%		
	Bike	1	4.8%	23	18.0%	0	0.0%	24	15.7%		
	RTA	9	42.9%	17	13.3%	0	0.0%	26	17.0%		
	Animal	0	0.0%	0	0.0%	4	100.0%	4	2.6%		
	Thermal	1	4.8%	8	6.3%	0	0.0%	9	5.9%		
	Person	1	4.8%	13	10.2%	0	0.0%	14	9.2%		



Figure [1]: Picture of a 9 years old child with simple single Contused wound in the head caused by blunt instrument [stone].



Figure [2]: Picture of an 11 years old child with a simple single puncture wound in the hand caused by pen with an intentional manner [interpersonal violence].



Figure [3]: Picture of a 7 years old male child with simple single contused wound in upper lip caused by driving bike.



Figure [4]: Picture of 10 years old child with simple single penetrating wound in the upper limb caused by driving bike.



Figure [5]: Picture of 17 years old male with dangerous multiple crushed wounds in the hand caused by mincer in work place.



Figure [6]: Picture of 16 years old male with dangerous multiple penetrating and cut wounds in the chest wall caused in intentional manner.



Figure [7]: Picture of a 4 months female child with multiple simple scratching abrasions in the head caused by RTA.



Figure [8]: Picture of 11 years old child with simple single cut wound in the foot caused by sharp instrument [piece of glass].



Figure [9]: Picture of 16 years old male with single dangerous crushed wound in the leg caused by RTA.



Figure [10]: Picture of 1-year female child with simple simple torn flap wound caused by door [closing on the little finger].



Figure [11]: Picture of a 2 years old child with second degree burn on the thigh and upper knee.



Figure [12]: Picture of a 15 years old child with single torn flap wound in the lower limb due to RTA.

DISCUSSION

Childhood injuries [either intentional or non-intentional] are major health problems that may require hospital care, and a large portion of these cases may result in disabilities and other health issues. Most of the pediatric injury or trauma could be avoided [7].

Unintentional injuries became the third leading cause of infant death in 2019. Low- and middle-income countries are disproportionately affected by these injuries, where child mortality due to unintentional injuries is more than three times greater than in high-income countries [13]. Injury and trauma in patients below 18 age group has a special regard with special pattern of injury, investigation and dealing due to the difference of anatomy, physiology and recognition in children compared to older individual. There are expenses of children trauma as the hospitalization and the future economic load due to incompetence and the work chances loss in the future [14].

This study was implemented at the emergency department of Al-Azhar University hospital [New Damietta] on children with injury and in the period from January 2024 to July 2024, there were 153 children examined in the emergency department achieved inclusion criteria of the study. The present study showed specific patterns of injuries in the childhood period according to gender, age and residence aiming to see the spectrum of injury from the medico legal point of view in children. According to the current study, the mean age of the study population was 8 ± 4.5 years. Across all age groups, boys had a higher frequency of injuries. Notably, males exhibited a greater frequency for all modes of injuries except for those caused by sharp objects and animal bites. This higher incidence of injuries among males may be attributed to behavioral and cultural factors. Boys are generally more physically active and more likely to engage in riskier behaviors at home and school. They are often more adventurous and thrill-seeking, which increases their exposure to injury risks [15].

Furthermore, in many developing countries, boys tend to participate more in outdoor physical activities and begin using vehicles at earlier ages, especially during school and adolescent years, which further heightens their vulnerability to injuries [16].

These findings are consistent with previous studies conducted in Egypt. For example, *Elbaih et al.* [17] and *Allam et al.* [7] also reported a higher incidence of injuries among males. Similar trends have been documented globally, as seen in the studies by *Mattila et al.* [18] and *Kalkan et al.* [19]; all of which found that males were more frequently injured than females. However, contrasting evidence exists. A study conducted in Turkey by *Büken and Yasar* [20] reported no significant gender differences in injury rates. The authors attributed this to similar lifestyle patterns and activity levels between males and females in that context, suggesting that gender-based differences in injury rates may vary by cultural and environmental factors.

In the present study, injury rates were higher in urban areas compared to rural ones. This finding aligns with previous research conducted in Egypt, including studies by *Halawa et al.* [1], and *Mohammed et al.* [21] and worldwide by *Hedström and Weinbaum* [22] which also reported a higher prevalence of childhood injuries in urban regions. However, these results contrast with findings from other international and national studies that observed a greater incidence of injuries among children in rural areas. For example, *Hammig and Weatherley* [23] reported higher rural injury rates in global contexts, and similar findings were noted in Egypt by *Allam et al.* [7] and *El-Farouny & Azab* [24].

The higher ratio of urban injuries in other studies could be attributed to higher number of urban participants in those study samples which conducted in Colorado, Ireland and Egypt respectively [1, 25, 26].

The observed discrepancy can be attributed to the setting itself. New Damietta is a predominantly urban area, and the sample consisted mainly of urban residents, which likely contributed to the higher injury rate observed in this group.

As regards the rate of injury in relation to specific age group, the most common affected age group [2-12] years [68.6%] and the least common affected age group [0-2] with [9.2%] as children in this age usually with limited activities and always under supervision of their mothers. This is consistent with *Allam et al.* [7] who stated that the most common affected age group [6-10] years.

Abed et al. [27] stated that most of the patients included in their research were toddlers and school-age. This can be explained by School age [6y to < 12y] and preschool age [3 y to < 6y], are prone to injuries since they are exposed to a variety of activities at home, school, and in the neighborhood. However, our results are in contrast with *El-Farouny and Azab* [24] who stated that the majority of children included in the study were in early adolescence [12 y to < 18y], followed by school age [6y to < 12y], preschool age [3 y to < 6y], and finally toddlers [1y to < 3y]. This may be due to differences in the composition of the population in different Egyptian governorates [24].

The current study showed that Evening injuries were more common across all age groups evening time represented [62.1%]. Which is consistent with *Hyginus, et al.* [28] and *Asuquo et al.* [15] who reported that a greater number of injuries occurred in the afternoon and evening [64.4%].

As regard the places of injury, with home injuries being more common in infancy and childhood, and road injuries increasing in adolescence. There is a high significant association between age group of study population and place of injury occurrence. Injuries at home represented [44.4%] followed by road [40.5%] which was in harmony with *Embabi et al.* [13] who stated that injuries at home represented 45 %.

Yigit et al. [29] observed that child traumas occurred most commonly at home with a rate of [59.8%]. More than [60 %] of injuries occurred in the home setting as reported by another Egyptian study *Halawa et al.* [1]. Studies from Canada and Tehran found similar results [30].

Possible explanations may be that home play involves various forms of unstructured and unsupervised activity which can potentially lead to injury [15].

Concerning schools' injuries, our study shows [11%] while *El-masry et al.* [31] showed [14%] and *Halawa et al.* [1] shows only 8.8%.

Workplace injuries were observed to represent 3.9% of all injuries in the studied population. Notably, all reported cases occurred among adolescent males aged 12–18 years. This aligns with findings from *Fouad et al.* [32] who found that work-related injuries were more frequent among older children, particularly those over 12 years of age. In contrast, *Caleo et al.* [33] reported that work-related injuries accounted for 7.5% of all new consultations among children, with no significant variation across age groups. However, male children exhibited a higher proportion of injuries [11%] compared to females [2.5%], indicating a gender disparity consistent with other studies.

Regarding the types of workplace injuries, 17.2% were due to sharp instruments, with cut wounds being the most common type [66%], followed by crushed wounds [16.7%]. This pattern is comparable to findings from **Pinzon et al.** [34], who studied working children in the streets of four major Latin American cities. Their study found that 39.6% of children reported work-related injuries, most commonly scratches [19.5%], cuts or lacerations [16.4%], and injuries from car accidents [8.9%].

In Egypt, **Fouad et al.** [32] noted that superficial or open wounds were the most common type of injury among working children, comprising 87.3% of all reported cases. Other less frequent injuries included eye-related injuries, dislocations, strains, and fractures [2.6%], and burns [2.4%].

The differences between the findings of the current study and those of previous research may be due to variations in the nature of work performed by the children, as Children in urban areas are mostly involved in commerce and construction sector, in contrast, the rural counterpart are typically working in agriculture. However, these children often suffer from occupational injuries. In addition, most of the earlier studies focused exclusively on children who were already engaged in work, meaning their samples consisted only of working children. This likely resulted in a higher observed rate of injuries in those studies compared to the current one, which may have included a broader population that was not limited to working children.

The intentional injuries in the present study represent a lesser rate of the total cases [9.2%] in comparison with non-intentional injuries [90.8%]. This is in harmony with **Allam et al.** [7] who reported that intentional injuries in their study represent [24.2%] of the total cases, additionally, these results were in consistent with **Gallaher et al.** [35] who recorded that the total intentional injuries in children below 18 years with ratio of 8.1% of total cases.

The intentional injury rate of the cases was higher in males [64.2%] than in females [35 %], which was in consistent with **Gallaher et al.** [35] who reported that female cases in intentional injuries was lower than male cases [72.6 % in males compared to 27.4% in females. Also, with **Allam et al.** [7] who reported the intentional injury rate of the cases was higher in males [75%] than in females [25%].

The age group with highest frequency in the intentional injuries was >2-12 age group [8.6%] which is the same age group with the higher frequency of non-intentional injuries [91.4%]. The most common affected site of intentional cases was head area which could be explained by the accessibility of this area this was in accordance with **Gallaher et al.** [35].

In the present study the commonest type of injury was contused wound [40.5%] followed by fractures [33.3%], abrasion and contusions [22.2%], cut wounds [11.8%], burns [5.9%], crushed [3.9%] and finally Penetrating wounds [cases 2.6%]. This was in harmony with **Halawa et al.** [1] and **Allam et al.** [7]. This could be explained by that the commonest cause of trauma in the present study was falls followed by RTA and driving bike which is considered blunt injury resulting in contused wounds and fracture. Also, lack of traffic rules in some places in developing countries and use of motor cycles and bike in our region the cause.

Fractures and contused wounds were common across age groups, with infants and younger children more likely to have contused wounds. Adolescents had a higher incidence of cuts and penetrating injuries.

Balan and Lingam [36] asserted that age significantly influences injury patterns, a finding consistent with our study where falls were the most common cause of injury [37.9%], particularly among younger children. As age increased, other causes such as road traffic accidents [RTAs] [17%] and injuries from sharp objects became more prevalent. Our analysis also revealed a strong and significant association between age groups and different types of injuries.

Older children are more vulnerable to RTAs, often occurring while walking or cycling, whereas younger children are more prone to burns and falls at home. This is supported by **Mutto et al.** [37], who observed that falls were the leading cause of unintentional injury in children under thirteen, while burns were more common in children younger than five years. Similarly, **Abed et al.** [27] reported a correlation between injury types and age groups, noting that falls were most common among preschool children, whereas nearly all adolescents admitted were due to RTAs.

Additional studies by **Halawa et al.** [1] identified falls as the predominant cause of unintentional injuries among children. Halawa et al. attributed these results, particularly in underdeveloped nations, to lower safety standards for furnishings and furniture, inadequate supervision, and limited access to safe play areas—factors known to increase the risk of falls in children.

Conversely, some studies, such as **Büken and Yasar** [20] reported lower incidence of traffic accidents among children. This discrepancy may be explained by geographical differences and the level of development; developed countries often have stricter traffic regulations and greater supervision on roads, reducing the frequency of RTAs, whereas such measures may be less enforced in developing countries.

As regard to the site of injury, the present study found that the head region was the most commonly affected area, accounting for [54.2%] of cases, followed by injuries to the upper limb [41.2%]. These findings are consistent with those of **Abed et al.** [27] and **Allam et al.** [7], who reported that the head-neck and upper extremity regions are the most frequently injured body parts in pediatric trauma. Similarly, **Yiğit et al.** [29] observed that head-neck injuries occurred in [64%] of cases, while extremity injuries ranked second with a rate of [41.9%].

The predominance of head injuries in children can be attributed to anatomical and physiological factors. Children have proportionally larger and heavier heads relative to their body size compared to adults, making the head more vulnerable to trauma. As children grow, the head-to-body size ratio decreases, which may reduce the frequency of head trauma with increasing age [38]. However, contrasting findings were reported by **El-Farouny and Azab** [24], whose study indicated that the most commonly affected areas were multiple injury sites, followed by isolated injuries to the head and lower limbs. This variation may be due to differences in injury mechanisms, age distribution, or study settings.

In our study, it was observed that a single body part was affected by trauma in the majority of cases, with a rate of [76.5%]. Most of these patients completed their treatment without the need for hospitalization or follow-up. In contrast, [23.5%] of the patients sustained multiple traumas, and their hospitalization and follow-up rates were significantly higher compared to those with injuries limited to a single body part. These findings are consistent with those reported by **Yiğit et al.** [29], who found that [73.64%] of patients had a single injury, while [26.35%] presented with multiple traumas. Their study also concluded that patients with multiple injuries were significantly more likely to require

hospitalization and follow-up, reinforcing the correlation between the extent of trauma and the severity of clinical outcomes.

In the current study, only 14.4% of children presenting to the Emergency Department with injuries required hospital admission following initial treatment, while the majority [83.0%] were discharged directly from the ED. These findings are consistent with those of **Catchpoole et al.** [39], who reported a similar hospital admission rate of 17% among injured pediatric cases.

A key observation in our study is that the need for hospitalization increased with age. Specifically, [35.3%] of adolescents required admission compared to only [8.6%] of children in the younger age group. This trend suggests that older children are more likely to sustain severe injuries that necessitate hospital-based care. These findings are in alignment with those of **Embabi et al.** [13], who reported that school-aged children had a higher rate of admission compared to preschool-aged children.

Similarly, **Catchpoole et al.** [39] observed that the highest proportion of injury-related hospitalizations occurred among children aged 10–14 years [34.4%], followed by those aged 5–9 years [30.9%], 1–4 years [30.2%], and infants under 12 months [4.5%].

Further analysis of causes of admission revealed that fall [23.8%] and Road Traffic Accidents [RTAs] [42.9%] were the leading mechanisms behind hospitalizations. This is consistent with findings from **Abed et al.** [27], who reported that RTAs were associated with the longest hospital stays and the highest morbidity and mortality rates among pediatric patients.

Gender differences were also observed in hospitalization rates. In our study, more males [17.9%] were admitted compared to females [4.3%], suggesting a gender disparity in injury severity or exposure to high-risk environments. This pattern aligns with the findings of **Catchpoole et al.** [39] who similarly noted higher hospitalization rates in males [18.4%] than in females [15.9%], and identified falls [32.2%] and being struck or colliding with objects [11.1%] as leading causes of hospitalization.

In the present study, the majority of injuries among children were found to be single and simple in nature. Specifically, simple injuries were observed in 87.6% of the cases, while grievous injuries accounted for 12.4%. These findings align partially with those reported by **Sharma et al.** [5], who noted that 52.61% of injuries were simple and 47.39% were grievous. The discrepancy may be attributed to variations in study populations, settings, or criteria for classifying injury severity.

A notable trend emerged regarding age-related patterns in injury severity. Younger children, particularly infants, predominantly sustained simple injuries, whereas adolescents exhibited a higher proportion of multiple and grievous injuries, with dangerous injuries reported in [32.4%] of cases. This may be explained by the increased risk-taking behavior and greater exposure to hazardous environments commonly associated with older age groups. Statistical analysis confirmed a highly significant association between the age of the study population and the severity of injury. Supporting these findings, **Gong et al.** [40] reported that most unintentional injuries among children in their study were mild and did not require hospital admission, with only a small percentage presenting with more serious outcomes.

In conclusion, the current work highlighted the pattern and associated risk factors for emergency department injuries of children

younger than 18 years of age. With other local studies from different governments of Egypt, it will be possible to build an effective preventive strategy to reduce such injuries. However, the study had some limitations. First, it is a single center study and only captured injuries presented at ED departments, thus not covering the large number of often less serious cases presented to general practitioners and other health service providers or those not presenting at all. The study also does not capture those severe cases that bypassed ED and got transferred directly into intensive or other inpatient care.

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