

PATTERN OF UNINTENTIONAL INJURIES AMONG CHILDREN ADMITTED TO MENOUFIA UNIVERSITY HOSPITALS

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ABSTRACT

Background: Children's injuries are a growing global public health problem. It can be divided into intentional and unintentional injuries based on intent. Unintentional injuries include road traffic accidents (RTA), falls, burns, poisoning, drowning, occupational injuries, and injuries in disaster situations, whereas intentional ones include suicide, assault, child maltreatment, and homicides. **Aim:** The study aimed to measure the frequency of unintentional injuries among children, to determine the different types and patterns of injuries, as well as the consequent morbidity and mortality. **Patients and Methods:** This was a cross-sectional study conducted on 275 cases of children less than 18 years of age admitted to the Menoufia University Hospital emergency room due to unintentional trauma over one year. **Results:** Males were around three times greater than females, accounting for 71.5% of the investigated sample. Road traffic accidents (RTA) accounted for 58.9% of all injury cases, followed by burn injuries (25.6%), and lastly, fall from height (15.6%). Recovery was the most frequent outcome (72.2%), followed by cases released against medical recommendation (11.1%), while 10% of patients experienced complications such as infection or permanent disability, and 6.7% died. **Conclusions:** Unintentional injuries are a major global health problem and one of the leading causes of death, hospitalization, and disability worldwide. Road traffic injuries (RTA), falls and burns are the most frequent causes of unintentional injuries in children in Egypt. **Recommendations:** Preventive measures include protecting children from hot liquids, enhancing pedestrian safety, monitoring bathing and using stair-blocking gates. Continuous monitoring and specialized injury prevention studies are needed to support the implementation of injury prevention techniques.

Keywords: Unintentional Injuries, Patterns, Children, Menoufia, Egypt.

INTRODUCTION

Children's injuries are a major public health issue. Each year, hundreds of thousands of children lose their lives due to injuries or acts of violence, and millions more endure the consequences of non-fatal injuries. Every year, injuries claim the lives of about 875 thousand children under the age of 18, most of them in low- and middle-income nations. In addition, injuries account for 13% of all childhood morbidities among children under the age of fifteen (Adeloye et al., 2018). Egypt is one of the low- or middle-income nations in the Middle East with a high injury rate. A household study carried out in 2011 in Egypt revealed that 95% of the children surveyed had at least one injury, indicating that childhood injuries placed a significant load on the healthcare system (Mohammed et al., 2020).

Unintentional Children's injuries can have a wide variety of physical effects, from little

bruises and cuts to serious fractures, brain traumas, and even death. Falls frequently result in injuries, particularly for young children whose balance and coordination are still developing. Burns, which are frequently brought on by contact with hot surfaces or hot liquids, can leave scars behind and cause permanent physical damage. Drowning in swimming pools, bathtubs, or natural water can cause brain damage or even death from oxygen deprivation, as it is extremely dangerous. Serious injuries from traffic accidents, such as traumatic brain injuries or spinal cord injuries, can have a long-term impact on a child's physical health (Abhilash et al., 2018). Apart from the physiological consequences, injuries sustained by children can also result in significant psychological impacts (Nelson et al., 2020).

Unintentional injuries are one of the most common causes of death, hospitalization, and

disability worldwide. However, the pattern and etiology of injuries and their outcomes vary substantially within populations and across countries (Yu et al., 2023). Many factors contribute to children's injuries like age, sex, behavior, and environment. Children of lower socioeconomic status generally have a greater risk of both fatal and nonfatal injuries. Therefore, for the prevention of children's injuries, their causes and patterns (epidemiology) should be understood. There are few studies on injuries among children in developing countries, especially in Arab countries, which may be due to the continued focus on treatment rather than prevention (Halawa et al., 2015).

The purpose of this study was to estimate the frequency of unintentional injuries among children admitted to Menoufia University Hospitals, to determine the different types and patterns of these injuries, as well as the consequent morbidity and mortality.

SUBJECTS AND METHODS

This cross-sectional descriptive study was carried out on (275) cases of children less than 18 years of age, admitted to Menoufia University Hospital emergency room due to unintentional trauma during the period from October 2022 to the end of September 2023.

The Ethical Committee of the Menoufia University Faculty of Medicine permitted this study. The parents or guardians of the cases completed a valid consent form after being informed of the study's purpose. The data was kept anonymous to protect record confidentiality.

The patients who participated in this study fulfilled the following requirements: they were between one to 18 years old and had accidental unintentional trauma (Identified from history taken from the patients or their guardians, and the clinical examination of the injury) such as falls, burns, and RTA. On the other hand, patients who refused to sign the consent form, those with suicidal injuries, those who were victims of purposeful harm caused by others (such as stabbings, gunshot wounds, various forms of physical abuse, or sexual abuse), patients who were readmitted to the hospital

for the treatment of sequelae or rehabilitation, and those who left the care unit before a comprehensive examination of their clinical status at the request of their guardians were among the excluded criteria.

The following information about the patients and their clinical status were gathered: demographic information, age group, sex, manner of trauma, location of the trauma, nature of the injury, and its general criteria. To assess the severity of the cases, the Glasgow Coma Scale (GCS) was utilized. The GCS relies on the function of the central nervous system (CNS) which includes verbal, motor, and eye-opening responses. According to Salottolo et al. (2014), the severity of the case ranged from mild (score =13–15), moderate (score = 9–12), and severe (score < 9).

Additionally, the patient's outcomes at the time of hospital discharge were evaluated as follows: recovered, discharged against medical recommendation, dead, or occurrence of complications as permanent infirmity. Statistical Package of Social Science (SPSS) Version 20 was used to tabulate and statistically analyze the collected data. The appropriate statistics, including number and percentage for descriptive statistics and the chi-square test for analytic statistics, were used. P values under 0.05 were deemed statistically significant. If the P value is 0.001 or below, it is said to be statistically highly significant (Dawson and Trapp, 2004).

RESULTS

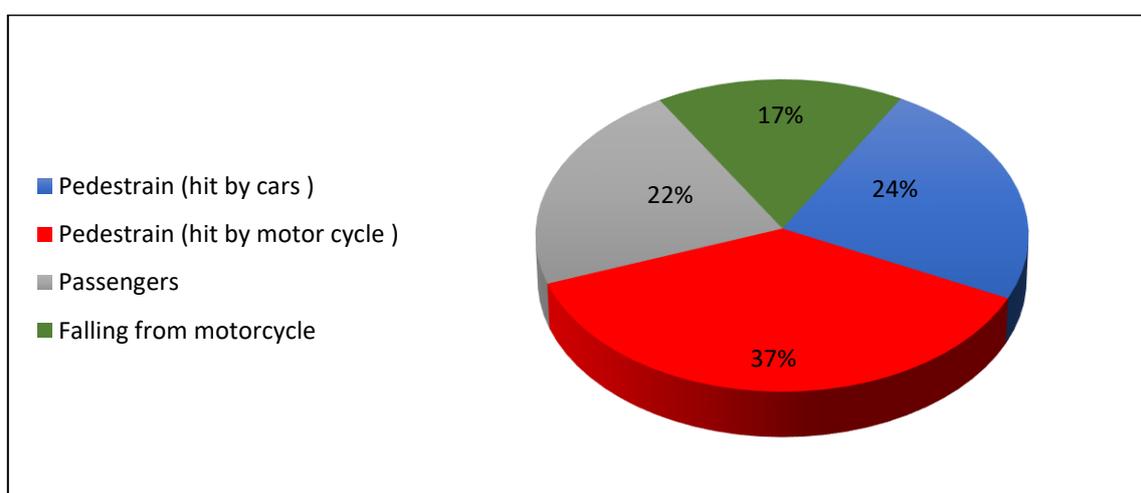
This cross-sectional descriptive study ran from October 2022 to the end of September 2023 on 270 wounded children cases presented to Menoufia University Hospital due to unintentional injuries. The majority of them (54.4%) were in early adolescence, followed by 18.9% and 17.8% in school and preschool age, respectively. Males were around three times greater than females, accounting for 71.5% of the investigated sample. There were 78.9% of cases from rural regions and 21.1% from urban areas. As seen in the table, most of the patients (58.9%) had basic education, while 4.4% had secondary education (table 1).

Table (1): Demographic characteristics of children included in the study.

	Value	No.	%
Age	Toddler (1y to < 3y)	24	8.9
	Preschooler (3y to < 6y)	48	17.8
	School-age (6 y to < 12y)	51	18.9
	Adolescence (12 y to < 18y)	147	54.4
Sex	Male	193	71.5
	Female	77	28.5
Residence	Rural	213	78.9
	Urban	57	21.1
Education	Illiterate (no schooling)	99	36.7
	Basic	159	58.9
	Secondary	12	4.4
	Total	270	100

As regards the cause of injury, road traffic accidents (RTA) accounted for 58.9% of all injury cases, followed by burn injuries (25.6%), and lastly fall from height (15.6%). Blunt instruments were more frequently mentioned (65.6%) than incidents involving sharp instruments (8.9%). Multiple anatomical sites affected were seen in (30.3%) of cases, followed by the head and lower limbs 11.1% each. Most RTA victims (37%) were pedestrians hit by motorcycles, followed by those hit by cars (24%), then passengers

(22%), and lastly, those who fell from motorcycles (17%) (**fig 1**). According to GCS, mild cases outweighed the other degrees (72.2%), followed by moderate and severe cases (17.8% and 10%, respectively). Radiological findings revealed that the majority of the cases (48.1%) had a fracture of the skull bone or another bone in the body. Intracranial hemorrhage was discovered in 17.7% of cases, intrabdominal collection of blood in 11.8%, and pneumothorax or hemothorax was identified in 5.5% of cases.

**Figure (1):** Distribution of injured cases in RTA according to their position.

Sixteen-point-seven percent of patients were admitted to intensive care units. 43.3% of the patients had surgical intervention, while the remaining cases had medical treatment only. Recovery was the most frequent outcome (72.2%), followed by cases left the hospital

against medical recommendation (11.1%), while 10% of patients experienced complications such as infection or permanent disability, and 6.7% died as shown in **Table (2)**.

Table (2): General criteria (types, subtypes, treatment, and outcome) of the injuries among the admitted children.

	Value	The studied cases (No =270)	
		No.	%
Cause of injury	Road traffic accidents (RTA)	159	58.9
	Falls	42	15.6
	Burn	69	25.6
	Head	30	11.1
Injured Part	Upper limb	24	8.9
	lower limb	30	11.1
	Chest	21	7.8
	Abdomen	15	5.6
	Face	9	3.3
Type of lesion	Combination of more than one site	141	52.2
	Abrasion and contusion	139	51
	Contused wound	112	41
	Cut wound	35	13
	Crushed injury	9	3
	Burn injury	69	26
	GCS	Mild (13-15)	195
Moderate (9- 12)		48	17.8
Severe (3-8)		27	10
Admission	Department	225	83.3
	ICU	45	16.7
Radiological findings	Pneumothorax or hemothorax	15	5.5
	Intracranial hemorrhage	48	17.7
	Fracture	130	48.1
	Intra-abdominal collection	32	11.8
Treatment	No finding	115	42.6
	Medical	153	56.7
	Surgical	117	43.3
Outcome	Complete recovery	205	76
	Recovered with complication	19	7
	Discharged against medical advice	30	11.1
	Died	16	5.9

A significant relation was found between age groups and the cause of trauma according to **Table (3)**; fifty percent of toddlers had burn injuries, whereas (43.8%) of preschool age

experienced falls from height, moreover, (58.8%) of school-age and (73.5%) of adolescents were injured due to RTA (p-value <0.05).

Table (3): Statistical comparison between the cause of injury and age of children by Chi-square test.

	Road traffic accident (RTA)		Fall		Burn		Total		χ^2	P**	
	No.	%	No.	%	No.	%	No.	%			
Age	Toddler	6	25	6	25	12	50	24	100	60.95	0.001
	Preschooler	15	31.3	21	43.8	12	25	48	100		
	School-age	30	58.8	9	17.6	12	23.5	51	100		
	Adolescence	108	73.5	6	4.1	33	22.4	147	100		

**P ≤ 0.001 is highly significant (HS)

Table (4) revealed a significant relationship between sex and the cause of injury: 69.4% of male injuries were caused by

RTA, whereas 42.9% of female injuries were caused by burning (p-value <0.001).

Table (4): Chi-square statistical analysis of the relation between sex and cause of injury.

Cause of injury	Male		Female		χ^2	P**
	No.	%	No.	%		
Accident	134	69.4	25	32.50	31.147	0.0001
Fall	23	11.9	19	24.7		
Burn	36	18.7	33	42.9		
Total	193	100	77	100		

**P ≤ 0.001 is highly significant (HS), ($\chi^2 = 31.147$ and p value <0.001).

There was a significant sex-age association, where there were more females than males among toddlers (58.3% to 41.7%), in contrast to the school-age group and

adolescents, as males predominated by 64.7% and 85.7%, respectively (p-value < 0.001) (**Table 5**).

Table (5): Chi-square statistical analysis of the relation between Sex and age.

Age	Male		Female		Total		χ^2	P**
	No.	%	No.	%	No.	%		
Toddler	10.0	41.7	14.0	58.3	24.0	100	37.08	0.001
Preschooler	24.0	50.0	24.0	50.0	48.0	100		
School-age	33.0	64.7	18.0	35.3	51.0	100		
Adolescence	126.0	85.7	21.0	14.3	147.0	100		

**P ≤ 0.001 is highly significant (HS), ($\chi^2 = 37.08$ and p value <0.001).

Table (6) showed that there was a significant association between the outcome and cause of trauma as 61% of recovered cases were due to road traffic accidents versus 57%

of cases that experienced complications as disfigurement were due to burning (p-value < 0.005).

Table (6): Chi-square statistical analysis of the relation between the cause of injury and outcome.

Outcome	Accident		Fall		Burn		Total		χ^2	P**
	No.	%	No.	%	No.	%	No.	%		
Recovered	125	61	37	18	43	21	205	100	18.391	0.005
Died	11	68.8	2	12.5	3	18.8	16	100		
Complication	8	42.1	0	0	11	57	19	100		
Discharged against medical advice	15	50	3	10	12	40	30	100		



Figure (2): Picture of an 11-year-old child with multiple abraded contusions on the face after a motorcycle injury



Figure (3): Picture of a 2-year-old child with scald injury over parts of the chest, abdomen, and right arm after injury by hot liquid.



Figure (4): Picture of a 14-year-old child with multiple contused wounds on the face after an RTA injury



Figure (5): Picture of a 3-year-old child with abraded contusion and contused wound after RTA injury



Figure (6): Picture of a 5-year-old child with black eyes bruising and swelling around the eyes and eyelids after a fall from height injury

DISCUSSION

Unintentional injuries continue to be a serious worldwide health issue. The major causes of unintentional injuries among children and adolescents worldwide include road traffic accidents, drownings, burns, and falls (Mutto et al., 2011).

The results of the present study revealed 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). Early adolescents are likely more prone to injuries since they are exposed to a variety of activities at home, school, and in the neighborhood. In contrast to the present study, Abed et al. (2022) stated that most of the patients included in their research were toddlers and school-age. Halawa et al. (2015) found that the age group between 2–6 years constituted the majority of studied patients; this may be due to differences in the composition of the population in different Egyptian governorates.

The present study revealed that males outnumbered females and accounted for around three times more than females in agreement with previous studies such as El-Sayed et al. (2012) & Abed et al. (2022) who found that males were more than females in their study. In most developing countries, boys are involved in more outdoor physical activities and start riding vehicles during their school age and adolescent period and hence are more prone to injuries (Abhilash et al., 2018).

The present study found that a higher

range of participants were from rural regions. This could be related to Menoufia Governorate's rural character. These results agreed with Omran et al. (2021) & Allam et al. (2023) who stated that there were various community and social risk factors in rural areas than in urban ones which could be explained by that in rural regions there is limited access to medical facilities and a lack of health insurance coverage, and thus the larger proportion of rural residents may not have sought treatment (Omran et al., 2021). In contrast to this study, Halawa et al. (2015); and Mohammed et al. (2019) in Egypt discovered that injuries were more common in urban than in rural regions. This discrepancy may be explained by that Menoufia governorate is a rural governorate with a high number of its population living in rural region.

As regards the cause of injury, the current study revealed that road traffic accidents (RTA) were the mostly leading cause of injury, followed by burn injuries and lastly falls from height. These results were in agreement with the studies of Kanchan et al. (2009) in India and Arslan and Demir (2022) in Turkey. The pedestrians hit by motorcycles and cars in the current study constituted a higher incidence among patients presented by road traffic accident injuries than passengers, and lastly falling from motorcycles. Kanchan et al. (2009) in India concluded that road traffic accidents were the most frequent cause of injuries in cases involved in their studies and also found that the highest proportion of road traffic accidents injured patients involved in

their study were pedestrians. This may be due to defects in road safety procedures, as the lack of bridges for pedestrians makes them vulnerable to being hit by speeding vehicles, as well as to some behaviors carried out by some pedestrians that may increase the chances of accidents occurring on the road as not paying attention and talking on the phone while crossing the road.

In contrast, **Abed et al. (2022)** declared that most RTA cases included in their study were children as car passengers. A study by, **Fraga et al. (2010)** found that the majority were passengers, followed by pedestrians struck.

This study also revealed that the cause of unintentional injury among children can differ with age and sex. As, there was a significant relation between them, as fifty percent of toddlers had burn injuries, while falls were predominant in preschool age and adolescents were mostly injured due to RTA. In addition, male injuries were mostly caused by RTA, whereas 42.9% of female injuries were caused by burning.

Balan and Lingam (2012) claimed that age had an impact on injury patterns. Older children are more vulnerable to road traffic accidents (RTAs) while they are walking or cycling, whereas younger children are more prone to burns and falls at home. **Mutto et al. (2011)** observed that falls were the main cause of unintentional injury among those under thirteen, whereas burns are more likely to occur in those younger than five. **Abed et al. (2022)** mentioned that there is a correlation between injury forms and age groups; since falling is the most common occurrence in both preschools, and nearly all adolescents were hospitalized as RTA cases. **Kamal (2013)**, found that falls were the most prevalent injury across all research groups, with burns coming in second. **Halawa et al. (2015); and Gad Allah (2020)** reported that children's unintentional injuries were most frequently caused by falls. **Halawa et al. (2015)** related these results in underdeveloped nations to diminished safety standards for furnishings and furniture, inadequate supervision, and restricted access to safe play areas; all of which have been linked to an increased risk of children falls.

Moreover, the most common part affected in the current work was multiple sites, followed by the head and lower limbs separately. These injuries reflect the severity of cases. However,

Allam et al. (2023) revealed that face injuries were the most common injuries in their study, followed by the upper limb. While **Abed et al. (2022)** found that the head and neck were the most frequently injured. This contrast may be explained by that the mostly leading cause of injuries among the included patients was road traffic accidents, which cause mostly polytrauma all over the body.

As the majority of cases presented by polytrauma, radiological findings in the initial assessment of the cases revealed that most of them had a fracture of the skull bone or another bone in the body. Also, intracranial hemorrhage, intraabdominal collection, and pneumothorax or hemothorax were recorded. **Gong et al. (2021)** reported that most of the unintentional children injuries included in their study were mild and did not require hospital admission and only a small percentage of patients may show up with minor injuries.

The mortality rate in the present study was low, nearly half of the dead cases were caused by RTA followed by burn. This highlights the major problem of RTA in Egypt. Similarly, **Fraga et al. (2010)** discovered that motor vehicle collisions were the leading cause of mortality for children older than five. They argued that regardless of the country's social and economic status, these results are similar to those found in research conducted worldwide. **Alghnam et al. (2014)** recorded a similar low mortality rate in children aged below 14 years. **Duramaz et al. (2015)** observed that the mortality rate in their study was low again and the highest cause of death was falling from height.

The majority of cases were recovered completely, these findings were in line with the study of **Kamal (2013)** who demonstrated that complete recovery was predominant among cases involved in his study. Furthermore, **Abed et al., (2022)** determined that nearly all children recovered from wounds and went back to their healthy state.

Only a small percentage of the involved patients developed complications, and more than half percent of them experienced disfigurement due to burn injury. These results reflect the danger of burn which was a major leading cause of disfigurement in this study. The absence of safety measures and lack of fire alarms and fire extinguishers in rural houses are factors directly related to socioeconomic status and all these factors are associated also with

care-seeking behavior. However, **Kamal (2013)** revealed that falls were associated with complications in the form of handicapping in about 6.6 % of the studied cases.

CONCLUSION

Unintentional injuries are a major global health problem and one of the leading causes of death, hospitalization, and disability worldwide. Road traffic injuries (RTA), falls and burns are the most frequent causes of unintentional injuries in children in Egypt.

RECOMMENDATIONS

Numerous precautions have to be followed to decrease or prevent unintentional injuries in children such as safeguarding kids from hot liquids, enhancing pedestrian safety, enhancing road safety measures, monitoring children while they bathe, and using stair-blocking gates. Continuous child injury monitoring utilizing standard procedures is a technique required in Egypt to monitor injuries and associated risk factors as well as follow the results of effective therapies. Besides that, the nation needs specialized injury-prevention studies, and the information obtained from such research should support the implementation of injury-prevention techniques.

CONFLICTS OF INTEREST

There are no conflicts of interest to report among the authors.

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الملخص العربي

نمط الإصابات غير المتعمدة بين الأطفال الذين تم إدخالهم إلى مستشفيات جامعة المنوفية

ريهام حسن الفرعوني و رشا ممدوح عزب

قسم الطب الشرعي و السموم الاكلينيكيه - كليه الطب - جامعه المنوفيه - جمهورية مصر العربية

المقدمة: تعتبر مشكله إصابات الأطفال مشكلة عالمية متزايدة في الآونة الاخيرة. يمكن تقسيم إصابات الأطفال إلى إصابات متعمدة وغير متعمدة. تشمل الإصابات غير المتعمدة إصابات المرور على الطرق ، والسقوط ، والحروق ، والغرق ، والإصابات المهنية ، والإصابات الرياضية ، والإصابات في حالات الكوارث ، بينما تشمل الإصابات المتعمدة الانتحار ، والاعتداء ، وسوء معاملة الأطفال ، والقتل.

الحالات والوسائل المستخدمة: كانت هذه دراسة مقطعية وصفية أجريت على (275) حالة لأطفال تقل أعمارهم عن 18 عامًا ، تم إدخالهم إلى غرفة الطوارئ بمستشفى جامعة المنوفية بسبب إصابات غير متعمدة خلال الفترة من بداية اكتوبر 2022 إلى نهاية سبتمبر 2023. تم فحص المرضى وتقييم حالتهم السريرية وجمع المعلومات التالية : المعلومات الديموغرافية، الفئة العمرية، الجنس، طريقة الاصابة، موقع الاصابة و طبيعتها. ولتقييم مدى خطورة الحالات، تم استخدام مقياس غلاسكو للغيوبية وقد تم تجميع هذه البيانات وتحليلها احصائيا.

النتائج: أظهرت نتائج الدراسة ان عدد الذكور أكبر من عدد الإناث ، ويمثل 71.5% من العينة التي تم فحصها. كما شكلت حوادث المرور على الطرق 58.9% من جميع الإصابات ، تليها إصابات الحروق (25.6%) ، وأخيراً السقوط من المرتفعات (15.6%). وكان التعافي هو النتيجة الأكثر شيوعاً (72.2%) ، تليها الحالات التي تم خروجها ضد التوصيات الطبية (11.1%) ، في حين عانى 10% من المصابين من مضاعفات مثل العدوى أو الإعاقة الدائمة ، وتوفي 6.7%.

الاستنتاجات: تعد الإصابات غير المتعمدة مشكلة صحية كبرى وأحد الأسباب الرئيسية للوفاة والاستشفاء والإعاقة في جميع أنحاء العالم. تعد الإصابات الناجمة عن حوادث المرور والسقوط والحروق من أكثر الإصابات غير المتعمدة شيوعاً بين الأطفال **التوصيات:** توصي الدراسة باتخاذ العديد من التدابير الوقائية لتقليل أو منع الإصابات غير المتعمدة لدى الأطفال مثل حماية الأطفال من الاصابة بالحروق السلعية ، وتعزيز سلامة المشاة ، وتعزيز تدابير السلامة على الطرق ، ومراقبة الأطفال أثناء الاستحمام .