



Epidemiology of Pediatric Trauma at a Tertiary Hospital in Riyadh, Saudi Arabia

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Abstract

Objective: To determine the patterns and distributions of pediatric traumas among gender, age groups, mechanisms of injury, and anatomical regions at a tertiary hospital in Riyadh, Saudi Arabia.

Methods: This retrospective observational study used the trauma registry of King Abdulaziz Medical City Trauma Center to extract data of all pediatric patients aged <14 years who were admitted to the hospital following trauma from January 2009 to April 2014. Demographic characteristics, date and time of admission, injury type and mechanism, body area involved and the mortality rates were analyzed.

Results: Totally 1762 patients were included, 68% of whom were males. The most common mechanism of injury was blunt trauma (73%), followed by burns (17%) and penetrating injuries (10%). Road traffic injuries were the most common cause (50%) of blunt trauma, followed by Fall (40%) and those caused by physical object (10%). During the study period, 305 patients with burns were treated with scalds accounting for the highest proportion (68%) of burn injuries. Penetration caused by sharp objects (79%) was the most frequent cause of penetrating injuries. Totally 50 mortality cases were recorded, which most commonly occurred among the school-aged group (40%). More observed in male (78%) with leading cause of deaths among patients was blunt injury with (92%).

Conclusion: This study has shown the patterns of pediatric trauma injuries in a tertiary hospital in Riyadh, Saudi Arabia, illustrating the local variability across genders, age groups, injury types and injury mechanisms. We have shown that trauma registries can be used to provide age-specific anticipatory guidance for trauma to children parents.

Keywords: pediatric trauma, trauma registry, anticipatory guidance.

Introduction

The incidence of traumatic injuries is predicted to exceed that of any other causes of disability-adjusted life year (DALY) and become the leading

cause of DALY by 2020.¹ Traumatic injuries are already recognized as the leading cause of death among children in many countries worldwide.^{2,3} Moreover, the rising hospital admission rates

among children were also found to be related to trauma.^{4,5} These findings were also confirmed locally in Saudi Arabia by previous studies.^{6,7}

Road traffic injuries (RTI) is the major mechanism of trauma and also the leading cause of traumatic deaths in Saudi Arabia,^{8,9} which accounted for over 5000 deaths in Saudi Arabia in 2005 alone.¹⁰ However, penetrating injuries are considered to be a global health problem, which are even more common than RTI in some European countries.¹¹

The use of trauma registries has been shown to play a crucial role in the reduction of death and disability rates associated with injuries because it influences the evaluation, application, and planning of trauma care.¹² Moreover, it is important for physicians to use these registry numbers to provide anticipatory guidance for parents and empower them to prevent morbidity and mortality associated with injuries. The change should come from every patient and their parents, and the physicians' role is to provide guidance to patients and parents visiting the clinic.

This study aimed to determine the common types of trauma, pattern and distribution among gender and age groups, and anatomical regions involved and provide anticipatory guidance by linking it to the numbers associated with trauma injuries.

Method

This retrospective observational study utilized the trauma registry of King Abdulaziz Medical City (KAMC) Trauma Center in Riyadh, Saudi Arabia, which is considered as one of the biggest trauma centers in the country. Trauma is defined as any physical injury caused by disruptive or violent action or any substance introduced into the body. We used the data of all pediatric patients aged <14 years old who were admitted to the hospital following trauma from January 2009 to April 2014.

The following variables were extracted: demographic characteristics, date and time of admission, type and mechanism of injury, body area involved, and mortality rate. Meanwhile, the participants were divided into five groups based

on age and in accordance with the World Health Organization's age group classification: <1 (infant), 1–2 (toddler), 3–5 (preschool), 6–12 (school age), and >13 (adolescents) years. Additionally, the mechanisms of injury were categorized as follows: blunt trauma, including road traffic injuries (motor vehicular and motorcycle accidents, pedestrian), fall and physical injuries, and drowning; penetrating injuries, including those caused by gunshot, stab wound, and other sharp objects (Sharp objects, including nails, woods, broken glasses, or sewing needles); and burn trauma, including those caused by scalds, chemicals, electricity, flames. The injuries were also classified into the following based on the body areas involved: head and skull, facial and orbital, spine, thoracic, abdomen and pelvis, and extremity injuries. In cases where more than one system is involved during trauma in patient, we categorized the condition as multisystem involvement.

All analyses of the data were performed using SPSS Statistics (version 22; IBM Corp., Armonk, NY, USA).

Result

During the study period, the demographic characteristics of the 1762 patients with trauma who were admitted to the emergency department (ED) of KAMC due to injury were extracted. The majority of the patient were males (68.4%). School age was the most common age of presentation (38.9%) followed by Pre-School (24.6%) and least are neonate (0.7%) (Table 1).

The most common mechanism of injury observed among the patient was blunt trauma (72.8%), followed by burn (17.3%) and penetrating injuries (9.9%). All mechanisms of injury were more frequently observed among males than females (Table 2)

Road traffic injuries was the most common cause of blunt trauma (44.9%), followed by Fall (40.1%) and those caused by physical object (10%); no female patient with physical sport injury was documented (Table 3).

A total of 305 patients with burn injuries were admitted to the KAMC center within the observed period, with scald burn accounting for the highest percentage of injuries (68.2%), followed by flame (22.3%) and chemical burns (5.2%), and electrical burns (4.3%). Patients with burn injuries were predominantly males, except in the cases of flame burns, where more females were affected than males (Table 3).

Table 3 also shows the total number of penetrating injuries, which accounted for 9.9% of the total percentage of injuries. Penetration caused by

sharp objects was the most frequent cause of penetrating injuries (79.3%), followed by gunshot (12.1%) and stab (8.6%). In this type of injury, the extremities were the most commonly involved area of the body (65%), followed by the facial and orbital areas (22.4%) (Table 4).

A total of 50 mortality cases were recorded, which most commonly occurred among the school-aged group (40%). More observe in male (78%) with leading cause of deaths among patients was blunt injury with (92%) (Table5).

Table 1. Demographic characteristics of the participants

		Age						Total
		neonate	infant	toddler	Pre school	School age	adolescent	
Sex	Female	2	30	135	172	190	27	556 (31.6%)
	Male	4	40	214	263	497	188	1206 (68.4%)
Total		6	70	349	435	687	215	1762

Table 2. Mechanisms of injury

		Sex		
		Female	Male	Total
Type of Injury in summary				
	Blunt	370	913	1283(72.8%)
	Burn	133	173	306(17.4%)
	Penetrating	53	120	173(9.8 %)
	Total	556	1206	1762

Table 3. Classification of blunt, burn, and penetrating injuries based on gender

		F	M	Total
		Count	Count	Count
Penetrating	Stab	4	8	12
	Gunshot	5	16	21
	Others	44	96	140
Burn	Scald	86	123	209
	Flames	36	32	68
	Chemical	6	10	16
	Electrical	5	8	13
Blunt	Road traffic injuries	159	417	576
	Fall	157	357	514
	Physical object	47	88	135
	Drowning	6	24	30
	Physical fight	1	9	10
	Physical sport	0	18	18

Table 4. Body areas affected by the penetrating injury

	System involved					
	Head injury	Facial and orbital injury	Chest injury	Abdominal and pelvis injury	Extremities injury	
Penetrating - Stab	0	3	4	2	6	15 (8.7%)
Penetrating Gunshot	8	2	2	5	4	21 (12.1%)
Penetrating Other	0	34	0	1	102	137 (79.2%)
Total	8	39	6	4	112	173 (100%)

Table 5. Demographics of death on arrival

		Count
Type of Injury in summary	Blunt	46 (92%)
	Burn	2 (4%)
	Penetrating	2 (4%)
SEX	F	11 (22%)
	M	39 (78%)
Age category	Infant	2 (4%)
	Toddler	4 (8%)
	Preschool	18 (36%)
	School	20 (40%)
	Adolescent	6 (12%)

Discussion

Trauma is considered as one of the most common causes of preventable morbidity and mortality.¹³ Based on the results of a local study, 16% of the victims of motor vehicular accidents are <10 years old.¹⁴ Although the incidence of trauma is well documented in other countries, we found a significant lack of studies with regard to the general description of trauma epidemiology in Saudi Arabia. Thus, this study aimed to provide an up-to-date perspective on this topic based on the data obtained from one of the biggest trauma centers in Saudi Arabia.

The result of the present study showed that males were more commonly affected by trauma injuries

that females. This finding is consistent with those of international studies,^{15,16,17} which we believe is associated with the tendency of males to engage in risky and dangerous activities. Additionally, school age (6 to 12 years) was the most common age of presentation, accounting for 39% of the cases. This result is also consistent with those of similar studies.^{10,18}

Blunt trauma was the most common mechanism of injury, which accounted for 72.8% of all the cases, and a male predominance pattern was observed among all types of injuries. In the present study, Road traffic injuries (RTI) was the most common cause of blunt trauma (44.9%), followed by Fall (40.1%) and those caused by

physical object (10%). This finding is consistent with the pattern observed among adult patients in a previous study, where traffic-related injuries were the most common cause of blunt trauma.¹⁹ This finding highlights the importance of establishing a multidisciplinary team in order to solve this issue and to primarily prevent RTIs by changing the behavior of the drivers in SA and btargeting the drivers through awareness campaigns like those done throughout social media. Beside that, efforts can be strengthened by strict reinforcement of the traffic laws in SA. Moreover, physician's role in informing the parents and families of patients about these statistics and providing them with the necessary anticipatory guidance, such as wearing a helmet when riding a bicycle, or utilizing age-appropriate baby car seat. Likewise, avoiding the use a baby walker, using the stairs' gate when it comes to falls in order to reduce the likelihood of injuries and prevent their negative effects.^{20,21}

In this study, no single case of a female patient who sustained an injury caused by physical sport activity had been reported. This finding is likely due to the fact that girl's schools do not offer sport activities or no public places where females can participate in sports have been established in Saudi Arabia, which reflect the conservative view of the government.²² However, the government is advocating a new movement that is aimed toward the implementation of numerous sports where individuals from both genders can participate. Hence, providing parents with sport-related safety information is important.²³

Burn was the second most common cause of trauma, which accounted for 17% of all cases. Majority of the patients sustained scald burns (68.2%), followed by flame burns (23%). This result is consistent with those of similar studies.^{24,25,19} Although a male predominance pattern was observed in most types of burn injuries, more females suffered burns caused by fire or flames than males. However, this finding was not reflected in the results of similar studies.^{26,27} Although school age was the most

common age of presentation in general, burn trauma is most commonly observed among the preschool-aged children (34%), followed by toddlers (28%). The number of deaths varied among different age groups. However, burn-associated mortality most commonly occurred in the school-aged group, followed by the preschool-aged group. The absence or malfunctioning of smoke alarms has been linked to deaths and injuries in residential fires. Therefore, ensuring the presence of a smoke alarm in every house is important regardless of social status, considering that financial difficulties might sometimes be the reason why individuals cannot afford to purchase a smoke alarm for their homes. In terms of scald injury prevention, safety tips, for example, adjusting the temperature of water heaters to 48 °C, using hot water temperature limiters when installing a water system in the house, and using containers that are designed to reduce spillage of hot liquids, are recommended to decrease the likelihood of scald injuries.²⁰

Penetrating injuries accounted for 10% of all traumas. Sharp objects were the most common causes of penetrating injuries, followed by gunshot (12%) and stab (9%). Numerous international studies reported that gunshot and stab injuries had the highest mortality rates among all types of penetrating injuries.^{28,29,30} The extremities were the most commonly affected body area, followed by the facial and orbital areas (22%). Specifically, the head was the most commonly involved body area in gunshot injuries. Penetrating injuries can be prevented through several methods, for example, by not asking children to perform dangerous tasks that could put them at risk of getting injured. Additionally, sharp objects at home should be placed away from the reach of the children. Windows and doors should also be made of shutter-proof glass. Finally, close supervision is crucial, especially in places around homes and playgrounds, where injuries most commonly occur.³¹

Conclusion

Numerous diseases can be prevented and predicted even before they can occur. The same principle is also applicable to trauma. This discrecional study provides information on the epidemiology of trauma among pediatric patients between the age of 0 and 14 years old who were admitted in a tertiary hospital in Riyadh, Saudi Arabia. The findings of this study revealed that the school-aged group (6–12 years) is the most commonly affected and has the highest overall number of deaths among all age groups. Generally, males were more predominantly affected by injuries than females. The results also showed that blunt trauma was the most common mechanism of injury, with road traffic injuries being the most frequent cause of blunt trauma. In this type of trauma, no single case of a female patient who sustained an injury due to a physical sport activity has been reposted. Moreover, burn was found to be the second most common cause of trauma, which accounted for 17.3% of all the cases. Although a male predominance pattern was observed in this type of injury, more females suffered from burns due to fire or flames than males. Additionally, burn trauma was most commonly observed in the preschool-aged group, although the school-aged group had the highest mortality rate. Meanwhile, sharp objects were the most common causes of penetrating injuries. The findings of this study highlight the need to develop an efficient multidisciplinary system to address the causes of trauma and establish a strategy to reduce the burden of this condition, especially in Saudi Arabia. In line with these results, physicians are also expected to provide anticipatory guidance to their patients as part of the solution to problems on trauma.²⁰

Limitation

10 cases of DOA were not mentioned due to the lack of their demographical data in the trauma registry.

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