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Research Article

Injury Pattern of Pediatric Trauma in an Integrated Trauma Center in UAE

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Abstract

Background: *Injury is an important cause for morbidity and mortality in pediatric population and exhibits complex injury patterns.*

Objective: *The objective of this study is to identify the injury pattern of children admitted to Sheikh Khalifa Medical City, Ajman.*

Research Methodology: *It was a retrospective explorative review of pediatric trauma. During study 507 pediatric trauma patients were included. The data was collected regarding variables such as demographic, mechanism of injury, pattern of injury, hospitalization period, ICU stay, Glasgow Coma Scale, treatment modality and 30-day mortality. Data was entered and analyzed using SPSS version 25.0.*

Result: *Among 507 pediatric trauma patients, 71.4% were males and the mean age was 5.42+3.625 years. Majority of the patient experienced fall (54.6%) and RTA (26.6%). The region involved was head for 54.0% patients, 18.3% experienced surgical treatment, mean hospital stay was 2.91+9.729 days and 30-day mortality was 0.6%.*

Conclusion: *Study concluded that majority of injuries occurred due to falls among male pediatric patients aged between 4 to 8 years. Only 12.8% patients required PICU admission and 30-days mortality rate was 0.6%.*

Keywords: *Injury, pediatric, trauma, mechanism, region involved, mortality.*

Introduction

The pediatric trauma is linked to significant morbidity as well as mortality;[1] and remains a public health care issue worldwide. The traumatic injuries due to all reasons results in 8.4 to 9.3 percent mortality among children.[2] According to WHO more than 6 million children aged less than 15 years die from injuries per year.[3] In America, about one-third of pediatric population (22m children) experience such kinds of injuries

every year. Generally, about 6000 children (0–14 years old) die annually caused by injuries in European Union. Trauma is responsible for 21.26% pediatric injuries in China with death rate 28.12 / 100,000 children.[4] Considering the premature death burden and the years lived along with disabilities, the common injuries in this population are among significant causes of DALYs (disability adjusted life-years).[5] The non-fatal injuries also cause long hospital stays and could have long-term economic as well as societal consequences regarding disability rehabilitation, care responsibility and earnings loss.[6]

The pattern and causes for pediatric injuries are influenced by patient age, sex, socio-economic as well as environmental factors. Among children, injuries occur due to several reasons such as RTAs (road traffic accidents), falls from the height at home or in playground, burn and during delivery.[7] Road accidents, drowning, falls, burns and poisoning are responsible for 60% of all mortalities caused by pediatric trauma.[2]

A study carried out by Cintean et al. (2023) assessed the epidemiology, patterns as well as mechanisms for pediatric trauma. During study 12,508 children were included. Among patients, 2924 lacerations & superficial tissue injury, 2703 fractures, 320 joint dislocations, 5151 bruises, 76 burns, 1284 distortions and 50 other kinds of injuries were managed. Most common reasons regarding fractures were falls, sports-related and leisure activities. Among 700 children who experienced fractures, 25.9% required surgery. Among all patients, 8.8% were hospitalized for one day and the in-hospital mortality rate was 0.03%.[8]

A study conducted by Sadoway and teammates (2024) demonstrated that out of 1258 injuries, the pediatric trauma rate was 41.7 / 100,000. The blunt trauma was responsible for 86.2 percent of injuries while motor vehicle accidents were most commonly observed cause (35.6%). The mortality rate among patients was 17.2%.[9]

Almalki and fellows (2023) undertook a study to evaluate the epidemiology for pediatric trauma in Makkah. During study children aged up to 14 years were enrolled. Falling from the height was most commonly observed injury mode in both genders (41.8%). In most cases, children were admitted to surgical ward (75.7%) and others were treated in emergency room without admission (15.4%).[10]

A study undertaken by Su and coworkers (2024) included 4568 underage trauma patients (3093 males and 1475 females). Among patients aged between 0-6 years, the maximum number of injuries was noticed. Falls were the major trauma cause, responsible for 52.78 percent. With regards to main injured body parts, limbs and skin were most commonly affected (60.22%), followed by, head and neck region (32.03%).[11]

As the trauma burden, pattern, mode and site of injury, as well as outcome varies from region to region and also in the different age groups, it is essential to understand these characteristics to formulate effective injury prevention strategies.[12] Therefore, current study was carried out to identify the injury pattern of children admitted to Sheikh Khalifa Medical City, Ajman.

Significance of Study

Pediatric polytrauma is a complex condition with unique characteristics and requirements for early clinical care. This study analyzed the injury patterns, early clinical care and outcomes of pediatric polytrauma patients in a Level II trauma center in Northern Emirates. The results of this study will help us to improve the quality of care provided to pediatric patients and to improve the shortcomings and to implement the preventive measures from concerned authorities of United Arab Emirates.

Hypothesis and Specific Objectives

Hypothesis: Is there a correlation between trauma pattern and the child's age?

Primary objective: To identify the trauma injury pattern of children admitted in Sheikh Khalifa Medical City, Ajman and to compare it with regional and internationally published reports.

Secondary objective: To stratify if certain injuries in children occur in specific age groups.

Research Methodology

It was a retrospective explorative review of pediatric trauma. During study 507 pediatric trauma patients were included. The data was obtained from Trauma Registry of Sheikh Khalifa Medical City, Ajman between the period from 01 January 2018 to 31 December 2023.

Inclusion Criteria:

- All pediatric patients aged 0-13 years, following trauma admitted to the Pediatric Unit or PICU.

Exclusion Criteria:

- Severely injured patients who died at the scene of injury or arrived dead to the hospital.
- Patients with mild injuries who were treated and discharged from the Emergency Department.

Data Collection:

The data was collected from the health information system (HIS) available in the hospital. This study included all the participants who were admitted to pediatric surgery department following trauma either in ward or in PICU. The data was collected regarding variables such as demographic, mechanism of injury, pattern of injury, hospitalization period, ICU stay, Glasgow Coma Scale, treatment modality (conservative or surgery) and 30-day mortality.

Data Analysis:

The collected data was entered in computer software SPSS (Statistical Package for Social Sciences) version 25.0. The data was statistically analyzed with same software. For quantitative variables mean and standard deviation (SD) were calculated and for qualitative variables frequency and percentages were calculated. Data was presented in tables and graphs for both quantitative and qualitative variables. Chi-square test was used to estimate the association between age and injury patterns. P-value ≤ 0.05 was considered significant.

Results

Table-1 demonstrates that among 507 pediatric trauma patients, 192 (37.9%) were 0-3 years old, 201 (39.6%) were 4-8 years old and 114 (22.5%) were 9-13 years old while the mean age was 5.42 ± 3.625 years.

Out of 507 patients, 362 (71.4%) were males and 145(28.6%) were females.

Result shows that among these patients, 224 (44.1%) were Emirati while 283 (55.9%) were non-Emirati.

Table-2 depicts that among 507 patients, majority experienced fall 277(54.6%), followed by, RTA 135(26.6%), MVA 31(6.1%), MVC 27(5.3%), burn 16(3.2%), mix 13(2.6%) and assault 8(1.6%).

Among 507 patients, the region involved was head 275(54.0%), followed by, face 70(13.8%), upper extremity 58(11.5%), abdomen 45(8.9%), chest 27(5.3%), lower extremity 20(3.9%) and back 13(2.6%).

Out of 507 patients, 65 (12.8%) were admitted to PICU while majority 442 (87.2%) was not admitted to PICU.

Table describes that among 507 patients, 15 (2.9%) had GCS score 3-8 and 12 (2.4%) had 9-12 while most of the patients had GCS score 13-15. The mean GCS score of patients was 14.50±1.885.

Out of 507 patients, 414 (81.7%) received conservative treatment while 93 (18.3%) experienced surgical treatment.

The mean hospital stay of patients was 2.91±9.729 days. However, majority 459 (90.5%) of the patients had hospital stay 1-5 days and 35 (6.9%) had 6-10 days while 13 (2.6%) patients had hospital stay more than 10 days.

Among 507 patients, 25(4.9%), 271(53.5%) and 211(41.6%) had L1, L2 and L3 trauma levels, respectively.

Result shows that among 507 patients, the 30-day mortality was 3(0.6%) while remaining significant proportion 504(99.4%) had no 30-day mortality.

Table-3 indicates the correlation between injury pattern and child's age. Among 192 patients who were 0-3 years old, 2 experienced assaults, 11 burn, 4 mix, 138 fall, 9 MVA, 7 MVC and 21 patients experienced RTA. Among 201 patients who were 4-8 years old, 4 experienced assaults, 3 burn, 5 mix, 90 fall, 12 MVA, 14 MVC and 73 patients experienced RTA. Among 114 patients who were 9-13 years old, 2 experienced assaults, 2 burn, 4 mix, 49 fall, 10 MVA, 6 MVC and 41 patients experienced RTA. The result was found statistically significant (P=0.000).

Table further revealed that among 192 patients who were 0-3 years old, the region involved was abdomen, back, chest, upper extremity, face, head and lower extremity for 10, 2, 10, 15, 18, 130 and 7 patients, respectively. Among 201 patients who were 4-8 years old, the region involved was abdomen, back, chest, upper extremity, face, head and lower extremity for 20, 6, 9, 22, 33, 100 and 11 patients, respectively. Among 114 patients who were 9-13 years old, the region involved was abdomen, back, chest, upper extremity, face, head and lower extremity for 15, 5, 8, 21, 19, 44 and 2 patients, respectively. The result was found statistically significant (P=0.000).

Table-1: Demographic data

	Frequency	Percentage
Age		
0-3 years	192	37.9
4-8 years	201	39.6
9-13 years	114	22.5
Total	507	100.0
Mean±SD	5.42±3.625	
Gender		
Male	362	71.4
Female	145	28.6
Total	507	100.0
Nationality		
Emirati	224	44.1
Non-Emirati	283	55.9
Total	507	100.0

Figure-1: Gender

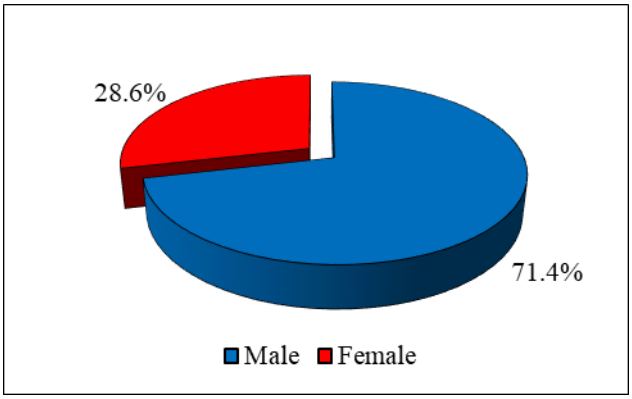

Figure-2: Nationality

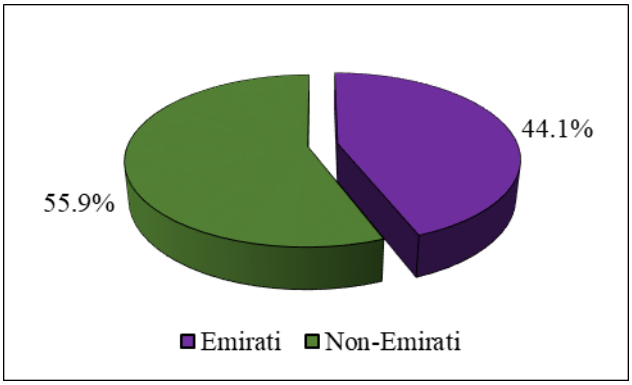

Table-2: Injury pattern

	Frequency	Percentage
Mechanism of injury		
Assault	8	1.6
Burn	16	3.2
Mix	13	2.6
Fall	277	54.6
MVA	31	6.1
MVC	27	5.3
RTA	135	26.6
Total	507	100.0
Region involved		
Abdomen	45	8.9
Back	13	2.6
Chest	27	5.3
Upper extremity	58	11.5
Face	70	13.8
Head	274	54.0
Lower extremity	20	3.9
Total	507	100.0
PICU admission		
Yes	65	12.8
No	442	87.2
Total	507	100.0
GCS		
3-8	15	2.9
9-12	12	2.4
13-15	480	94.7
Total	507	100.0
Mean±SD	14.50±1.885	
Treatment modality		
Conservative	414	81.7
Surgery	93	18.3
Total	507	100.0
Hospital stay		
1-5 days	459	90.5
6-10 days	35	6.9
>10 days	13	2.6
Total	507	100.0
Mean±SD	2.91±9.729	
Trauma level		
L1	25	4.9
L2	271	53.5
L3	211	41.6
Total	507	100.0
30-Day Mortality		
Yes	3	0.6
No	504	99.4
Total	507	100.0

Figure-3: Mechanism of injury

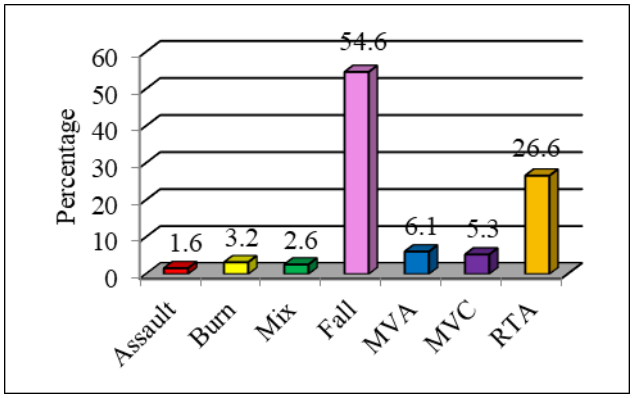

Table-3: Correlation between injury pattern and child's age

	Age groups			Total
	0-3 years	4-8 years	9-13 years	
Mechanism of Injury				
Assault	2	4	2	8
Burn	11	3	2	16
Mix	4	5	4	13
Fall	138	90	49	277
MVA	9	12	10	31
MVC	7	14	6	27
RTA	21	73	41	135
Total	192	201	114	507
P-value = 0.000				
Region involved				
Abdomen	10	20	15	45
Back	2	6	5	13
Chest	10	9	8	27
Upper extremity	15	22	21	58
Face	18	33	19	70
Head	130	100	44	274
Lower extremity	7	11	2	20
Total	192	201	114	507
P-value = 0.000				

Discussion

Injury is an important cause for morbidity and mortality in pediatric population and exhibits complex injury patterns. Present study was carried out to identify the injury pattern among children admitted to Sheikh Khalifa Medical City, Ajman. To acquire appropriate outcomes, a group of 507 pediatric trauma patients was included in the study and found that most of the patients were 0-8 years old and the mean age of patients was 5.42±3.625 years. A similar study carried out by Jones and coworkers (2019) showed almost comparable results that mean

age of the patients was 6.4±5.2 years.[12] But the results of another study conducted by Alansari and associates (2023) indicated that mean age of pediatric trauma patients was 9.3 years.[2]

As far as gender of the patients is concerned, study revealed that majority of the patients (71.4%) were males and remaining insignificant proportion (28.6%) was of female patients. The results of a study undertaken by Kunwar and collaborators (2020) also confirmed that most of the patients (58.2%) were males and 41.8% were female patients.[13]

It was found during study that less than half of patients were Emirati while more than half were non-Emirati. Among these trauma patients, majority experienced fall (54.6%), followed by, RTA (26.6%), MVA (6.1%), MVC (5.3%), burn (3.2%), mix (2.6%) and assault (1.6%). The results of a study performed by Dagnaw and teammates (2022) highlighted that most prevalent causes of trauma were fall down injury (37.3%) and road traffic accidents (24.2%).[14] A study done by Yaseen and fellows (2023) indicated that injury pattern among 54.4%, 31.1%, 9.0%, 3.3% and 2.2% patients were road traffic injuries, falls from height, poisoning, burns and electrocution, respectively.[3] In their study Fylli et al. (2023) reported that among pediatric trauma patients the most prevalent cause was head injury (64.3%).[15] A recent study undertaken by Su and comrades (2024) elucidated that falls were the most significant cause for pediatric trauma (52.8%).[11]

The findings of our study further revealed that among majority of patients, the region involved was head (54.0%), followed by, face (13.8%), upper extremity (11.5%), abdomen (8.9%), chest (5.3%), lower extremity (3.9%) and back (2.6%). In this regard dissimilar results were reported by different studies. In a study, Alansari and companions (2023) reported that most commonly region involved was head (38.8%), followed by, chest (19.9%), abdomen (13.0%), pelvis (10.3%), upper extremity injury (15.7%) and lower extremity (18.6%).[2] A study performed by Almalki and colleagues (2023) asserted that most commonly involved body parts were extremities (59.0%), followed by, head (34.7%), chest (9.4%), neck (5.1%), pelvis (4.5%), abdominal organs (4.1%), back (2.3%) and eye (1.5%).[10]

During study GCS score among patients was also assessed. It is important to mention here that significant majority (94.7%) of patients had GCS score 13-15 (mild), 2.4% patients had 9-12 (moderate) and 2.9% patients had 3-8 (severe). Virtually, a study done by Alansari and associates (2023) exhibited similar scenario that most of the patients (85.7%) had GCS score 13-15 (mild), 4.2% patients had 9-12 (moderate) and 10.1% patients had 3-8 (severe).[2] The results of our study further disclosed that only 12.8% pediatric patients required PICU admission. But a study performed by Onyemaechi and partners (2020) confirmed that 8.3%

pediatric patients required ICU admission.[7] Another study undertaken by Almalki and colleagues (2023) indicated that only 5.3% pediatric patients required ICU admission.[10]

It was found during study that among these patients, majority (53.5%) had L2 trauma levels while 4.9% and 41.6% had trauma level L1 and L3, respectively. In our study 18.3% patients required surgical treatment and 81.7% were treated with conservative treatment. Similar scenario was reported by a study undertaken by Ndung'u et al., (2019) who also asserted that most of the patients (71.5%) required surgical treatment and 28.5% were treated with conservative treatment.[16] However, a study done by Onyemaechi and partners (2020) highlighted that 55.9% patients experienced surgery while 44.1% patients were treated conservatively.[7] The results of our study further highlighted that most of the patients had hospital stay 1-5 days and the mean hospital stay was 2.91±9.729 day. But a recent study conducted by Sadoway and partners (2024) indicated that mean hospital stay of pediatric patients was 7.6 ± 9.1 days.[9]

When 30-days mortality rate was assessed among patients, study demonstrated that the mortality rate was only 0.6% (3 patients). The findings of our study are much better than the study carried out by Schuster et al. (2024) who elucidated that 30-day mortality rate was 19.0%.[17] However, a study conducted by Thakur et al., (2022) reported that mortality rate was 4.3% (39 patients).[18]

Study also assessed the correlation between injury pattern and child's age, significant results (P=0.000) were found regarding age with mechanism of injury and region involved. A study performed by Fylli et al. (2023) also showed significant association (P<0.001) of age with mechanism of injury and region involved.[15] Bao and coworkers (2024) also confirmed significant association (P<0.001) of age with mechanism of injury and region involved.[4]

Conclusion

Study concluded that majority of injuries occurred due to falls among male pediatric patients aged between 4 to 8 years. Only 12.8% patients required PICU admission and 30-days mortality rate was 0.6%. There was significant correlation of age with mechanism of injury and region involved. Further studies are required to conducted on large scale to assess the injury pattern of pediatric trauma.

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