ORIGI NAL ARTICLE

Pediatric trauma research in the Gulf Cooperation Council countries

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KEYWORDS
children; research; strategic planning; trauma

Summary Background/Objective: To review published pediatric trauma research from the Gulf Cooperation Council (GCC) countries so as to identify research fields that need to be enhanced.

Methods: A MEDLINE search for articles on pediatric trauma from GCC countries during the period 1960 to 2010 was performed. The content of articles was analyzed, classified and summarized.

Results: Fifty-three articles were found and retrieved of which 18 (34%) were published in the last 5 years, 42 (79.2%) were original articles. The first author was affiliated to a university in 29 reports (54.7%), to a community hospital in 13 (24.5%) and to a military hospital in 10 (18.9%). All articles were observational studies that included 18 (34%) case-control studies, 18 (34%) case reports/case series studies, 8 (15.1%) prospective studies, and 7 (13.2%) cross sectional studies. The median (range) impact factor of the journals was 1.3 (0.5-3.72). No meta-analysis studies were found.

Conclusion: A strategic plan is required to support pediatric trauma research in GCC countries so as to address unmet needs. Areas of deficiency include pre-hospital care, post-traumatic psychological effects and post-traumatic rehabilitation, interventional studies focused on a safe child environment and attitude changes, and the socioeconomic impact of pediatric trauma.

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1. Introduction

Pediatric trauma is a major health problem worldwide. Globally, pediatric injuries account for a remarkable 40% of all child deaths.\(^1\) Most Gulf Cooperation Council (GCC) countries are high-income with developing economies.\(^2\) These countries include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). Pediatric trauma and its effects at a national level have not been extensively studied in this region. Prevention remains the most effective measure to reduce this burden of loss.\(^3\) Management and prevention priorities for childhood trauma must be identified and acted upon with implementation of strategic planning research initiatives. This cannot be accomplished comprehensively without awareness of what has been done already and which important areas of research have not yet been investigated.

The aim of this study is to analyze the areas of interest already explored and the quality of the pediatric trauma research conducted in GCC countries to date, in order to identify research areas that merit investigation.

2. Materials and methods

A MEDLINE search of the PubMed website on pediatric trauma publications from GCC countries covering the period 1960 to 2010 was performed.\(^4\) Definition of a child included everyone below the age of 18 years according to the Convention on Rights of the Child.\(^5\) Terms used for the search were "injury, trauma, child, pediatric"; age limits were 0–18 years, and specific country names were entered. A total of 101 abstracts were retrieved, all were reviewed manually. Fifty-nine articles were related to pediatric trauma, all full papers were obtained through the National Medical Library of the Faculty of Medicine and Health Sciences, UAE University.

The articles were critically analyzed and classified according to a prepared protocol developed specifically for the study. This protocol contained the country name, MEDLINE category, first authors’ affiliation, year of publication, journal impact factor in 2008, study design, area of study, mechanism of injury, injured body regions, and reason(s) for exclusion of an article.

Six articles were excluded (Appendix 1): two were studies in adults; two articles included data not from GCC countries; one article was similar to a previously published study by the same author with the same study aim and patients; and one article was a short report of another article, which was published subsequently. The contents of 53 articles (Appendix 2) were studied. Data were reviewed by three of the authors, analyzed independently, discussed, and consensus was taken in controversial areas. The number of publications generated was standardized according to country population in 2007.\(^2\) Data were analyzed with PASW Statistics 18, SPSS Inc., USA.

3. Results

Fifty-three published pediatric trauma research articles from the GCC countries were retrieved. Eighteen (34%) articles were published during the past 5 years (Fig. 1) with Kuwait having the highest number of published articles per 100,000 population (0.42) (Table 1). Thirty-eight of 53 journals had an impact factor in the Journals Citation Reports.\(^6\) The median (range) impact factor of these articles was 1.3 (0.5–3.72).

The first author was affiliated to a university in 29 reports (54.7%), to a community hospital in 13 (24.5%) and a military hospital in 10 (18.9%). Forty-two (79.2%) of the reports were original articles (Table 2), only three articles (6%) were published in free-access journals. All articles have been observational studies that included 18 (34%) case-report/case-series studies, 18 (34%) case-control studies, 8 (15.1%) prospective studies, and 7 (13.2%) cross-sectional studies. No meta-analysis studies were found. The reported causes of trauma were mainly multiple mechanisms in 15 (28.3%) followed by road traffic collisions in seven (13.2%) (Table 3). Twenty-four (45.3%) reported the effect of trauma on multiple body regions (Table 4).

No research publications were found on pre-hospital care, post-traumatic psychological effects, post-traumatic rehabilitation of injured children, interventional studies focused on a safe child environment and attitude changes, or the socioeconomic impact of pediatric trauma.

4. Discussion

Trauma is a leading cause of morbidity and mortality in children. The curiosity of children and limited physical and cognitive ability render them more susceptible to injury than others. Their injuries are generally preventable.\(^7\) Principles of trauma management and prevention can be
shared worldwide. The identification of regional features of pediatric trauma and subsequent planning for management and preventive interventions in GCC countries requires scrutiny of research stemming from the region. Publications are the final outcome of research and can be considered as an indicator of the level of research activity.

The MEDLINE is a valuable journal database with strict criteria for inclusion. Journals that are indexed in MEDLINE are highly cited and accessible through PubMed. We have chosen MEDLINE publications and the impact factors of the journals cited as indicators of good quality research. Our study has shown that there have been very few publications on pediatric trauma in the GCC countries. These publications have increased exponentially. This was more obvious after 1990. The recent impact factor of these publications had a median value of 1.3.

A majority of the publications have come from university centers. Academic institutions have a responsibility to lead research endeavors in the community as Faculty members are usually trained in research methodology. Research collaboration between university, community, and military hospitals at national and regional levels will benefit the community as a whole.

The majority of pediatric trauma research in GCC countries was epidemiological in nature. Surprisingly, the studies were mainly observational. Neither randomized controlled trials nor meta-analysis studies were found. Case reports and case-series studies have the simplest design and constituted 34% of all studies. Eighteen (34%) of the reports were case-control studies. These can be completed in a much shorter time and are less expensive to conduct than other studies. Only eight (15.1%) were prospective studies. The majority of cases, families and teachers were not aware of the visual loss. 23 Pediatric animal-related injuries were the most common type of burns (73%). Burns had an overall mortality of 1.6% (Table 6).7 Surface burns were the most common type of burns (73%). Burns had an overall mortality of 1.6% (Table 6).15–20 A 10-year retrospective study on drowning in children showed that 80% of patients were less than 6 years of age. Seventy-five percent of drownings occurred in private swimming pools, of which only one was compatible with proper safety standards for swimming pools.21 Two articles discussed child sexual abuse and child maltreatment, one of them was retrospective in nature. This can be attributed to a lack of planning for clinical research, of incentives, time available for research, health informatics and available funding.8 Our study has shown that Kuwait was the most active GCC country in pediatric trauma research standardized per 100,000 population. This is not specific for pediatric trauma research per se but also for other types of medical research. We have shown previously that Kuwait had the highest standardized medical research publications in the GCC countries with 6.57 publications per 100,000 population followed by the UAE with 2.62 publications per 100,000 population. The medical publications from Kuwait dropped temporarily following the Second Gulf War of 1990 but then increased exponentially, while medical publications from other GCC countries continued to increase exponentially over time.9

The same trend was shown in trauma research stemming from the UAE.10

Globally, road traffic injuries are the second leading cause of death among children aged 5 to 14 years.7 Road traffic collision (RTC) is a growing problem in the GCC countries with higher mortality rate compared with other high income countries.11 It is the most commonly studied mechanism of pediatric trauma and remains one of the leading causes of death and disability in the GCC Countries.11 The majority of injured children in the studies reported were pedestrians (70%). The overall mortality of RTC was 5% (Table 5).12–14

Burns, drowning and falls were less studied. Scald burns were the most common types of burns (73%). Burns had an overall mortality of 1.6% (Table 6).15–20 A 10-year retrospective study on drowning in children showed that 80% of patients were less than 6 years of age. Seventy-five percent of drownings occurred in private swimming pools, of which only one was compatible with proper safety standards for swimming pools.21 Two articles discussed child sexual abuse and child maltreatment, one of them was a 20-year retrospective study on surgical aspects of child sexual abuse. It has shown that 70% of sexually abused children were girls; the perpetrator was a family relative in 54% of the victims and 10% of the victims were disabled.22 Three articles discussed pediatric eye injuries. Lithander et al, in a cross-sectional survey of 6292 school students, has shown that 12 had loss of vision of one eye caused by an injury. In the majority of cases, families and teachers were not aware of the visual loss.23 Pediatric animal-related injuries were addressed in two studies; one of them was retrospective in 78 children. Ninety-two percent of these children were camel jockeys who fell during camel racing. The majority had head injuries.24

### Table 2 MEDLINE category of the articles studied.

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original article</td>
<td>42</td>
<td>79.2</td>
</tr>
<tr>
<td>Case report</td>
<td>9</td>
<td>17.0</td>
</tr>
<tr>
<td>Review</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>Letter to the Editor</td>
<td>1</td>
<td>1.9</td>
</tr>
</tbody>
</table>

### Table 3 Mechanism of trauma studied by different articles.

<table>
<thead>
<tr>
<th>Mechanism of injury</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple mechanisms</td>
<td>15</td>
<td>28.3</td>
</tr>
<tr>
<td>Road traffic collision</td>
<td>7</td>
<td>13.2</td>
</tr>
<tr>
<td>Burn</td>
<td>6</td>
<td>11.3</td>
</tr>
<tr>
<td>Penetrating injury</td>
<td>5</td>
<td>9.4</td>
</tr>
<tr>
<td>Child abuse</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Iatrogenic</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Animal-related</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Corrosive ingestion</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Drowning</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Fall</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>Other mechanisms</td>
<td>7</td>
<td>13.2</td>
</tr>
</tbody>
</table>

### Table 4 Different body regions studied by the articles.

<table>
<thead>
<tr>
<th>Region</th>
<th>Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple body regions</td>
<td>24</td>
<td>45.3</td>
</tr>
<tr>
<td>Extremity/orthopedic</td>
<td>7</td>
<td>13.2</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>6</td>
<td>11.3</td>
</tr>
<tr>
<td>Head</td>
<td>4</td>
<td>7.5</td>
</tr>
<tr>
<td>Eye</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Chest</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Dental</td>
<td>3</td>
<td>5.7</td>
</tr>
<tr>
<td>Urology</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>3.8</td>
</tr>
</tbody>
</table>
We included burns, poisoning, and other unintentional causes of trauma as external causes of injury in accordance with the WHO world report on child injury prevention. Furthermore, burns and poisoning are described in chapter XIX as a part of injuries in the International Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for 2010.

Clinicians and epidemiologists need to heighten an awareness in policy makers that trauma is a major public crisis that merits appropriate research and funding which can be cost-effective in reducing the unacceptable burden of trauma. Funding can also be raised from the local community if the importance of the research projects and their potential impact on child safety is clearly explained. Interdisciplinary collaboration between basic scientists, health care providers, clinical researchers, educators, economists, legislators and policing agencies is essential to drive the suggested agenda.

During the Arab Children’s Health Congress 2010 held in Dubai, a parallel round table session took place to identify the research agenda in the Middle East in the field of pediatric care, injury, and prevention. The general consensus was the need to direct the pediatric trauma research initiatives so as to fill the research gaps in this field in the GCC states. The recommendations of the conference were similar to the conclusion of the present paper.

We realized the importance of injury surveillance and established a Trauma Research Group within our Faculty of Medicine and Health Sciences in 2001. The first step in this direction was to collect data utilizing a registry surveillance system. The group’s efforts resulted in establishing a trauma registry in 2003. This helped to consolidate trauma research efforts in the UAE and attracted more research funding which led to the development of a road traffic collision registry 3 years later. The trauma registry was then modified to include important information on injury prevention and made more user-friendly with regard to easier data entry.

Data in our trauma registry have given rise to a number of publications and abstracts in pediatric trauma, these being based on registry data that were presented nationally and internationally.

The trauma research publications from the UAE have helped to promote trauma prevention in the community leading to preventive legislation. A child safety seatbelt law has been recently implemented. Another example is the prevention of child camel jockey injuries following legislation on 5 July 2005 banning children from taking part in camel racing. Health Authority Abu Dhabi (HAAD) has developed a model of healthcare trauma system that will include major trauma centers at Abu Dhabi and Al-Ain cities.

The next step is to establish a nationwide trauma registry, which will allow collection of data from different hospitals in distant emirates. The registry requires some modifications to collect specific data relating to pediatric trauma. Widespread experience from the USA has shown that simply inaugurating independent pediatric trauma registries may not succeed because of a lack of ongoing commitment to funding. According to the experience of the National Trauma Bank, USA, apparently, it is much more cost-effective to collaborate with trauma surgeons in adult practice, utilizing the same tool for data collection for both adults and children. Optimal trauma management and prevention is interdisciplinary in nature and collaborations between adult and pediatric trauma surgeons need to be built, with some difficult bridges to cross, for the benefit of all our patients regardless of age. We hope that governments in our region will realize the major socioeconomic impact of pediatric trauma on our communities so that they will support different research projects on pediatric trauma.

### Table 5

<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Number</th>
<th>Gender M/F</th>
<th>Occupant</th>
<th>Pedestrian</th>
<th>Others</th>
<th>Mortality</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Maramhi et al</td>
<td>KSA</td>
<td>5</td>
<td>4/1</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>Bile duct injuries</td>
</tr>
<tr>
<td>Crankson</td>
<td>KSA</td>
<td>664</td>
<td>469/195</td>
<td>177</td>
<td>472</td>
<td>15</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Gupta et al</td>
<td>Oman</td>
<td>10</td>
<td>—</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>Extradural hematoma</td>
</tr>
<tr>
<td><strong>Total Percentage (%)</strong></td>
<td></td>
<td>679 (100)</td>
<td>473/196 (71/29)</td>
<td>185 (27.3)</td>
<td>476 (70)</td>
<td>18 (2.7)</td>
<td>34 (5)</td>
<td></td>
</tr>
</tbody>
</table>

KSA = Kingdom of Saudi Arabia.

### Table 6

<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>No</th>
<th>Gender M/F</th>
<th>Scald</th>
<th>Flame</th>
<th>Electrical</th>
<th>Chemical</th>
<th>Others</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamal et al</td>
<td>KSA</td>
<td>197</td>
<td>119/78</td>
<td>148</td>
<td>45</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Lari et al</td>
<td>KSA</td>
<td>394</td>
<td>234/160</td>
<td>276</td>
<td>91</td>
<td>10</td>
<td>4</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Bang et al</td>
<td>Kuwait</td>
<td>388</td>
<td>233/155</td>
<td>388</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Al Qattan et al</td>
<td>KSA</td>
<td>3</td>
<td>1/2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Al Shehri et al</td>
<td>KSA</td>
<td>380</td>
<td>191/189</td>
<td>243</td>
<td>105</td>
<td>19</td>
<td>7</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>Sharma et al</td>
<td>Kuwait</td>
<td>826</td>
<td>526/300</td>
<td>550</td>
<td>192</td>
<td>65</td>
<td>—</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total Percentage (%)</strong></td>
<td></td>
<td>2188</td>
<td>1304/884 (60/40)</td>
<td>1605 (73.4)</td>
<td>433 (19.8)</td>
<td>96 (4.4)</td>
<td>16 (0.7)</td>
<td>38 (1.7)</td>
<td></td>
</tr>
</tbody>
</table>

KSA = Kingdom of Saudi Arabia.
trauma. This will identify the real size of the problem and ways for its management and prevention.

In summary, we believe that there is a need for greater commitment to strategic planning to support pediatric trauma research in the GCC countries with interactions between hospitals on a national and at a regional level. A well-organized user-friendly data collection system for pediatric trauma is essential for conducting such high quality research. Areas of deficiency needing to be addressed are pre-hospital care, post-traumatic psychological effects and post-traumatic rehabilitation of injured children, safe child environment, and the socioeconomic impact of pediatric trauma. Obstacles to these endeavors can be overcome if we can convince our local communities that such initiatives are of overriding importance in terms of child health and future economic prosperity.

Competing interests

The authors declare that they have no competing interests.

Appendix 1 Excluded articles.


Appendix 2 MEDLINE articles on pediatric trauma and injury from GCC countries included in the study.


References


