Pre-adolescent Gunshot Injuries: Anatomy of a Jamaican Problem

SE Dundas[1], C Abel[1], ND Duncan[2], C Pinnock-Ramsaran[1], DM Sawh[1]

ABSTRACT

This retrospective analysis explores the apparent increase in gunshot injuries among pre-adolescent Jamaican children. During the five-year study period (2001–2005), 74 children less than 12 years old were treated for gunshot injuries at the Bustamante Hospital for Children. In the last four years of the study, the hospital incidence of such child shootings rose by 155%. Children between six and eleven years of age were seen to be at particular risk. Shootings were likely to occur between 4:00 pm and 10:00 pm in the evening, at or near home, in inner city communities. Affected children were unlikely to have been under direct adult supervision at the time of injury and were reported to be intended targets of the shooting in 49% of cases. Injuries to the limbs occurred most frequently, resulting chiefly in soft tissue injuries and open fractures. Half required operative intervention, most avoiding blood transfusion. Hospital stay was usually less than a week. Though clearly needed, social support services were underutilized. A mortality rate of 4% was seen but long-term morbidity was uncommon. Routine social and psychiatric evaluation of victims, organized after school-care, establishment of paediatric paramedical services, establishment of a dedicated paediatric interhospital transfer team and more widespread training in paediatric trauma management are recommended to improve the quality of care given to paediatric victims of firearm injuries.

Heridas de Bala en Pre-adolescentes: Anatomía de un Problema de Jamaica

SE Dundas[1], C Abel[1], ND Duncan[2], C Pinnock-Ramsaran[1], DM Sawh[1]

RESUMEN

Este análisis retrospectivo explora el aumento evidente de las heridas de bala entre los niños jamaicanos pre-adolescentes. Durante un período de cinco años de estudio (2001–2005), 74 niños menores de 12 años fueron atendidos debido a heridas de bala en el Hospital Pediátrico Bustamante. En los últimos cuatro años de este estudio, la incidencia en el hospital de heridas producidas con armas de fuego a niños aumentó en un 155%. Niños entre seis y once años de edad se consideraban particularmente en riesgo. Los tiroteos ocurrían probablemente entre 4 pm de la tarde y 10 pm de la noche, en la casa o en el vecindario, en las comunidades de los suburbios citadinos internos (conocidos como inner cities). Es poco probable que los niños afectados hayan estado bajo supervisión directa de algún adulto en el momento de recibir la herida, y se reportó que fueron objetivo expreso de los disparos en el 49% de los casos. Las heridas en las extremidades ocurrieron con mayor frecuencia, trayendo como consecuencia principalmente heridas en tejidos blandos y fracturas abiertas. La mitad de ellos requirió intervención quirúrgica, evitándose la transfusión sanguínea en la mayoría de los casos. La estadía en el hospital por lo general duró menos de una semana. Aunque evidentemente se necesitaban servicios de apoyo social, hubo una marcada subutilización de los mismos. Se observó una tasa de mortalidad del 4% pero la morbilidad a largo plazo resultó poco común. La evaluación psiquiátrica y social de rutina de las víctimas, organizada después de la atención en la escuela, el establecimiento de servicios paramédicos pediátricos, el establecimiento de un equipo dedicado de transferencia interhospitalaria pediátrica, y un entrenamiento ms amplio en el tratamiento de traumas pediátricos, se recomiendan a fin de mejorar la calidad de la atención brindada a las víctimas pediátricas de heridas por arma de fuego.

West Indian Med J 2007; 56 (6): 508

From: [1]Bustamante Hospital for Children, Arthur Wint Drive, Kingston 5, and [2]Department of Surgery, Radiology, Anaesthesia and Intensive Care, The University of the West Indies, Kingston 7, Jamaica, West Indies.

Correspondence: Dr SE Dundas, Bustamante Hospital for Children, Authur Wint Drive, Kingston 5. Fax: (876) 970-4302, e-mail: sedundas@cwjamaica.com.

INTRODUCTION

Jamaica, a Caribbean island of 4411 square miles, has a population of 2.65 million people (census 2000). A total of 1471 murders were reported on the island during the year 2004, 75.9% of which involved firearms (1). The murder total increased to 1669 in 2005 (2). Urban gun violence dominates crime statistics, leading to an estimated murder rate in the capital city of Kingston of more than 150 per 100 000 population, one of the highest in the world (3).

Crime prone communities, called 'garrison communities', frequently have strong political affiliations. Though shootings occur primarily in these inner city garrison communities, the vast majority of these murders are driven not by political rivalry but by drug- or gang-related feuds. Murders are also a means by which social or domestic disputes are settled (1, 3), with children being collateral victims or the intended means of settling vendettas. In the recent past, there has been a parallel increase in assaults and murder of children, with 147 shootings reported in children 18 years and under during the year 2004 (1).

The Bustamante Hospital for Children (BHC), a 250-bed institution in Kingston, is the only dedicated paediatric hospital in the English-speaking Caribbean. It is the principal trauma referral centre for children up to 12 years old. This study details the experience gained in treating pre-adolescent gunshot assault victims at the BHC between January 2001 and December 2005. The single institution was used because, as the only dedicated paediatric trauma centre in the island, most child trauma victims presented to BHC directly or were referred there after stabilization at other facilities. It was therefore believed that trends in paediatric trauma at the BHC would accurately represent the Jamaican situation.

SUBJECTS AND METHODS

A retrospective study was performed over the five-year period between January 1, 2001 and December 31, 2005. Information was collected from hospital statistics, medical records, surgical ward admission records, operating theatre records and records of the hospital social support services. Demographic information, circumstances of shootings according to the given history, location of gunshot wounds, time of arrival at BHC, presentation for medical care prior to arrival at BHC, the presence of hypovolaemic shock, location of gunshot wounds, internal injuries, surgical operations performed, transfusion rate, access to social support services, duration of hospitalization and outcomes were recorded. The study protocol was approved by the Advisory Panel on Ethics and Medico-Legal Affairs in the Ministry of Health.

RESULTS

Seventy-seven children younger than 12 years of age were treated for gun related injuries at BHC between January 1, 2001 and December 31, 2005. Three patients were excluded: two had been electively readmitted for reconstructive surgery following gunshot injuries sustained before the study period; the third had received blunt injuries from gun-butting rather than gunshot. Therefore, there were 74 children who were treated for gunshot injuries sustained within the five-year study period.

At least nine children were treated for gunshot injuries in every year of the study period. The incidence fell from 15 children in 2001 to nine in 2002 but has risen every year since (Fig. 1). The incidence of 23 children with gunshot injuries in 2005 represents a 44% increase on the previous year's total and is 155% higher than that in 2002. Peak incidence for firearm injuries occurred between July and September in 2001 (seven children), between October and December in 2004 (eight children) and in the corresponding period of 2005 (ten children).

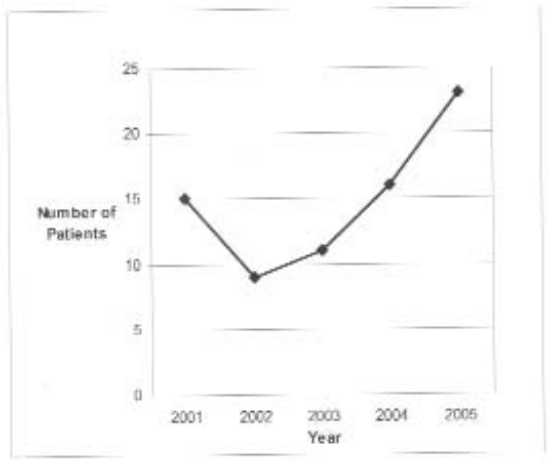

Fig. 1: Pre-adolescent children with gunshot injuries by year

Injured children ranged from three months to 11 years old, with eight years being the modal age. Sixty-four per cent of patients were six years or older, and 46% were eight years or older at the time of their injury (Fig. 2). There was a slight gender predilection as 57% were boys.

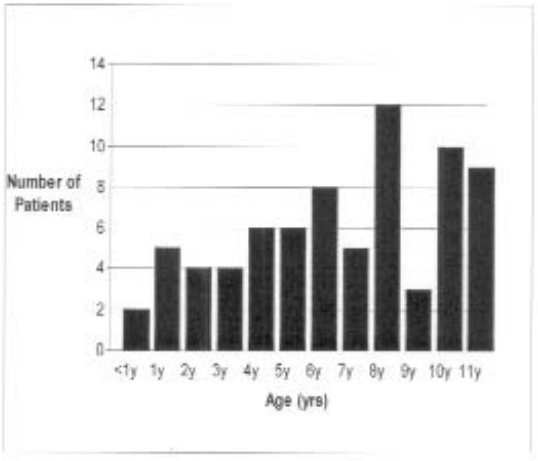

Fig. 2: Gunshot injury victims by age

Children were most often shot at or near their homes. The affected children lived mainly in the inner city communities of Central Kingston, Olympic Gardens, Denham Town, Tivoli Gardens, Windward Road, Whitfield Town and Jones Town (Fig. 3). Two patients from Spanish Town and

Fig. 3: Corporate area distribution of children who sustained gunshot injuries.

1 injured child Hospital

one from Portmore, in the adjoining parish of St Catherine, were also injured. Two patients who were shot in rural St Andrew and one from each of the parishes of St Ann, St James and St Thomas were treated at BHC in Kingston. While over half (51%) of the victims were taken directly to the Bustamante Hospital for Children, 24 children were stabilized at the Kingston Public Hospital (KPH), an adult trauma care facility, prior to transfer. Others presented initially to rural community hospitals (4), private practitioners' offices (2) and community health centres (1).

Thirty-seven children (50%) presented to hospital between 4:00 pm and 10: 00 pm (Fig. 4). On presentation, 23 (31%) were in haemodynamic shock.

The circumstances of shootings were ascertained from accompanying caregivers at the time of presentation. In 36 cases (49%), children were the intended targets of drive-by shootings, home break-ins or attempted executions of entire families. Twenty-six children (35%) were crossfire victims, typically caught in shoot-outs on public streets. Only four children were shot accidentally while playing with firearms (Fig. 5). Though many were reportedly playing outside the home or on the adjoining street when the incident occurred, the majority of children, 52%, were not under direct adult supervision at the time of shooting. Twenty children (27%) were not only gunshot victims but also witnessed family members being shot. Eight children (10%) witnessed the death of a family member in the incident. Eleven of the 74 children were shot multiple times.

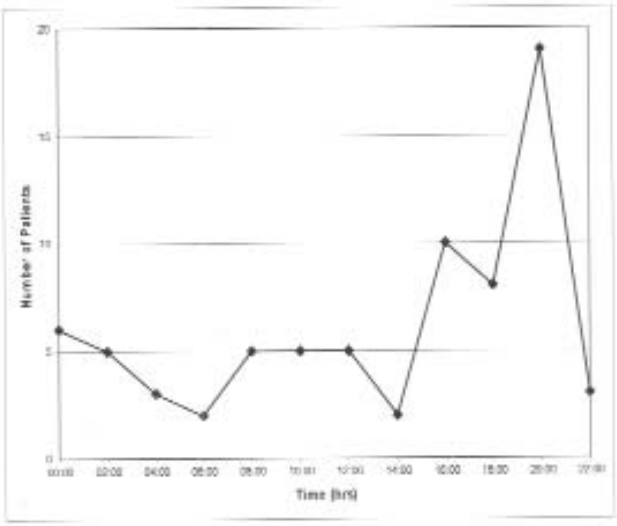

Fig. 4: Time of emergency room presentation.

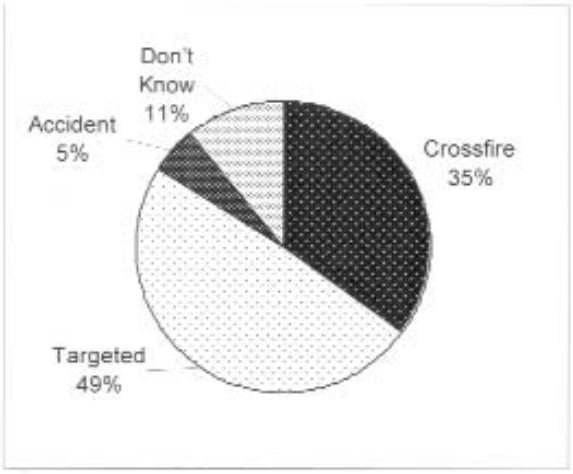

Fig. 5: Circumstances of shooting.

The sites of injury, in descending order of frequency, included the lower limbs (31), upper limbs (14), head (13), chest (11), buttocks and pelvis (8), abdomen (7), back (5) and the neck (2) (Fig. 6). Injuries sustained included soft tissue injuries (26) and open fractures (17). Four patients had joint disruption. Haemopneumothoraces (7) and lung contusion (6) occurred in more than half the children with injuries to the chest. Head injuries included open skull fractures (4) and facial injuries (4), with three children sustaining eye or ear loss. One child experienced a life-threatening neck injury with damage to the trachea and oesophagus. Abdominal gunshot injuries were equally likely to result in bowel lacerations (4) or solid organ injuries (4). The diaphragm and bladder were injured in two cases and one case respectively. Wounds to the buttocks or pelvis resulted in two anorectal lacerations. Thirty-seven patients (50%) had surgical operations (Table). These were most commonly simple debridement (12),

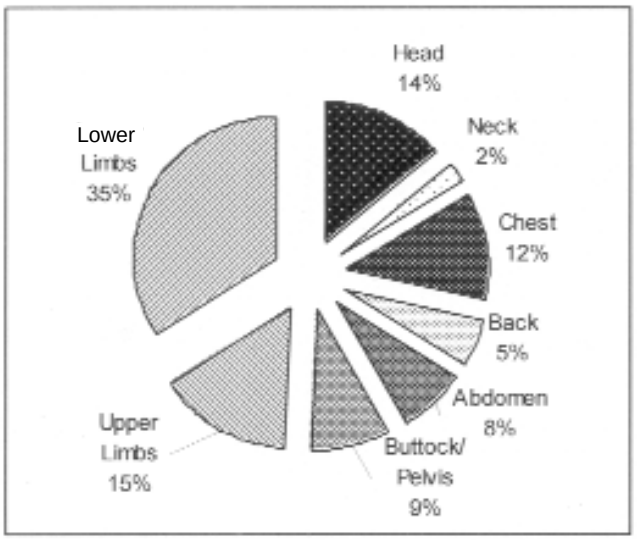

Fig.6: Gunshot injury sites in pre-adolescent Jamaican children.

removal of bullet fragments (9) and suturing of lacerations (3). Nine laparotomies were performed, at which four patients had bowel resection and primary bowel repair. Following proctosigmoidoscopy, one diverting colostomy was sited. The liver, diaphragm and bladder were each repaired once in this series. Most solid organ injuries did not require active operative repair. While only one patient required a formal thoracotomy, thoracostomy tubes were placed in seven patients. Despite the frequency of limb injuries, only two patients had open reduction and internal fracture fixation; most fractures were managed non-operatively. Three children had joint exploration and repair of ligaments. The neck was explored in two patients, one of whom required airway repair.

Table: Surgical operations performed on pre-adolescent children with gunshot injuries

Surgical operations performed	**Number of patients**
Wound debridement	12
Removal of foreign bodies	9
Suture wound	3
Repair corneal laceration	1
Neck exploration/ airway repair	2
Tube thoracostomy	7
Thoracotomy	1
Laparotomy	9
Colostomy	1
Proctosigmoidoscopy	2
Joint exploration/ repair	3
Open reduction internal fracture fixation	2
Total no. of operations	**52**

Total no. of children = 37; no. = number

Blood product transfusion was deemed necessary in 14 patients (19%) who were persistently haemodynamically unstable during resuscitation or who were severely anaemic postoperatively. The remainder received crystalloid resuscitation and support.

Hospital stay was generally short. Sixty-five per cent of patients were discharged within seven days of admission and by 14 days after injury, 85% were at home. Only seven patients (10%) remained in hospital for more than three weeks. The prolonged hospitalization was necessary in three cases to arrange placement and custody of the child, in three cases for treatment of femoral fractures by skin traction and in one case for treatment of recurrent gastrointestinal bleeding with repeated intensive care unit admissions.

The social services available at the BHC were underutilized. Only 25 patients (34%) were referred to the hospital social worker for investigation of the circumstances of injury and a decision regarding placement of the child. Referrals to the social work department were often overlooked, especially when the child's physical injuries were limited and the hospital stay was short. In fact, only 25% of children who were hospitalized for one week or less were referred to the social worker compared to 50% of those whose hospital stay exceeded a week. The Child Abuse Mitigation project (CAMP Bustamante) was initiated in January 2004 to provide social support for vulnerable children as well as community interventions to prevent violence. Despite availability of the service, only 20 (51%) of 39 children injured since January 2004 were referred to the service. Formal child psychiatry assessment and counselling services are provided by the Child Guidance Clinic. Only 21 patients (28%) were referred to and assessed by this service.

Three children died from gunshot wounds. One fatality in a three-month old infant resulted from a single shot to the occiput, causing an open skull fracture and cerebral evisceration. The two other children, aged two and ten years old, suffered multiple fatal gunshot injuries to the chest. The three-month old and the two-year old patients had experienced cardiopulmonary arrest before arrival in the emergency department. The ten-year old child was brought to the emergency room in decompensated shock, after more than an hour without care at the scene of injury. Resuscitative efforts were unsuccessful.

Most patients (51%) had no discernable long term morbidity. Psychological and social deficits were reported in nine patients referred to and formally assessed by the psychiatrists of the child guidance clinic. This represents 12% of the injured children but 43% of the 21 patients who were formally assessed by this service. Specifically, post-traumatic stress disorder, bereavement and social displacement – when children were relocated to less volatile areas – were reported. Wound complications including infection, dehiscence and hypertrophic scarring occurred in six cases. Other less frequent complications included peripheral nerve palsy (3), joint restriction (3), osteomyelitis (2), hypoxic brain injury (1), visual impairment (1), deafness (1), thoracic clot retention (1) and stoma complications (1).

DISCUSSION

Traditionally, women and children in Jamaica have enjoyed relative protection from gun violence. The data herein presented indicate that this is no longer the case. On the contrary, children now seem to be a targeted group. Illustrative of this is the fact that 11 of the 74 children had multiple gunshot wounds, indicating a clear intent to kill. Also, the number of pre-adolescent paediatric firearm injury cases has increased by a factor of 1.5 over the five-year study period, and more than doubled (2.6x) between 2002 and 2005.

No age group within the study sample was exempt. However, ambulant children, six years of age or older, were the most common targets, sustaining injury in the after-school period of 4:00 pm to 10:00 pm. This correlates with the observation that these children were not under direct adult supervision at the time of injury but instead were involved in unsupervised play near their homes in inner-city Kingston. Their vulnerability during this period indicates a need for organized after-school activities and safe supervision in such communities.

Gun crime is known to be more common in inner-city communities (1, 3), a demographic which is reflected in this pre-adolescent paediatric study sample. While recognizing that violence in the Jamaican society is a systemic problem, it is possible to use the index cases which present to our hospital as foci for community-based violence prevention interventions.

There were three accidental self-inflicted shootings, no suicide attempts and only one shooting known to be perpetrated by another child aged 13 years. This contrasts with reports of the North American experience which cite access to unsecured firearms in the home, peer-on-peer violence and suicide as significant contributors to firearm injuries in children (4–7). History given by caregivers indicates that children were the intended targets during home break-ins, drive-by shootings and attacks by lone gunmen. Less commonly, children were hit by stray bullets in shoot-outs between gunmen or between gunmen and security forces. Despite the circumstances under which these children were injured, the hospital social support services were underutilized and tended to be offered to patients with major physical injuries and long hospital stays. It is our view that the social circumstances of all paediatric victims of gun violence should be investigated to ensure future safety of the child, even if this prolongs hospital stay.

A significant proportion of patients first presented to the KPH, an adult trauma care facility, located in the heart of the inner-city. A further number presented to community hospitals and outpatient healthcare facilities, not specifically equipped for paediatric trauma care. It is not known how many children were treated at these peripheral healthcare facilities without referral for assessment and tertiary care at BHC. The fact that children did present to peripheral facilities however emphasizes the need for more widespread training of healthcare providers in the use of advanced trauma life support (ATLS) and paediatric advanced life support (PALS) protocols, so as to provide adequate emergency care at any facility to which a child may present. There is a need to establish centres in every health region where the equipment and expertise for emergency paediatric trauma management may be quickly accessed.

Most children were shot in the limbs and required simple debridement for soft tissue injuries or open fractures. Limb wounds however resulted in a significant proportion of the long-term morbidity, including peripheral nerve palsies, osteomyelitis and joint restriction. Wounds to the head, chest, abdomen or pelvis, though less prevalent, were more likely to result in major operative intervention and accounted for all fatalities.

Family members were shot in 27% of cases. There were eight fatalities. These resulted in significant psychological upheaval and the need for physical relocation of children, away from familiar surroundings. Despite inconsistent referrals to CAMP Bustamante and the Child Guidance clinic, psychological and social problems were the most commonly diagnosed long-term morbidity. The true numbers of children with psychological sequelae of gun violence will only become apparent as more children are formally assessed. Counselling and a formal paediatric psychological assessment should therefore be routinely offered to all children who have been the victims of or witnessed gun violence.

Hospital stays were short for most patients. Seven patients stayed in excess of 21 days, in most cases, because of social issues or conservative clinical management choices. Though three of the children with long hospital admissions had multiple organ injuries, it was the resolution of the placement and custody issues, rather than delayed physical recovery which prevented earlier release from hospital.

The mortality rate of 4% represents three children who died before arriving at hospital and one who died in the emergency room from multiple gunshot wounds. There were more fatalities from chest and abdominal wounds than from head injuries. Though the absolute number of fatalities is small, this contrasts with a North American study which cites severe head injury as the leading cause of paediatric firearm fatality (7). All children admitted to the surgical wards survived.

The sole patient who died in the emergency room might have been saved had he been brought to hospital in a more timely manner or received basic emergency care at the scene. Ongoing gunfire in the area delayed his transit to hospital and there was no paramedical service available. Most children in this study were not attended to by paramedical personnel or transferred by trained transfer teams. The emergency medical response (paramedical) service in Jamaica is in its formative stages. With appropriate training, dedicated hospital-based teams of paediatric trauma nurses and physicians can be organized for transfers of children from peripheral health facilities in the meantime.

In summary, the number of pre-adolescent children presenting to the BCH with gunshot wounds has increased by 155% between 2002 and 2005. The patients were mostly from inner-city communities and there is a suggestion that they were more likely to have been shot intentionally than hit by a stray bullet. Six to eleven-year olds are at particular risk. Injuries to the limbs predominated, resulting in open fractures and soft tissue injuries. More attention needs to be focussed on violence prevention and after-school supervision of children in at-risk areas. Formal training in paediatric trauma management and the use of standardized evidence-based trauma protocols needs to be implemented in all healthcare institutions which see paediatric victims with gunshot injuries. Finally, paediatric paramedical and emergency trauma transfer teams need to be trained to bring injured children to tertiary care in a timely and appropriate manner.

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