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Gunshot injuries in infants and children in KwaZulu-Natal — an emerging epidemic?

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Objectives. To determine the pattern of firearm injuries in children under the age of 13 years admitted to a paediatric surgical unit in KwaZulu-Natal and to assess the impact of such injuries on hospital resources.

Design. Retrospective review of the Department of Paediatric Surgery and hospital databases for all gunshot admissions, 1983 - 1995 inclusive.

Setting. King Edward VIII Hospital, Durban.

Subjects. Children aged 12 years and under admitted to the care of the Department of Paediatric Surgery for management of gunshot injuries.

Methods. Data retrieved included demographic details, circumstances of injury, duration of hospital stay, management and outcome in terms of mortality and long-term morbidity.

Results. One hundred and six patients were identified, of whom 96 were available for review. There has been a rapid escalation of numbers presenting. During 1994 - 1995, an additional 38 children with gunshot injuries were admitted to other units within Durban academic hospitals. The mean age of injury in patients admitted to the Department of Paediatric Surgery was 6.4 years and the abdomen was the most frequently injured area. Multiple injuries were common. The in-hospital mortality rate was 10.4%. Major morbidity, including paraplegia, hemiplegia, amputation and major peripheral nerve deficit, was seen in 11.4%. Duration of bed occupancy in the general surgical ward reached 247 days in 1995.

Conclusion. There is an increasing incidence of gunshot injuries in this region. Of children surviving to reach hospital, 10% die and 11% are left with lifelong major morbidity. Most victims are innocent bystanders and too young to be considered active participants. Prevention will require sociopolitical stability and the disarming of the community.

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The province of KwaZulu-Natal, including the Durban metropolitan area, has been the scene of sociopolitical conflict since the dawn of the new political order in South Africa in 1990. Children have been caught up in this cycle of violence and have not been protected by their innocence.

In this region, gunshot injuries in children, which before 1990 were rarely seen, have become commonplace and the trend shows no signs of abating (Fig. 1). The current numbers threaten to overwhelm the facilities available as the clinical load is additional to the existing levels of trauma in this age group. The Department of Paediatric Surgery does not have a monopoly on gunshot injuries in children and to these figures must be added those patients presenting to other clinical departments. During 1994, 18 additional patients and, during 1995, 20 were treated without recourse to the Department of Paediatric Surgery. Such patients typically had single-system injury, e.g. ophthalmic or orthopaedic.

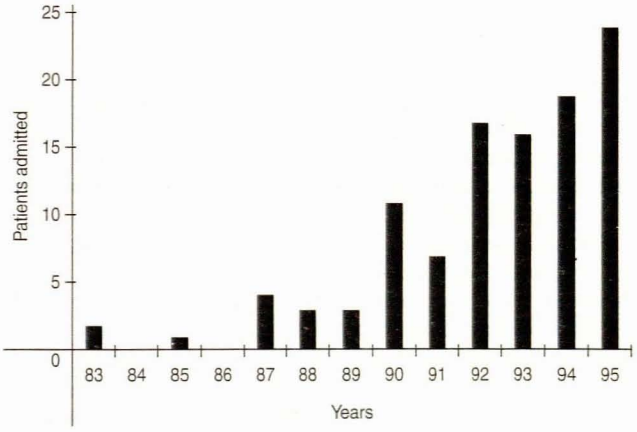

Fig. 1. Gunshot admissions, 1983 - 1995 (*N* = 106).

Reports of gunshot injuries in children have focused on gang-related violence and accidental shooting.[1] The wounding of innocent juvenile bystanders and other non-participants secondary to adult conflict is an increasing problem.

Injury patterns in our patients differ from other reported large series, reflecting the different age groups and weapons involved.[2] Extrapolation from overseas experience may therefore be inappropriate to our environment.

We have reviewed 96 children under the age of 12 years who presented to a general paediatric surgical service with gunshot injuries, and have attempted to define the increase and effects of such injuries and to identify the circumstances of injury so that intervention may be planned.

Patients and methods

All patients admitted with gunshot injuries to the paediatric surgical service at King Edward VIII Hospital, Durban, during the period 1983 - 1995 were identified from the departmental database and their records were retrieved. Data on patient profile, circumstances of injury, weapon used and site and extent of injuries were extracted where possible. Surgical interventions, hospital stay and outcome in terms of death or disability were recorded. Data capture did not include injuries in patients older than 12 years or in those with single-system injuries managed by other departments, such as Orthopaedic Surgery or Ophthalmology. While the Department provides the only tertiary surgical services for children in the province and is responsible for the care of all polytrauma victims, patients managed by other hospitals are not included. Data on pre-hospital mortality was provided by the Department of Forensic Medicine of the University of Natal, the State Pathologist and the South African Police.

Results

One hundred and six patients were identified for the period 1983 - 1995 (Fig. 1), and define the increasing frequency of such injuries. Detailed evaluation was possible in patients admitted after 1988. In 2 of these patients insufficient data were available for inclusion; 96 patients are therefore reviewed.

Thirty-seven children admitted to other units during 1994 - 1995 (neurosurgery 7, maxillofacial surgery 6, ophthalmology 6, orthopaedic surgery 14, vascular surgery 2, cardiothoracic surgery 2) are excluded from this analysis.

Age at injury ranged from 3 months to 12 years, with a mean of 6.4 years. The peak incidence was 3 - 4 years of age (Fig. 2).

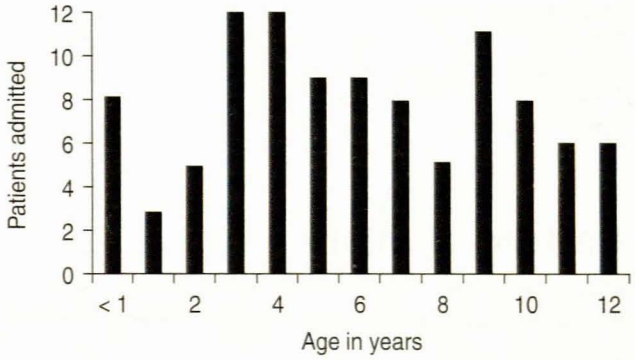

Fig. 2. Age at presentation.

Circumstances of injury

The circumstances of injury were established in 38 children. One child was injured while playing with a gun. There were no attempted suicides. Two children were apparently injured by law enforcement officers. All other children were injured as bystanders, during an assault on the mother, or as random victims in massacres or other inter-adult violence. Only 1 child who survived to be admitted to hospital was known to have been shot with a high-velocity weapon (AK 47).

Place of injury

Table I outlines the place of injury for 106 children admitted to the surgical wards. It is likely that the Natal Midlands region is under-represented as a result of the available surgical facilities in that area.

Table I. Gunshots

	Place of injury (*N* = 106)
Kwa-Mashu	18
Umlazi	9
Inanda	9
Other peri-urban areas	22
South Coast	27
North Coast	9
Midlands	5
Unknown	7

Pre-hospital mortality

Detailed information is available for the period 1990 - 1995. During this time 94 children with gunshot injuries were admitted to the care of the Department of Paediatric Surgery. During the same period, 399 children with gunshot injuries were delivered to State mortuaries in the province (South African Police — personal communication).

Thirty-eight of the 94 children admitted between 1990 and 1995 had been shot within the Durban metropolitan area and were admitted to the paediatric surgical ward at King Edward VIII Hospital. During the same period 40 children were delivered to the main State mortuary in Durban (Department of Forensic Medicine — personal communication).

Pattern of injury

Multisystem injury in children injured by firearms is common (Fig. 3). Among patients admitted to the Paediatric Surgical Unit, abdominal injuries were most common (*N* = 45, 47% of admissions). Sex incidence was almost equal (boys 23, girls 19). Girls were somewhat younger (5.7 years) than boys (6.5 years). Injuries were confined to the abdominal wall in 6 children and were treated non-operatively. Thirty-nine children underwent laparotomy. Abdominal organs injured ranged from 0 in 1 patient to 4 in 3 patients. Mortality correlated with the number of abdominal organs injured (Table II).

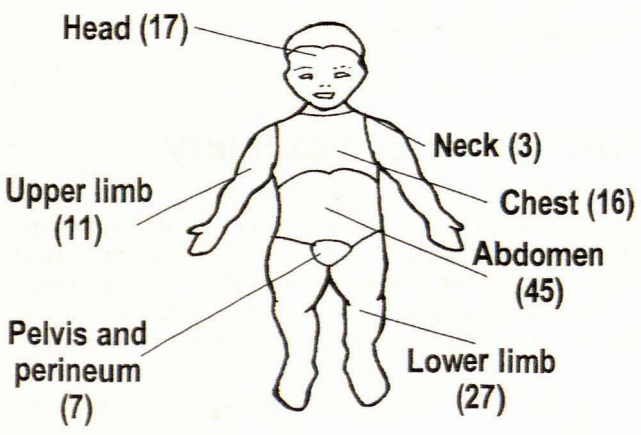

Fig. 3. Area of injury (*N* = 96).

Table II. Abdominal gunshots (*N* = 45)

Abdominal organs injured	Patients	Mortality
0	7	0
1	21	1 (5%)
2	10	2 (20%)
3	4	2 (50%)
4	3	2 (75%)
	45	7 (16%)

Thirteen (29%) patients required intensive care including ventilatory support. Second laparotomies were necessary in 7 children because of liver rebleeding, anastomotic dehiscence, mechanical obstruction or drainage of infection; 2 of these children died.

Thoracic injuries were seen in 21 children including 4 in whom penetration of the diaphragm was identified at laparotomy for abdominal injuries.

Only 7 of these patients had isolated thoracic injury. In 5 children there was also a gunshot wound of the head. Seven patients had simultaneous abdominal injuries and 7 had additional limb injuries. Two children with combined thoraco-abdominal injuries died. Associated thoracic spinal injuries rendered 2 patients paraplegic. Thoracotomy or another operative procedure was performed in 14 patients.

Sixteen children were shot in the head, with penetration of the cranial vault in 8. Of these, 7 also had injuries elsewhere. Only 4 of those with skull penetration underwent a neurosurgical procedure. Two children with brain injuries died; 4 remain hemiplegic.

Pelvic or perineal injuries were seen in 15 children, of whom 1 died after surgery. Three patients required repair of major vascular injuries and 4 required repair of major nerve trunks. Six children were shot in the face. This was the only injury in 2 children, one of whom died following aspiration.

Surgery

Sixty-one (63%) patients required emergency operations. Duration of bed occupancy by children with gunshot injuries in the general paediatric surgical ward reached 247 days in 1995.

Eighteen significant acute complications were encountered (30%); 11 were septic in nature, either within the chest, peritoneal cavity or wound following abdominal surgery. One cerebral abscess and one case of meningitis developed after brain injury. Other complications included adhesive bowel obstruction, rectal bleeding, hepatic

rebleeding and anastomotic dehiscence. Thirteen patients required peri-operative ventilation in the intensive care unit.

Eleven patients (11.4%) have major permanent residual disability; paraplegia (2), hemiplegia (4), major peripheral nerve defect (4) or amputation (1). Overall, 10 patients died (10.4%).

Discussion

Reports of gunshot injuries in children from the USA are skewed by the inclusion of large numbers of adolescents engaged in gang warfare.[1,2] This is not paralleled in South Africa where childhood victims are much younger and are the innocent victims of adult violence. This not only has a bearing on the extent and type of facilities required to manage such victims, but also mandates a different approach to prevention. In children under 13 years, the victim is rarely the prime target of the assailant.[3]

While it is probable that a hospital-based review that reports on survivors will over-emphasise low-velocity firearm injury, such weapons are capable of causing serious injuries in this age group.[4,5] Children are less likely to survive a high-velocity injury than adults and among our patients there was only 1 survivor of a known AK 47 injury.

The high prehospital mortality rate may represent high-velocity missile injuries in small people, a paucity of available emergency medical services in some areas, or both. It would seem that survival to hospital is less likely in rural areas.

The need for admission and surgery among our patients was higher than the 26% reported from the USA,[6,7] perhaps because of the younger age of patients.

There appears to be no end in sight to the exponential rise in incidence of these injuries. While phasic increases have been reported from other areas[8] these have related to the waxing and waning of gang wars and are not directly relevant to the South African experience. The trend is therefore likely to continue unless sociopolitical stability is achieved in the region.

Guns are widely available within the community. An armed society is a particular threat to children, in whom gunshot-related deaths occur nearly three times more often than in adults.[9-11]

This report tends to minimise the number of affected children, given that those treated elsewhere in the province, those treated by other specialties and those who did not present for medical care were excluded. There is a need for a register of gunshot injuries in South Africa to allow detailed epidemiological study upon which to base intervention strategies.

In our experience, and that of others,[12] major morbidity is primarily the result of injuries to the brain,[13] spinal cord and major peripheral nerves. Mortality is related additionally to combined thoraco-abdominal trauma.

In addition to the human misery caused by such assaults, there are significant economic implications for health services.[14] These implications are both acute (with 247 bed days per annum now given over to the care of gunshot victims and increasing use of ICU facilities) and chronic (with 11% of victims having significant permanent disability).

It is hoped that political maturity and a reduction in the number of firearms in the community will result in fewer injuries to children.

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