Pediatric Abdominal Trauma in Sub Saharan Africa

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Abstract

Background: Trauma is recognized as a leading cause of morbidity and mortality in children worldwide. Trauma to the abdomen in children can occur isolated, but frequently, in association with other regions of the body. It is now being increasingly recognized as a significant health problem in African children. Whereas childhood infectious disease control had taken the centre stage in the healthcare delivery system of many Sub Saharan African countries, care of trauma cases had not received similar attention.

Objectives: To review the current experiences with pediatric abdominal trauma in sub Saharan Africa with emphasis on the peculiar pattern and challenges of care in that region. The aim of the review is to describe the current mode of care of children with trauma, and to suggest ways of improving them.

Methods: Literature review was done through the MEDLINE, and African Journals online (AJOL), as well as bibliographic searches for relevant scientific studies. There was also painstaking search of non-indexed local journals. Write up was then based on information directly relevant scientific studies. There was also painstaking search of non-African Journals online (AJOL), as well as bibliographic searches for relevant scientific research work carried out in and outside the region. Appropriate references and acknowledgements are made where necessary. Personal opinions have been restricted mostly to suggestions or recommendations.

Results: Pediatric abdominal injury has been described from the perspective of the Sub Saharan region of Africa. The emphasis has been on the peculiarity of the pattern in most developing countries of Africa and the challenges in the care of these patients. There are suggestions on the ways to enhance prevention, and care of children with abdominal injury.

Conclusion: Pediatric trauma is assuming an increasingly important position in the burden of childhood health problems in Sub Saharan Africa. Abdominal trauma is common in these trauma cases as isolated injury or in association with injuries to other parts of the body. Current state of care still falls short of acceptable standards in most parts of the region. There is need for well articulated trauma system and provision of more modern equipment to improve on the quality of care of children with abdominal trauma in this region of the world.

Keywords: Pediatric Trauma; Morbidity; Mortality; Abdominal Injury; Sub Saharan Africa

Introduction

Sub Saharan Africa (SSA) refers to the region of Africa, south of the Sahara desert. Politically speaking, it refers to African countries which are fully or partially located south of the Sahara desert except Sudan [1]. It is a vast area made up of people of diverse origin, culture, and socioeconomic circumstances. Therefore no single description can uniformly capture the picture in all parts of SSA. However, what may be relevant here is that the SSA is made up of mostly developing countries. The human population in this region was put at 900 million as at 2007. With a growth rate of 2.3%, the population is projected to reach 1.5 billion by 2050 [2]. More than 40% of the population are children 15 years and below. The exact incidence of pediatric abdominal trauma in SSA is unknown. However, trauma is estimated to account for 13% of childhood disease burden and nearly one million deaths / year in developing countries [3,4]. An estimated 15–17% of children in SSA will die from trauma or non trauma related diseases before the age of 5 years [5,6]. The healthcare systems in these countries have concentrated their limited resources on control of infectious diseases and infestations. Pediatric trauma as a health problem therefore, has received much less attention.

Until recently, not much was known or published about pediatric abdominal trauma in Sub Saharan Africa despite the fact that trauma had been recognized as a leading cause of morbidity and mortality worldwide. Trauma is estimated to constitute up to 5% of pediatric admissions in tertiary health facilities in this region but the specific incidence is not well documented [7–9]. With improving economy of some of the countries in this region, improving control of infections with better healthcare facilities and in the face of rising incidents of wars, insurgency, and terrorist activities, the contribution of abdominal trauma to the burden of childhood diseases is on the rise and becoming even more significant as a health problem.

Presentation of Pediatric Abdominal Trauma

Pediatric abdominal trauma in Sub Saharan Africa may occur as isolated injury, but frequently, in association with trauma to other regions of the body. Various studies have shown high incidence of abdominal injuries among cases of multiple injuries in children [10,11]. The chest and or the perineum are more often involved in association with the abdominal injury than the head, neck and limbs. There is no specific gender predisposition but children of the lower socioeconomic class appear to be more at risk [7]. Children between the ages of 5–14 years appear to be at greatest risk of these injuries [10,14]. This may be due to the fact that this is the common age range of children who may be involved in child labor to support their families. These cases are encountered both in the urban and rural areas.

Blunt abdominal injuries are more common than the sharp penetrating injuries. Ordinarily in blunt abdominal injuries, the abdominal wall should be intact; however in children with umbilical hernias, as is common with children in this region, the hernias occasionally rupture complicating blunt abdominal trauma. The commonest point of rupture seen in our practice is the umbilicus. In children abdominal trauma is particularly serious due to the relative higher risk of injury to internal organs than adults. The reasons for this higher risk of visceral injury are mostly anatomical: firstly, the thin abdominal wall allows internal organs to be close to the surface; secondly, the liver, spleen and kidneys lie relatively lower and not well protected by the rib cage. The urinary bladder is more of abdominal than pelvic organ in the younger child. A third reason for children in Sub Saharan Africa is their tendency to have malaria-related enlargement of the spleen (Tropical Splenomegaly Syndrome). These enlarged spleens are at higher risk of rupture.
even with relatively minor trauma. With visceral injury, these children are at greater risk of death than their adult counterparts due to their limited ability to withstand fluctuations in the status of the cardiovascular system.

Sharp penetrating abdominal injuries in children are less common than the blunt injuries. They constitute about 14% of pediatric abdominal trauma but their incidence has been on the rise in recent times [12]. Impalement injuries of the perineum or stab wound of the back may cause serious abdominal; visceral injury. This form of injury commonly encountered in children who have fallen off fruit bearing trees, have often been considered minor or overlooked, until features of peritonitis or abdominal distension appear.

Causes of Pediatric Abdominal Trauma

1. Road traffic accidents have been recognized as the leading cause of blunt abdominal trauma in children. They may account for 26–40% of pediatric injuries in many parts of SSA [13,15,16]. A report from Northern Nigeria shows that more than 50% of pediatric abdominal traumas are due to traffic accidents [14]. These injuries may occur with the patient as a passenger or as a pedestrian (vehicular-pedestrian accidents). Vehicular / pedestrian accidents are more commonly seen as cause of abdominal trauma. Motorcycle related accidents is a major cause of pediatric trauma in Nigeria [15,16]. The victims are usually children attending school on foot, or errand for some adult at home, or more commonly, carrying their wares for sale in busy streets and high ways. Road traffic accidents may be of less significance in some parts of Africa and was ranked third as cause of pediatric trauma in Ethiopia [15].

2. Falls from heights and falls on ground are the second commonest cause of blunt abdominal trauma in SSA. It is the cause of about 25% of childhood injuries [13,14,16]. Falls from fruit bearing trees is among the most serious mechanisms of injury [13]. It is often seen in the rural setting. Mortality and morbidity tend to be high due partly to the severity of the injuries sustained and long distances of health facilities from such locations. In urban setting, falls may occur in the domestic environment when the child trips and falls over hard or sharp objects. This may lead to blunt or sharp penetrating injuries. Falls from buildings assume more prominent place than from trees in a report from Kenya [17]. Children walking along streets with unprotected manholes and gutters may trip and fall over the edge or into such holes.

3. Physical combat and kick in the abdomen causing blunt abdominal injuries are particularly seen among school children.

4. Animal attacks have been seen frequently as a cause of PAT. Children may share the same domestic environment with domestic animals in many parts of SSA. In some cases, they have the responsibility to feed and look after those animals. Consequently cases of bruised or gashed abdomen from animal attack are common in some regions of SSA [18,19]. Cows are the worst offenders but donkeys, horses and dogs have been encountered. Severe blunt or penetrating abdominal trauma can result from cow horn and horse kicks.

5. Stab and gunshot injuries are commonly seen in cases of homicide, physical abuse and criminal attacks including armed robbery. Stab injuries are often with knife, broken bottles or other sharp metal or stick and are common in domestic violence. Gunshot wounds in children is being seen increasingly as more children are caught up in civil violence in the region [20,21].

6. Abdominal trauma due to child abuse is uncommonly seen in this region. This is unlike reports from other parts of the world. It is yet uncertain if this low incidence is real or due to non reporting of such cases [5,6]. A study in South Africa suggests that less than 1% of abused children are brought to hospital [22].

7. The increasing wave of wars, insurgency and terrorist activities in certain parts of Sub Saharan Africa has added another dimension to the causes and types of pediatric abdominal trauma encountered in the region [23]. Injuries from high velocity shrapnel, bullets, ballistic missiles, and falls from buildings give very complex picture of the types of abdominal injuries being seen in these children caught up in violence.

Clinical Evaluation and Initial Care

Pediatric abdominal trauma should always be considered as emergency. The initial evaluation and care should commence from the site of the injury. Ideally the paramedics should be on hand to do this and to move the patient in an ambulance as quickly as possible to the nearest centre where appropriate care can be given. Unfortunately, this service is not available in most parts of the Sub Saharan Africa. The few available are confined to the cities. Consequently, untrained relatives and neighbors have to bring these patients frequently in awkward positions. There are often delays with most patients arriving care centers later than six hours, and sometimes up to 72 hours after injury. A good number are diverted to unorthodox and quack practitioners. The result is that many have developed peritonitis or renal failure, suffered additional injuries, or are dead on arrival.

An initial quick assessment on arrival is directed at identifying immediate threats to life and to correct or ameliorate them. Decisions on the management of these patients relies heavily on this clinical assessment, as many centers in this region lack sophisticated tools for further assessment of those patients.

Investigation of Pediatric Abdominal Trauma

Abdominal ultrasound

This tool is available and affordable in most secondary and tertiary health facilities in this region. Despite this, many patients who need it may not get it due to power outage or unavailability of trained and experienced sonographer in emergency situation. Its sensitivity is dependent on the proficiency of the sonographer and the status of the machine used.

Plain abdominal X-ray

This is very useful tool in our region because of its availability and amount of information that is obtained from it. In the younger child, it will show the lower part of the chest and any air under the diaphragm will indicate rupture of a hollow viscus or penetrating abdominal injury. Ground glass appearances and bowel displacement indicate peritoneal collections. Fractures of the ribs, vertebrae, pelvis and presence of radio opaque foreign bodies are identified.

Diagnostic peritoneal lavage

This aims to detect bleeding or leakage of intestinal contents or pancreatic juice in the peritoneal cavity. Though, it is no longer
in common use in many other regions of the world, it is still considered useful in settings where other diagnostic modalities are not available. However, this usefulness is limited in some of our centers because frequently, prompt accurate analysis of the effluence is not guaranteed. Additionally, the risk of introducing infection is heightened in our practice due to insufficient aseptic measures.

**Intravenous urography**

Intravenous urography may be needed if there is suspicion of renal or ureteric injury. Extravasation of contrast indicates injury but non appearance of the kidney may indicate that the pedicle is torn or kidney is shattered.

**Computerized Tomography**

This is rarely used as a tool in evaluation of abdominal trauma in our setting. It is not available in many centers and the cost may be prohibitive. Where available its use may lead to undue delay of intervention. It is however recognized as one of the most useful diagnostic tools particularly with contrast enhancement.

**Laparoscopy**

This is becoming increasingly popular and available in centers in Africa. However cost, paucity of trained and experienced minimal access surgeons still limits its use. In patients who are hemodynamically stable but in whom there is strong suspicion of visceral injury, it can confirm if there is need for operative management. In experienced hands operative intervention may be done laparoscopically as well.

**Treatment**

The care of children with abdominal trauma commences alongside the initial clinical evaluation. Children with multiple injuries may die from injuries to other regions of the body. Management of a severe chest or head injury must take precedence over the abdominal injury.

Resuscitative measures should be instituted. The airway, breathing and circulation must be secured. This will ensure that there is a patent airway, and patient is breathing well. Except for the most minor cases, a good venous access is secured to collect sample for blood tests and to administer fluids and drugs. Analgesics and antibiotics are administered. Nasogastric tube may be inserted to decongest the stomach and a urethral catheter to assist in monitoring of the urinary output. The choice of fluid depends on local experience but most centers will use Ringers Lactate or Normal saline for resuscitation. The rate and the volume administered are guided by much reliance on clinical judgment and the blood pressure and the pulse rate and volume, the blood pressure and the administered are guided by much reliance on clinical judgment. Lactate or Normal saline for resuscitation. The rate and the volume depends on local experience but most centers will use Ringers Lactate or Normal saline for resuscitation.

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**Operative Management**

This is the treatment of choice for all cases of penetrating abdominal injury. Some authors advocate that even if there is peritoneal violation but there is no evidence of visceral injury, exploration should be withheld and a triple contrast CT done first to assess for visceral injury [10]. In our region where such facilities are not readily available or affordable and can lead to undue delay, such patients are best explored surgically.

The access for exploration is guided by the suspected visceral injury. A suprapubic transverse incision is versatile and affords access to all parts of the peritoneal cavity. It also gives a cosmetically better scar than the midline incision which is more acceptable in adults. The specific procedure at surgery depends on the injured organs. Wherever possible, repair and conservation of the organ is recommended.

Spleen: Splenorrhaphy, segmental resection, and omental wrap of the spleen are options. Splenectomy rate among patients with abdominal trauma may be higher in our region as surgeons may consider it faster than splenorrhaphy in the face of relatively unsafe anesthesia. Overwhelming postsplenectomy infection (OPSI) and severe malaria is a serious risk for children who have had splenectomy in Sub Saharan Africa. They should receive vaccination against pneumococcal organism (pneumovac) as well as malaria prophylaxis (proguanil).

Liver injuries are commonly minor in our practice, but major injuries tend to have poor outcome as facilities and skills for major procedures as lobectomy are not commonly available.

Kidneys: Renal preservation should always be the preference. Nephrectomy should be the last resort when there is severe damage and an Intravenous urography or radioisotope scan had shown a non functioning kidney. Fortunately, excellent results have been reported with non operative treatment of most of renal injuries [24].

Hollow viscera: These are less common than the solid organ injuries. The bowels are the most commonly injured hollow viscous. Bowel injuries could be serosal tears, contusion, perforation, transverse mesenteric tears. Surgical options for these include simple closure, wedge resection, resection and anastomosis, hemicolectomy or colostomy Major abdominal vessel injuries are not commonly seen, as most die before arrival in our setting. Few
of such cases which are seen tend to have poor outcome because of the peculiar challenges of lack of facilities and needed skills.

Operative Findings

The spleen is the most commonly injured solid organ in most reports from our region. It is followed by the liver. The most commonly injured hollow viscus is the small bowel. Other common findings are mesenteric and omental tears, gastric and bowel lacerations or perforations, bladder rupture, pancreatic and renal tears.

Outcome and Prognosis

Patients who have been selected for non operative management tend to do well probably because they tend to have less serious injuries. Patients who presented early and operated on early tend to have good chances. However, patients who have injury to major vessels, or who have been delayed while being attended to by untrained hands, tend to have bad prognosis. Also multiply injured patients, and cases with avulsion and loss of abdominal wall, have poorer prognosis than those with isolated abdominal injury. There are no population based studies on the outcome of PAT. However some hospital based studies in SSA indicate mortality rate in the range 1.5–14.4% [25–27]. These results may be inaccurate since the less injured children may not come to the hospital and the severely injured ones may die before arrival. Records of long term morbidity are also not possible as most cases are lost to follow up [28].

Control of PAT and Recommendations

The problem of PAT in SSA stems from intricate interrelationship between social, economic, cultural and geographic factors. Proposals as to the ways to prevent or control it should be all encompassing. Whereas the use of seat belts, child safety belts and airbags helped to curb deaths and injuries following vehicular crash in the USA, making such a policy in many parts of SSA may not achieve similar result as many of cases of PAT had been travelling in an overloaded bus or car moving at unacceptably high speed on bad road. Indigenous solutions based on scientific understanding of the problem from local perspective are likely to produce better results in our region.

Well organized research, to generate reliable data on epidemiology, pattern and outcome of PAT is imperative. This will guide policy makers on planning and appropriate allocation of resources which will ultimately lead to better care for PAT. Training of more manpower to meet the rising need for trauma healthcare providers has become more crucial than ever before. Emphasis must be laid on trauma in both undergraduate and postgraduate training. Also training exchange programs between training centers in this region and centers in the advanced countries will afford trainee in SSA first hand exposure to world standards in the management of trauma.

Establishment of trauma centers in all the zones of the countries in SSA will help bring the care close to the people. This will eventually make way for trauma system that will enhance care and reduce morbidity and mortality. Pediatric Intensive Care Units which are virtually nonexistent in most health facilities in SSA should be established and well equipped to care for the critically injured children.

Healthcare providers may move beyond the emergency rooms and theatres to form advocacy groups for rights of children, for peaceful conflict resolution, and good governance. Public health enlightenment programs should be frequently organized to raise the people’s consciousness of exposure of children to risk of trauma by certain cultural and social practices.

Conclusion

Pediatric abdominal trauma is a growing health problem in Sub Saharan Africa. It is now a significant contributor to the burden of childhood diseases in that region. The peculiarities in pattern and outcome are related to social, economic and cultural problems, and inadequate healthcare delivery system. Road traffic accidents top the list of causes but other important causes are on the rise. Whereas ultrasound and CT scan monitoring are crucial in the diagnosis and monitoring of PAT, thorough clinical assessment and judgment remains the most reliable and available tool in SSA when the sophisticated tools are not readily available. More research, more training, proper planning and funding are needed to improve on the current picture of PAT in SSA and to prepare for the projected increase in burden of pediatric abdominal trauma.

Conflicts of Interest

No conflicts of interests to declare

References


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