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Closed Abdominal Trauma in Children: Epidemiological Profile, Management, And Outcomes in A Resource-Limited Pediatric Surgery Unit

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Abstract

Background: Blunt abdominal trauma (BAT) in children remains a potentially severe emergency, particularly in low-resource countries where access to advanced imaging is limited. To describe the epidemiological characteristics, injured organs, management modalities, and clinical outcomes of pediatric BAT at a Hospital in Douala.

A retrospective study was conducted from January 2023 to December 2024 including children aged 0–15 years admitted for blunt abdominal trauma. Demographic data, mechanisms of injury, affected organs, hemoperitoneum, AAST classification, interventions performed, length of hospital stay, and outcomes were analyzed. Statistical tests included Fisher's exact test and the Mann–Whitney test. Among 320 pediatric trauma admissions, 22 cases of BAT were identified (6.9%). The mean age was 7.2 years; 59% were boys. Road traffic accidents accounted for 59.1% of cases. Injured organs included the spleen (50%), liver (40.9%), and kidney (9.1%). Non-operative management was applied in 90.9% of cases. Outcomes were favorable in 95.5%, with one death (4.5%) related to polytrauma. The Mann–Whitney test showed no significant difference in hospital stay between hepatic and splenic injuries ($p = 0.905$). Fisher's exact test showed no statistically significant association between hemoperitoneum and unfavorable outcome ($p = 0.45$).

Conclusion: Blunt abdominal trauma in children is relatively uncommon but clinically significant. Non-operative management is safe and effective in hemodynamically stable patients, even in resource-limited settings.

Introduction

Trauma is a major cause of morbidity and mortality in children, particularly in low- and middle-income countries where healthcare systems are limited [1,2]. Blunt abdominal trauma (BAT) accounts for up to 90% of pediatric abdominal injuries and primarily involves solid organs such as the spleen, liver, and kidney [3–5]. Children are particularly vulnerable due to anatomical characteristics including a thinner abdominal wall, less developed musculature, and a more anterior position of intra-abdominal organs [6].

Management of BAT relies on assessing hemodynamic stability and the use of imaging modalities, notably FAST ultrasound and abdominopelvic CT scan [7]. However, in low-resource settings, access to CT imaging is limited, making clinical

monitoring essential.

In Cameroon, few studies have focused on pediatric BAT. This study aims to supplement existing data by describing epidemiology, injured organs, diagnostic examinations, interventions performed, outcomes, and statistical correlations between relevant variables.

Methods

This retrospective descriptive and analytical study was conducted in the Pediatric Surgery Department of Laquintinie Hospital in Douala, a referral hospital in the Littoral region of Cameroon.

The study period extended from January 2023 to December 2024. The study population included children aged 0–15 years admitted for blunt abdominal trauma. Penetrating trauma and incomplete medical records lacking

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sufficient information were excluded.

Operational definition: Blunt abdominal trauma (BAT) refers to abdominal injury without parietal breach, secondary to direct or indirect impact, potentially causing intra-abdominal organ injury (spleen, liver, kidney, small intestine) or hemoperitoneum.

- Data were extracted from hospitalization records, emergency charts, and imaging reports. A standardized form collected:
- Sociodemographic data: age, sex
- Mechanism of trauma: road traffic accident (RTA), domestic fall, recreational fall, others
- Symptoms: abdominal pain, vomiting, altered consciousness, associated injuries
- Complementary examinations: FAST/abdominal ultrasound, abdominopelvic CT scan (if available), brain CT (in polytrauma)
- Injured organ: spleen, liver, kidney, small intestine, combined injuries
- Presence and degree of hemoperitoneum: absent, mild/moderate, severe
- AAST classification (Grade I–V)
- Treatment modality: non-operative management (NOM), surgery, intensive care
- Outcome: favorable, complications, death
- Length of hospital stay (days) and 6-month follow-up status (when available)

Management followed ATLS® (Advanced Trauma Life Support) recommendations, including primary assessment, hemodynamic stabilization, complete clinical examination, and close monitoring.

Non-operative management (NOM) was preferred in stable children regardless of hemoperitoneum presence, in accordance with international guidelines. Surgery was indicated only in cases of persistent instability, suspected bowel perforation, or uncontrolled intra-abdominal hemorrhage.

Data were analyzed using Python (pandas, scipy.stats). Qualitative variables were expressed as frequencies and percentages; quantitative variables were presented as means or medians depending on distribution. Statistical tests included:

- Fisher's exact test: comparison of proportions (e.g., hemoperitoneum ↔ outcome)
- Mann–Whitney test: comparison of hospital stay duration by injured organ

Statistical significance was set at $p < 0.05$.

The study protocol was approved by the Ethics Committee of Laquintinie Hospital. Consent was waived due to the retrospective nature of the study. All data were anonymized and treated confidentially.

Results

During the study period (January 2023–December 2024), 320 pediatric trauma cases were recorded. Among them, 22 cases of blunt abdominal trauma (6.9%) met inclusion criteria.

Patients' ages ranged from 1 to 14 years (mean 7.2 ± 4.6 years). Children aged 6–10 years were most affected (36.4%), followed by those under 5 years (31.8%) and 11–15 years (31.8%). A male predominance was observed (59.1%).

Road traffic accidents were the leading cause (59.1%), mainly involving unprotected pedestrians. Domestic falls accounted for 31.8%, and recreational falls for 9.1%.

The spleen was the most frequently injured organ (50%), followed by the liver (40.9%) and kidney (9.1%). Two cases involved multivisceral injury (spleen–liver). Intestinal injuries

were rare (two small bowel contusions).

Associated extra-abdominal injuries included head trauma (45.5%) and thoracic trauma (22.7%). Severe hemoperitoneum occurred in 18.2% and mild/moderate in 31.8%.

Abdominal ultrasound was performed in 63.6% of patients; CT scan was available in only 18.2%. Hemoperitoneum was detected in 50% of children. AAST grading was established in only two patients (Grades II and III).

Non-operative management was applied in 90.9%. Two small bowel perforations required emergency laparotomy. One death (4.5%) occurred in a child with severe polytrauma and traumatic brain injury. One child was discharged against medical advice.

Favorable outcomes occurred in 95.5%. Mean hospital stay was 4.2 days (range 1–6 days). At six months, 18 children had normal follow-up; three were lost to follow-up.

No significant differences were found in hospital stay between splenic and hepatic injuries ($p = 0.905$), and hemoperitoneum was not associated with unfavorable outcome ($p = 0.45$).

Discussion

This study shows that pediatric BAT accounts for 6.9% of trauma cases in Douala. Findings are comparable to African and international series, highlighting road traffic accidents as the major cause [3,4].

The spleen and liver were most commonly injured, consistent with existing literature [5,6].

Results confirm that hemoperitoneum, even when severe, is not an automatic indication for surgery, in agreement with international data [7,8].

The absence of association between injured organ and hospital stay supports the effectiveness of conservative treatment despite limited CT availability.

The single death was related to severe polytrauma with traumatic brain injury, emphasizing the need for improved comprehensive trauma care.

Conclusion

Blunt abdominal trauma in children is a significant clinical entity. This study confirms the effectiveness of non-operative management in the vast majority of cases. Improving access to imaging and monitoring could further enhance healthcare performance in resource-limited countries.

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