Original Article

Paediatric Splenectomy at the National Centre for Paediatric Surgery, Sudan: A Five-Year Cross-Sectional Retrospective Study

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Abstract

Background: Splenectomy is a common paediatric surgical procedure indicated for various haematological and non-traumatic conditions. Understanding patient demographics, clinical characteristics, and surgical outcomes is essential to optimise management and improve care. **Objective:** This study describes the indications, operative approaches, and early outcomes of paediatric splenectomy at the National Centre for Paediatric Surgery. **Methods:** We conducted a single-centre, retrospective review of 47 paediatric patients who underwent splenectomy between 2019 and 2023. Data on demographics, clinical presentation, surgical details, and early postoperative outcomes were extracted from medical records. Descriptive and bivariate analyses were performed to evaluate associations between variables. **Results:** This study included 24 males (51.1%) and 23 females (48.9%) with a mean age of 7.1 ± 3.3 years. The main indications were thalassaemia 48.9%, sickle cell disease 25.5%, and hereditary spherocytosis 17%. Pallor 38.3% and abdominal pain 29.8% were the most frequent presentations. All patients underwent open splenectomy, with a paramedian incision in 85.1% of cases. Intraoperative bleeding occurred in 4.3% of patients, and postoperative complications were minimal, with a single surgical site infection. Mean hospital stay was 5.2 ± 1.9 days. **Conclusion:** Pediatric splenectomy is safe and effective for haematological disorders, with low complication rates and rapid early recovery.

Keywords: Paediatric splenectomy, Thalassaemia, Sickle cell disease, Hereditary spherocytosis, Resource-limited setting

Introduction

The spleen is the largest organ of the haematologic and reticuloendothelial system and plays a pivotal role in immune surveillance and haematologic homeostasis.[1] Splenectomy is a well-established procedure in paediatric surgery, with indications differing markedly from adults. While trauma is the predominant indication in adults, paediatric splenectomy is most commonly performed for haematological disorders, including hereditary spherocytosis (HS), sickle cell disease (SCD), and idiopathic thrombocytopenic purpura, whereas neoplastic indications are rare.[2,3] Approximately two-thirds of the global population with SCD live in Africa, and 50–90% of affected children in sub-Saharan Africa die before their fifth birthday. Sickle cell disease is highly prevalent in Sudan, with marked ethnic variation and a disproportionate burden among populations such as the Misseriya tribe.

Children with SCD are particularly susceptible to severe complications, including vaso-occlusive crises and acute splenic sequestration, which frequently necessitate splenectomy.[4,5] Endemic infections such as schistosomiasis and malaria also contribute to splenic pathology requiring splenectomy.[6] Despite established perioperative protocols, postoperative complications remain a concern, with overwhelming post-splenectomy infection posing the most serious long-term risk.[7,8,9] This study describes the demographics and operative management of paediatric splenectomy at Sudan's largest paediatric surgical centre, providing essential baseline data to guide clinical practice and improve outcomes in a resource-limited setting where data are scarce.

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Methods

This single-centre, cross-sectional, retrospective study was conducted at the National Centre for Paediatric Surgery, Sudan, the country's largest specialized paediatric surgery centre. Ethical approval was obtained from the institutional ethics committee. The study included 47 paediatric patients who underwent splenectomy between January 2019 and December 2023. All children aged 1 day to 16 years were eligible, while patients with incomplete medical records were excluded. Data were extracted from medical records using a standardized form to capture demographic characteristics, clinical presentation, surgical indications, operative details, complications, and length of hospital stay. Comprehensive patient histories and physical examinations supplemented the extracted data. As this was a cross-sectional study, follow-up beyond the hospital stay was not included.

Descriptive statistics, including frequencies and percentages, summarised categorical variables, while means and standard deviations were reported for continuous variables. Bivariate analyses were performed using Chi-square tests for categorical variables and ANOVA for continuous variables, with statistical significance defined as $p < 0.05$.

RESULTS

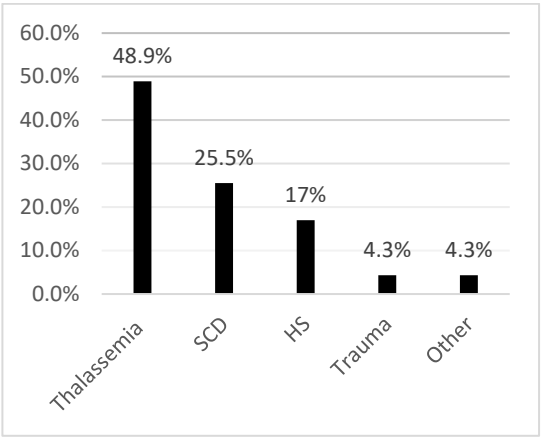
Among 47 patients, 24 (51.1%) were male and 23 (48.9%) females, with a mean age of 7.1 ± 3.3 years. Sex distribution did not differ significantly across disease groups ($p = 0.319$). The leading indications for splenectomy were thalassaemia (n = 23; 48.9%), sickle cell disease (n = 12; 25.5%), hereditary spherocytosis (n = 8; 17%), trauma (n = 2; 4.3%), and other causes (n = 2; 4.3%) as shown in Figure 1.

Common clinical presentations included pallor (38.3%), abdominal pain (29.8%), and abdominal distension (27.7%). The mean splenic size was 15.7 ± 4.1 cm, and splenules were observed in 9 patients (19.1%). Non-haematological causes were associated with older age ($p = 0.049$), higher body weight ($p < 0.001$), and abdominal pain ($p = 0.046$).

The majority of patients (85.1%) underwent splenectomy via a paramedian incision, which was predominantly used for haematological diseases, whereas midline incisions were used for trauma cases ($p = 0.020$). Intraoperative bleeding occurred in two patients, and one patient developed a postoperative wound infection. The mean time to oral intake was 2.1 ± 0.8 days, and mean length of hospital stay was 5.2 ± 1.9 days. Surgical and clinical outcomes are summarised in Tables 1 and 2.

Discussion

Splenectomy remains a cornerstone in managing non-traumatic paediatric splenic disorders. Open splenectomy provides optimal exposure for large or complex spleens but is associated with longer hospital stays and visible scarring.



SCD; sickle cell disease; HS, hereditary spherocytosis.

Figure 1: The causes of splenectomy among paediatric patients (N=47).

Laparoscopic splenectomy, introduced in children in 1993, is now recognized as a safe and effective alternative, offering shorter recovery, reduced blood loss, and improved cosmetic outcomes. Its use, however, is limited in large spleens or complex haematological cases due to technical challenges and operative risks.[10,11] In this study, all procedures were performed via open splenectomy due to limited laparoscopic equipment and trained personnel.

Consistent with international reports,[3,12,13] haematological disorders predominated as indications for splenectomy: thalassaemia (48.9%), SCD (25.5%), and HS (17%). Trauma was uncommon (4.3%), reflecting advances in paediatric trauma care, in contrast to Khasawneh *et al.,* where trauma accounted for 42% of paediatric splenectomies.[14]

Patients were slightly more often male (51.1%) with a mean age of 7.1 ± 3.3 years, similar to Topi *et al.,* (median 8.8 years),[13] but younger than Qureshi *et al.,* (10.9 ± 0.6 years)[15] and Çağlar *et al.,* (10.3 ± 2.9 years).[12]

Postoperative recovery was favorable, with mean time to oral feeding of 2.1 ± 0.8 days and mean hospital stay of 5.2 ± 1.9 days, consistent with prior reports.[12,16,17] Intraoperative bleeding occurred in 4.3% of cases, and postoperative wound infection was rare 2.1%, slightly higher than Aaron et al., 1.8% [18] but lower than Topi *et al.,* 7.8%,[13] reflecting careful surgical technique and perioperative management.

Overwhelming post-splenectomy infection (OPSI) is a rare but life-threatening complication of splenectomy, first described by King and Shumacker in 1952,[19] most commonly caused by encapsulated organisms including *Streptococcus pneumoniae, Haemophilus influenzae,* and *Neisseria meningitidis*.

Risk is highest in children younger than 2 years and during the first two years after splenectomy, particularly in those with underlying haematological disease or immunocompromise; presentation often begins with non-specific flu-like symptoms and may rapidly progress to sepsis, shock, disseminated intravascular coagulation, and death within 24–48 hours.[20]

Table 1: The characteristics of paediatric patients who underwent splenectomy

	Total	Thalassaemia	SCD	HS	Trauma	Other	*P*
	(N=47); n (%)	(N=23); n (%)	(N=12); n (%)	(N=8); n (%)	(N=2); n (%)	(N=2); n (%)	
Age (Years); mean ± SD	7.1±3.3	6.5±3	6.6±2.8	6.8±3.2	12.5±4.9	11±1.4	0.049[a]*
Gender							
Male	24(51.1)	10(43.5)	7(58.3)	6(75)	1(50)	0(0)	0.319[b]
Female	23(48.9)	13(56.5)	5(41.7)	2(25)	1(50)	2(100)	
Weight (kg); mean ± SD	19.3±8.4	16.8±6.3	17.5±3.8	21±7.1	41.5±17.6	30.5±9.1	<0.001 [a]*
Presentation							
Pallor	18(38.3)	7(30.4)	6(50)	3(37.5)	2(100)	0(0)	0.218[b]
Abdominal pain	14(29.8)	4(17.4)	6(50)	2(25)	2(100)	0(0)	0.046 [b]*
Abdominal distension	13(27.7)	6(26.1)	4(33.3)	2(25)	1(50)	0(0)	0.824[b]
Jaundice	12(25.5)	2(8.7)	6(50)	3(37.5)	0(0)	1(50)	0.128[b]
Hepatomegaly	10(21.3)	2(8.7)	4(33.3)	3(37.5)	0(0)	0(0)	0.233[b]
Bleeding tendency	3(6.4)	1(4.3)	1(8.3)	1(12.5)	0(0)	0(0)	0.070[b]
Vomiting	3(6.4)	1(4.3)	0(0)	0(0)	2(100)	0(0)	0.074[b]
Hernia orifices	1(2.1)	0(0)	0(0)	1(12.5)	0(0)	0(0)	0.289[b]
Spleen size (cm); mean ± SD	15.7±4.1	15.4±3.9	14.3±3.2	18.8±5.6	13.5±2.1	15.5±0.7	0.232[a]
Splenule	9(19.1)	4(17.4)	5(41.7)	0(0)	0(0)	0(0)	0.146[b]

SCD; sickle cell disease, HS; hereditary spherocytosis, [a] ANOVA test, [b] Chi-Square tests, *Significant *p*- Value

Table 2: The surgical characteristics, postoperative surgical site infection and LOHS among paediatric patients who underwent splenectomy

	Total (N=47); n (%)	Thalassaemia (N=23); n (%)	SCD (N=12); n (%)	HS (N=8); n (%)	Trauma (N=2); n (%)	Other (N=2); n (%)	*P*
Abdominal incision							
Paramedian	40(85.1)	19(82.6)	12(100)	7(87.5)	1(50)	1(50)	0.020[b*]
Transverse	4(8.5)	4(17.4)	0(0)	0(0)	0(0)	0(0)	
Midline	3(6.4)	0(0)	0(0)	1(12.5)	2(100)	0(0)	
SSI	1(2.1)	1(4.3)	0(0)	0(0)	0(0)	0(0)	0.626[b]
LOHS (days)	5.2±1.9	5±1.7	5.1±1.8	5.7±2.8	5±1.4	5.5±2.1	0.918[a]

SCD; sickle cell disease; SSI; surgical site infection, HS; hereditary spherocytosis, PO; postoperative, LOHS; length of hospital stays, [a] ANOVA test, [b] Chi-Square tests, *Significant *P*- Value.

Prompt empiric intravenous antibiotics, typically vancomycin with ceftriaxone, early goal-directed therapy, appropriate vaccination including the 23-valent pneumococcal vaccine with revaccination every 3–6 years, and patient and caregiver education are essential to reduce mortality from 50–70% to 10–40%.[20, 21]

To our knowledge, this study represents the first comprehensive analysis of paediatric splenectomy in Sudan, providing critical insights into patient characteristics, surgical indications, and early outcomes. It highlights that splenectomy is safe and effective even in resource-limited settings and establishes essential baseline data to guide future clinical practice and research.

Conclusion

Paediatric splenectomy is primarily performed for haematological disorders, with low complication rates and rapid early recovery. Timely intervention and careful perioperative management optimise outcomes. Long-term monitoring and infection prophylaxis are essential to ensure sustained health and quality of life.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest

Data availability

The data used and analysed during this study are available from the authors on reasonable request.

Ethics statement

Ethical approval was obtained from the ethical committee at the National Centre for Paediatric Surgery, which also granted a consent waiver, as the study was retrospective and based solely on medical records without direct patient contact or intervention.

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