Original Article

Spectrum of Paediatric Surgical Cases in a Private Mission Teaching Hospital in Nigeria

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Abstract

Introduction: Establishing the nature of conditions requiring surgery among children in a particular location may be crucial for policy formulation and implementation as regards paediatric surgery. **Objective:** This study aimed to describe the pattern and outcome of paediatric surgical cases operated upon in a newly established paediatric surgical unit in Nigeria. **Subjects and Methods:** This was a cross-sectional study of all subjects that were operated upon by the paediatric surgery unit over a 28-month period. Data obtained included age, sex, diagnosis, timing of surgery, post-treatment complications and outcome. Diagnoses were categorised based on the International Classification of Diseases 11th revision for morbidity and mortality statistics. Data analysis was done using Stata version 12. **Results:** A total of 377 procedures were performed on 336 patients with a male-to-female ratio of 2.1:1. The median age at surgery was 36 months. Disorders of the digestive system (184, 48.8%) and developmental anomalies (119, 31.6%) accounted for majority of the cases, with inguinal hernias and hydrocoeles accounting for 17.0% of all cases. Thirty-six per cent of the procedures were emergent ones, and the overall complication rate was 23.6% (89/377). The unplanned re-operation rate was 7.4% (25/336) and mortality rate was 5.1% (17/336). Typhoid ileal perforation was responsible for 4 (23.5%) of the deaths. **Conclusion:** Congenital anomalies and surgical infections represent a major surgical burden among children in our sub-region of Nigeria. There is, therefore, the need for focused research on these conditions and the integration of children surgery into public health programmes for children in sub-Saharan Africa.

Keywords: Acute appendicitis, children surgery, congenital anomalies, Nigeria, spectrum

Introduction

Paediatric surgery remains a growing specialty in low- and middle-income countries (LMICs).[1-3] Our institution was established in 1907 as a mission hospital and was converted into a teaching hospital in 2009. However, a formal paediatric surgical unit was not established until 2016. An appraisal of this service was, therefore, imperative for quality assessment, planning and allocation of resources.[4] Although community-based studies are better for baseline epidemiological data,[5] studies like this may provide information on disease patterns among served populations.[6,7]

This study aimed to describe the pattern and outcomes of paediatric surgeries in a newly established paediatric surgical unit in Nigeria.

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Subjects and Methods

This was a prospective cross-sectional study of all patients who had surgery at our institution between March 2016 and June 2019. Our institution is a 220-bedded mission-owned teaching hospital located in the southwestern part of Nigeria serving a total population of about 836,520 people according to projections from the 2006 National Census. We have a paediatric and neonatal bed capacity of 42. These facilities are shared by both medical and surgical services, with the former dominating most of the bed spaces. The paediatric surgery unit manages general and urologic surgical patients between the age of 0 and 18 years but handled older patients in special cases.

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However, the hospital did not have a paediatric intensive care unit and patients requiring this were routinely managed in the general intensive care centre.

This study excluded all neonatal circumcisions, as these were routinely performed by trained nurses as outpatient procedures on specific days. Ethical approval was obtained from the hospital's Ethics Review Board. Data obtained included: the patient's age, sex, diagnosis, timing of surgery (elective or emergency), post-treatment complications and outcome. Categorisation of diagnosis was based on the International Classification of Diseases 11th revision (ICD-11) for morbidity and mortality statistics (version: 04/2019). Categorical variables were summarised using frequencies, proportions and ratios, while quantitative variables were summarised using the median and interquartile range. The data obtained was presented using tables, graphs and charts. Data analysis was done using Stata version 12 (StataCorp. 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP).

Results

Three hundred and seventy-nine procedures were performed on 336 patients over a 28-month period. Figure 1 shows the distribution of cases over the years. There were 229 (68.2%) boys and 107 (31.8%) girls, giving a male-to-female ratio of 2.1:1. The median age of all the patients at surgery was 36 months (3 years), with the ages ranging from 1 day to 18 years. Sixty-two per cent of the patients were within the age group of 0–5 years [Figure 2]. Figure 3 shows the age distribution within each category of disease, with those with developmental anomalies having a median age of 19 months (interquartile range [IQR] =38.8 months) and those with injuries, poisoning and consequences of external causes having a median age of 72 months (IQR = 126 months).

Disorders of the digestive system accounted for majority (48.8%) of the procedures carried out, with inguinal hernias and hydrocoeles forming 17.0% of all procedures [Table 1]. Developmental anomalies were the second most frequent reason for paediatric surgical procedures (31.6%). The most common developmental anomaly affecting boys was cryptorchidism, while cleft lip and palate were the most common in girls. Neoplasms were predominant in females.

One hundred and thirty-seven (36.3%) cases were emergency procedures, 240 (63.7%) were elective cases, while 152 (40.3%) patients were managed as day cases. Eighty-nine (23.6%) patients developed complications following surgery, with surgical site infection accounting for 28 (31.5%) of the complications. Twenty-five (7.4%) patients had unplanned re-operation (s) related to their initial presentation, while eight (2.4%) had staged procedures. Seventeen patients died, giving a mortality rate of 5.1% (95% confidence interval: 2.7%–7.3%). Table 2 shows the distribution of the deaths. Typhoid ileal perforation (TIP) (4, 23.5%) caused the most deaths while both trauma patients who suffered abdominal injuries died. Ten (58.8%) deaths occurred in males and

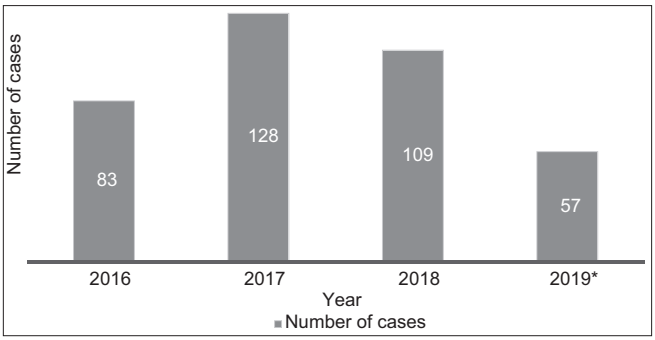


Figure 1: Distribution of procedures done per year. *First 6 months only

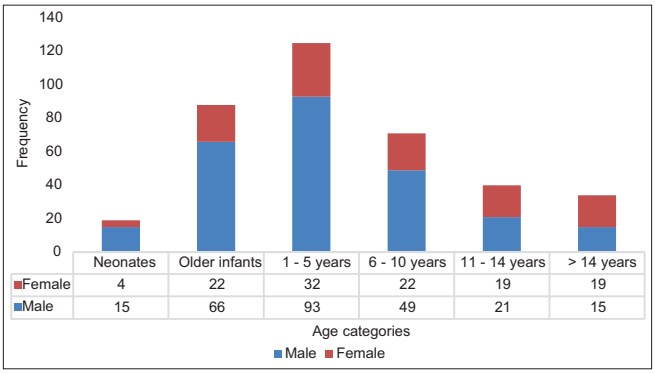


Figure 2: Age and sex distributions of the patients as at the time of each procedure

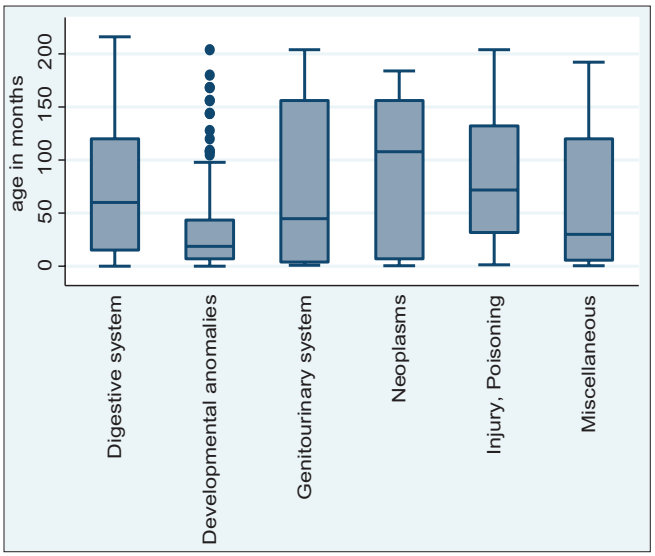


Figure 3: Age distribution of the patients based on the system of the presenting diagnosis. Line indicates the median

eight (47.1%) occurred among infants. Emergency cases accounted for all deaths, except one, in a patient who suffered malignant hyperthermia during repair of cleft palate.

Discussion

Paediatric surgery still cuts a peripheral figure in the discussions of global health.[8] Many hospitals in LMICs do

Table 1: Pattern of paediatric surgery cases managed at the Bowen University Teaching Hospital, Nigeria, between March 2016 and June 2019

Diagnosis	Frequency (%)	Male	Female
Digestive system			
Inguinal hernias/hydrocele	64 (17.0)	61	3
Appendicitis	31 (8.2)	12	19
Perforations of the GI tract	28 (7.4)	13	15
Umbilical/incisional/ventral hernias	21 (5.6)	11	10
Intussusception	11 (2.9)	8	3
Intra-abdominal collections	11 (2.9)	3	8
Thyroglossal cyst	6 (1.6)	2	4
Small bowel obstruction	6 (1.6)	4	2
Branchial cyst	3 (0.8)	2	1
Stomas	3 (0.8)	1	2
Sub-total	184 (48.8)	117	67
Developmental anomalies			
Cryptorchidism	26 (6.9)	26	0
Cleft lip/palate	19 (5.0)	5	14
Hypospadias	18 (4.8)	18	0
Hirschsprung's disease	17 (4.5)	12	5
Posterior urethral valve	11 (2.9)	11	0
Malrotation	6 (1.6)	5	1
Anorectal malformations	5 (1.3)	2	3
IHPS	4 (1.1)	4	0
Duodenal atresia	3 (0.8)	2	1
PUJ obstruction	3 (0.8)	2	1
Ankyloglossia	3 (0.8)	0	3
Omphalocoele	2 (0.5)	1	1
Intestinal atresias	1 (0.3)	1	0
Bladder exstrophy	1 (0.3)	1	0
Sub-total	119 (31.6)	89	30
Genitourinary system			
Testicular torsion	10 (2.7)	10	0
Post-neonatal circumcision	5 (1.3)	5	0
Post-circumcision penile injury	4 (1.1)	4	0
Urethrocutaneous fistula	4 (1.1)	4	0
Labial agglutination	2 (0.5)	0	2
Meatal stenosis	1 (0.3)	1	0
Sub-total	26 (6.9)	24	2
Neoplasms			
Benign	10 (2.7)	4	6
Wilms tumour	2 (0.5)	0	2
SCT	2 (0.5)	0	2
Other malignant masses	2 (0.5)	2	0
Sub-total	16 (4.2)	6	10
Injury, poisoning or certain other consequences of external causes			
Enterocutaneous fistula	7 (1.9)	3	4
Blunt/penetrating abdominal injury	2 (0.5)	2	0
Gastric outlet obstruction from caustic injury	1 (0.3)	1	0
Sub-total	10 (2.7)	6	4
Miscellaneous			
Abscesses	5 (1.3)	2	3
Burst abdomen	3 (0.8)	3	0
Thyroid cyst	1 (0.3)	0	1
Pleural effusion	1 (0.3)	0	1
Others	12 (3.2)	11	1
Sub-total	22 (5.8)	16	6
Total	377 (100.0)	259	118

Categorisation is based on the ICD 11th revision (ICD-11) for morbidity and mortality statistics (version: 04/2019). GI: Gastrointestinal, IHPS: Infantile hypertrophic pyloric stenosis, PUJ: Pelviureteric junction, SCT: Sacrococcygeal teratoma, ICD: International classification of diseases

not have established paediatric surgery units and must rely on adult surgeons to handle surgeries in children. Despite the rise in the number of trained paediatric surgeons in Nigeria, many hospitals have maintained the *status quo*, as most of the available paediatric surgeons are employed in government-owned tertiary hospitals. Our institution is a private-owned tertiary facility and began a formal paediatric surgery unit in 2016. This article presents a summary of the initial experience of the unit.

These data demonstrate male preponderance among children undergoing surgical operations in our centre, in keeping with findings from most other centres.[9-13] Although this has been reported in several studies, the reason for this has not been fully elucidated. This is despite population census figures in Nigeria showing almost equal sex distribution of individuals between the age of 0 and 9 years.[14] The median age of 3 year in the present study appears to be lower than that reported in other similar studies across Africa where mean ages ranged between 4.9 and 6.4 years.[7,9-13] This reduction might be explained by the difference in methodology which focused more on admissions, excluding day cases, in contrast to the method used in the present study. However, it is of note that more than half of the patients in this study were under 5 years, a critical target population of the United Nation's Sustainable Development Goals (SDGs) aimed at improving good health and well-being in the population.

In the present study, categorisation of diseases was done using the 11th revision of the ICD-11. Disorders of the digestive system, developmental anomalies and disorders of the genitourinary system were the three leading reasons for paediatric surgery in our centre, accounting for almost 90% of all procedures performed. Surgery for inguinal hernias remains the most common procedure undertaken, giving credence to the statement that 'inguinal hernia repair is the most common operation performed by paediatric surgeons'.[15] Inguinal hernias accounted for 17% of all the procedures, like the finding of 15.9% of all paediatric surgical admissions reported by Alagoa and Gbobo in the Niger Delta, Nigeria.[12]

Congenital anomalies (CAs) appear to be the predominant reason for children surgery in our centre, in contrast to trauma as reported by some epidemiological studies.[7,10,13] However,

Table 2: Distribution of mortality among the different surgical conditions and sex

Surgical condition	Frequency (%)	Male:female ratio
Congenital		
Malrotation	3 (17.6)	3:0
Anorectal malformation with associated ileal atresia	1 (5.9)	0:1
Posterior urethral valve	1 (5.9)	1:0
Duodenal atresia with associated omphalocoele	1 (5.9)	0:1
Meconium ileus	1 (5.9)	0:1
Cleft palate	1 (5.9)	1:0
Sub-total	8 (47.1)	5:3
Acquired		
Typhoid ileal perforation	4 (23.4)	2:2
Blunt/penetrating abdominal injury	2 (11.8)	2:0
Intussusception	2 (11.8)	0:2
Infantile hypertrophic pyloric stenosis	1 (5.9)	1:0
Sub-total	9 (52.9)	5:4
Total	17 (100.0)	10:7

some other studies from Nigeria and Ethiopia reported CAs as the most common reason for paediatric surgical admissions accounting for 35.1%–37.8% of cases.[9,11,12] CAs are emerging as an important group of diseases in LMICs. A previous study in our centre had demonstrated a CA prevalence of 6.3% among all neonatal admissions[16] and CAs have also been ranked in the top three of most studies evaluating the epidemiology of paediatric surgical admissions.[12]

In contrast to studies that found that trauma (and burns) accounted for the bulk of patients requiring paediatric surgical admission, trauma only accounted for 0.5% of procedures performed in our hospital. Trauma in this series may have been underestimated due to the exclusion of orthopaedic and neurosurgical patients, who are managed by the trauma team. Of the acquired conditions, appendicitis (8.2%) and perforations of the gastrointestinal tract (7.4%) accounted for the most procedures done. Derbew *et al*. also observed that appendicitis was the most common surgical condition responsible for 12% of paediatric operations in Ethiopia in 2006.[11] In the review by Akau *et al*. in 2017, peritonitis (12%) and appendicitis (8.4%) were the most reported surgical infections among paediatric surgical admissions. In the late 20th century, the reported incidence of appendicitis was relatively low in developing countries.[17,18] There is, however, a changing trend with increasing incidence of acute appendicitis in these countries perhaps due to industrialisation, westernisation and dietary changes towards low-fibre meals.[17] This changing trend of acute appendicitis may explain our observation in this study.

More than a third of the cases were surgical emergencies and the overall complication rate was 23.6%. The overall mortality rate of 5% in this study may not be too far away from the 5.3%–9.9% mortality rates reported among paediatric surgical admissions elsewhere in Africa.[7,9,12] The difference in rates may be as a result of the different denominator used in this work, in which only patients who underwent surgical operations were included and the relatively low mortality rate observed eventually may have been because day-case procedures formed a significant proportion of the study subjects. However, this provides a good background for an evolving system like ours to build on.

TIP contributed the most to mortality in this series accounting for 23.5% of the deaths. Typhoid ileitis remains a major public health challenge in our setting with associated significant morbidity and mortality. This may suggest possible exposure to unhygienic water and food sources. There is the need for public health authorities to bring TIP back to focus, ensure health education of communities and advocacy for the provision of safe water and good environmental sanitation, a target of the SDGs.

This study has presented an overview of paediatric surgical procedures carried out in a relatively new paediatric surgical unit. This demonstrates the significant paediatric surgical burden that needs to be addressed in this environment. The establishment of a paediatric surgical unit in hospitals in developing countries should no longer be subject to choice but, in fact, a necessity in order to improve child health delivery. This could also help guide the establishment of surgical units for children in Nigeria. Efforts should also be made to provide workforce, equipment and facilities, anaesthesia and research, as ancillary to improve child healthcare.[19] This will further help in improving outcomes in a unit such as ours.

Conclusion

Congenital conditions are the most common reason for surgery in children in our centre. Surgical infections contributed the most to mortality in this paediatric surgical group representing a major burden of surgical care. There is, therefore, the need to focus research on CAs and surgical infections in Nigeria and by extension, sub-Saharan Africa. Children surgery should form an essential and integral part of public health programmes designed for childcare in our region.

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Conflicts of interest

There are no conflicts of interest.

References

1. Butler MW, Ozgediz D, Poenaru D, Ameh E, Andrawes S, Azzie G, *et al.* The global paediatric surgery network: A model of subspecialty collaboration within global surgery. World J Surg 2015;39:335-42.
2. Holmer H, Lantz A, Kunjumen T, Finlayson S, Hoyler M, Siyam A, *et al.* Global distribution of surgeons, anaesthesiologists, and obstetricians. Lancet Glob Health 2015;3 Suppl 2:S9-11.
3. Chirdan LB, Ameh EA, Abantanga FA, Sidler D, Elhalaby EA.

Challenges of training and delivery of pediatric surgical services in Africa. J Pediatr Surg 2010;45:610-8.
4. Ugwu GI. Pattern and outcome of paediatric admission in a tertiary hospital in the Niger delta region of Nigeria: A two year prospective study. Int J Med Appl Sci 2012;1:15-29.
5. Obu HA, Chinawa JM, Uleanya ND, Adimora GN, Obi IE. Congenital malformations among newborns admitted in the neonatal unit of a tertiary hospital in Enugu, South-East Nigeria--a retrospective study. BMC Res Notes 2012;5:177.
6. Adem A, Abebe A, Abdurahman M. Pattern of surgical admissions to Tikur Anbessa Hospital, Addis Ababa, Ethiopia. East Cent Afr J Surg 2001;6:31-4.
7. Bickler SW, Sanno-Duanda B. Epidemiology of paediatric surgical admissions to a government referral hospital in the Gambia. Bull World Health Organ 2000;78:1330-6.
8. Sitkin NA, Ozgediz D, Donkor P, Farmer DL. Congenital anomalies in low- and middle-income countries: The unborn child of global surgery. World J Surg 2015;39:36-40.
9. Akau KS, Danjuma S, Luka AJ, Nuhu Y, Olatunde OO, Godfrey M. Pattern and outcome of paediatric surgical admissions in a new tertiary hospital in northwestern Nigeria. J Surg 2017;5:82-5.
10. Thanni LO, Shonubi AM, Akiode O. A retrospective audit of paediatric surgical admission in a sub-urban tertiary hospital. West Afr J Med 2005;24:10-2.
11. Derbew M, Ahmed E. The pattern of pediatric surgical conditions in Tikur Anbessa Unversity Hospital, Addis Ababa, Ethiopia. Ethiop Med J 2006;44:331-8.
12. Alagoa PJ, Gbobo I. Pattern of paediatric surgical admissions in a tertiary hospital in a semi – Urban community in the Niger delta: A three-year review. Int J Trop Dis Health 2014;4:45-51.
13. Abahuje E, Uyisabye I, Ssebuufu R. Epidemiology of pediatric surgery in Rwanda: A one year review. RMJ 2016;73:11-6.
14. Population Distribution by Age 2006-Nigeria Data Portal. Availble from: https://nigeria.opendataforafrica.org/xlomyad/population-distribution-by-age-2006. [Last accessed on 2020 May 04].
15. Glick PL, Boulanger SC. Inguinal hernia and hydrocoeles. In: Grosfeld JL, ONeill Jnr JA, Fonkalstrud EW, Coran AG, editors. Pediatric Surgery. 6th ed. Philadelphia: Mosby/Elsevier; 2006. p. 1172-4.
16. Ajao AE, Adeoye IA. Prevalence, risk factors and outcome of congenital anomalies among neonatal admissions in OGBOMOSO, Nigeria. BMC Pediatr 2019;19:88.
17. Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, *et al.* The Global Incidence of Appendicitis: A Systematic Review of Population-based Studies. Ann Surg 2017;266:237-41.
18. Ahmed SA, Makama JG, Mohammed U, Sanda RB, Shehu SM, Ameh EA. Epidemiology of appendicitis in northern Nigeria: A 10-year review. Sub-Sahar Afr J Med 2014;1:185-90.
19. Chirdan LB, Ngiloi PJ, Elhalaby EA. Neonatal surgery in Africa. Semin Pediatr Surg 2012;21:151-9.