

## **Pattern and Outcome of Paediatric Surgeries: A Private Paediatric Hospital Experience in Southern Nigeria**

### **ABSTRACT**

**Aim:** This study was undertaken to determine the pattern and outcome of paediatric surgeries in a private hospital in Southern Nigeria.

**Study Design:** A retrospective study

**Place and Duration of Study:** Study was carried out at Tehilah Children Hospital over a 14-months period from 1<sup>st</sup> April 2020–31<sup>st</sup> May 2021.

**Methodology:** Essential information needed were retrieved from the hospital Health Management System and data analysed using SPSS version 23.

**Results:** Of 1289 children admitted during the study period, 105 had surgical interventions (prevalence of 8.1%). Age range was from 8 days to 16 years (median age of 36months) with male predominance. Only 34.3% of the patients were self-paying. The most common surgical conditions were congenital anomalies (28.1%), followed by surgical infections (22.8%) and then urogenital diseases (19.3%). The least common were central nervous system diseases (0.9%). Emergencies accounted for 39.8% of cases done. The commonest surgeries done were circumcision (16.8%), appendectomy (15.9%) and herniotomy/herniorrhaphy (14.2%). One child died (mortality rate of 1%). Duration of stay was mostly < 3days (41.7%). Longest duration was seen in those who had Laparotomy and Skin graft.

**Conclusion:** The prevalence of surgical interventions in a paediatric private hospital in Southern Nigeria was high with emergency surgeries constituting 38.9% of all cases. Thus, for reduction in paediatric morbidity and mortality, we advocate the improvement of surgical infrastructure and manpower not only in tertiary but also in the private health sector.

**Key words:** Pattern, Outcome, Paediatric Surgeries, Private hospital, Southern Nigeria

### **INTRODUCTION**

Hospital admission data is very useful in assessing the pattern of disease within a population and is thus invaluable in health care planning [1,2,3]. This will facilitate adequate budgetary provision to meet the needs of children requiring surgical interventions not only in the tertiary centers [1,4,5] but also in the private sector. Pediatric surgeries may be required for cases such as congenital anomalies (malrotation, omphalocele, hernias, cleft-lip/palate, intestinal atresia), trauma (burns, fractures, head injuries, blunt abdominal injuries), surgical infections (appendicitis, peritonitis, osteomyelitis, ulcers), gastro-intestinal tract disorders (intussusception, entero-cutaneous fistulas) and others [1,2,3,4,5]. A significant number of these may require emergency intervention. Factors which contribute to increased morbidity/mortality in paediatric surgeries as seen in developing countries like Nigeria include poor access to specialist care, late presentation, lack of medical facilities with surgery specialty, human resources and cost [1,3,6,7,8,9].

Cost implications which are often challenging [6,7,8,9] may be mitigated by health insurance which in our country is more readily accessed in the private health care sectors via the Health management organizations. The outcome of paediatric surgical cases is more favourable in developed countries because of availability of improved surgical skills and technology, functional intensive care units, total parenteral nutrition and adequately trained staff [6]. Improving the accessibility and quality of pediatric surgical care in resource –poor nations will substantially reduce childhood morbidity and mortality [9].

There is paucity of data on the pattern and outcome of paediatric surgeries in private hospitals in Nigeria, as most of the studies done were in tertiary public hospitals [1,2,3,4,5]. This study was thus carried out to ascertain the pattern and outcome of paediatric surgeries in a private paediatric hospital in southern Nigeria.

## MATERIALS/METHODS

This was a retrospective review of all children admitted with surgical pathologies in Tehilah Children hospital, Port Harcourt, Rivers State over 14 months (from 1<sup>st</sup> April 2020-31<sup>st</sup> May 2021). Our study centre is a 38 bedded private hospital with an average monthly admission rate of 80-90 children per month. Age group seen is 0-17 years with a well-equipped neonatal unit and childrens' ward. Its' specialist staff strength include 5 Paediatricians, a Paediatric surgeon, two ENT surgeons, a Burns and Plastic surgeon, a Neurosurgeon, an Orthopaedic surgeon, two Anaesthetists, a radiologist and a radiographer. It has a fully functional theatre with an ultramodern paediatric anaesthetic machine, a paediatric ventilator, fully functional radiology, laboratory and blood bank services.

Data of all children admitted during the study period was retrieved from the admissions and theatre records of the hospitals' health Management System. Information obtained included age, sex, diagnosis, type of intervention/surgery, duration of admission and outcome. The outcome measures considered were discharge, death, left against medical advice and referral. There were however, no cases of referral nor leaving against medical advice during the study period.

Data was entered in an Excel spreadsheet and analysed using SPSS version 23. Results were presented as frequency, percentages and bar charts.

## RESULT

### Characteristics of the study population

There were 1,289 children admitted during the period of study of which 105 had surgical interventions giving a prevalence of surgical interventions among children admitted as 8.1%. Males predominated, 77 (73.3%) with M:F ratio of 3:1. Age range of children was 8 days to 16 years, majority were between 29 days and 5 years of age 53(50.5%) with a median age of 36 months. Most had weights greater than 8kg, 42(40.0%) with median weight of 17.0kg and majority had insurance coverage, 69(65.7%), Table 1.

**Table I:** Characteristics of the study population

Variables	Frequency, N=105 (%)
<b>Sex</b>	
Male	77 (73.3)
Female	28 (26.7)
<b>Age</b>	
0-28 days	16 (15.2)
29days-5 years	53 (50.5)
>5 years	36 (34.3)
<b>Weight (kg)</b>	
< 4	33 (31.4)
4-8	30 (28.6)
> 8	42 (40.0)
<b>Insurance status</b>	
HMO	69 (65.7)
Self-pay	36 (34.3)

**Types of Surgical conditions**

The commonest surgical conditions were congenital anomalies 32 (28.1%) followed by surgical infections, 26 (22.8%), Urogenital diseases 22 (19.3%) and Ear, nose & throat diseases 17 (14.9%) while the least was central nervous diseases 1 (0.9%). The commonest congenital anomalies were Hernia, 12 (37.5%), ankyloglossia 6 (18.8%), hydrocele 4 (12.5%) and upper gastrointestinal obstruction 4 (12.5%) while for surgical infections, appendicitis 18 (69.2%) and abscesses 4 (15.5%) were commonest whereas circumcision 19 (86.4%) was the commonest urogenital conditions. Adeno-tonsillar diseases 15 (88.2%) was the commonest Ear, nose and throat surgical diseases while avulsion injury of the tongue 3 (25.0%) was the commonest trauma observed. The only central nervous system surgical disease observed was hydrocephalus 1 (0.9%), Table II.

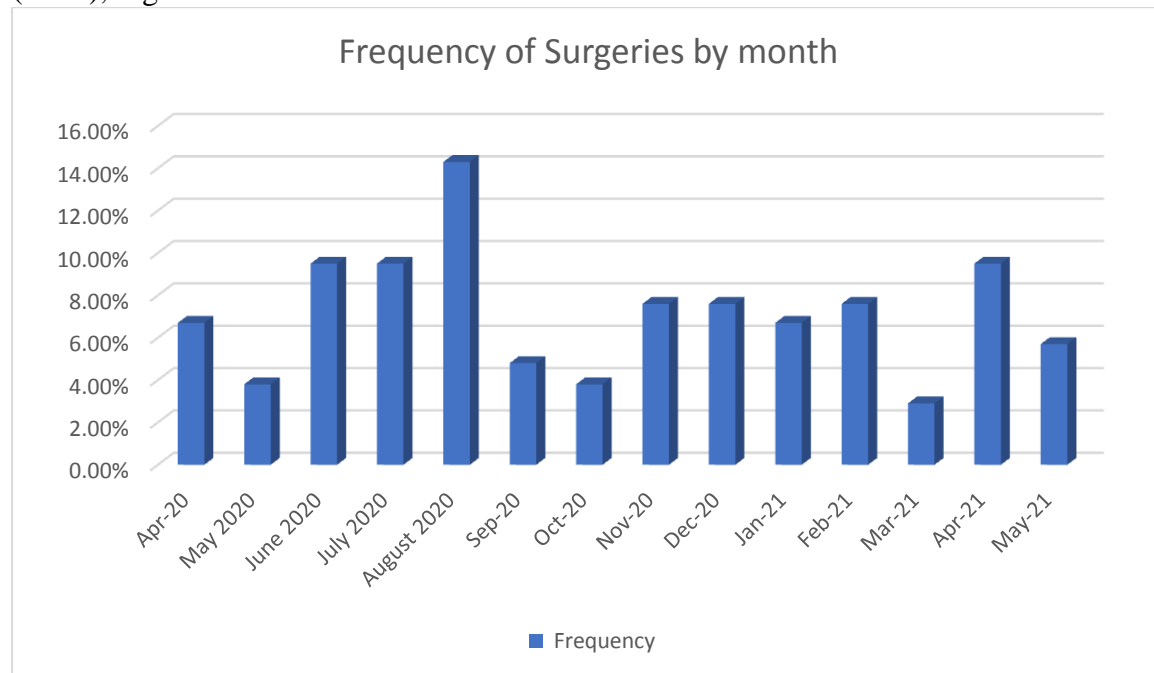
**Table II:** Types of Surgical conditions

<b>Types of Surgical diseases, n=114</b>	<b>Frequency (%)</b>
<b>Congenital anomalies, n=32 (28.1%)</b>	
Hernia	12 (37.5)
Ankyloglossia	6 (18.8)
Hydrocele	4 (12.5)
Upper gastrointestinal obstruction.	4 (12.5)
Undescended testis	2 (6.3)
Hypospadias	1 (3.1)
Meatal stenosis	1 (3.1)
Hirschsprung disease.	1 (3.1)
Congenital scalp warts	1 (3.1)
<b>Surgical infections, n=26 (22.8%)</b>	
Appendicitis	18 (69.2)
Abscess	4 (15.5)
Pyogenic granuloma.	1 (3.8)
Cellulitis	1 (3.8)
Necrotizing enterocolitis	1 (3.8)
Peritonitis.	1 (3.8)
<b>Urogenital diseases, n=22 (19.3%)</b>	
Circumcision	19 (86.4)
Testicular torsion.	2 (9.1)
Priapism.	1 (4.5)
<b>Ear, Nose &amp; Throat diseases, n=17 (14.9%)</b>	
Adeno-tonsillar diseases	15 (88.2)
Foreign body in right ear	2 (11.8)
<b>Trauma/Burns, n=12 (10.5%)</b>	
Avulsion injury of the tongue	3 (25.0)
Fractures of limbs	2 (16.7)
Lacerations (face, nostrils)	2 (16.7)
Burns	2 (16.7)
Blount's disease	1 (8.3)
Amputated finger	1 (8.3)
Corn left foot	1 (8.3)
<b>Gastrointestinal diseases, n=4 (3.5%)</b>	
Acute abdomen	2 (50.0)

Intussusception	1 (25.0)
Bleeding duodenal ulcer	1 (25.0)
<b>Central nervous system diseases, n=1 (0.9%)</b>	
Hydrocephalus	1 (100.0)

### Number of Surgeries by month

Most surgeries were done in August 2020, 15 (14.3%) while the least was in March 2021, 3 (2.9%), Figure 1.

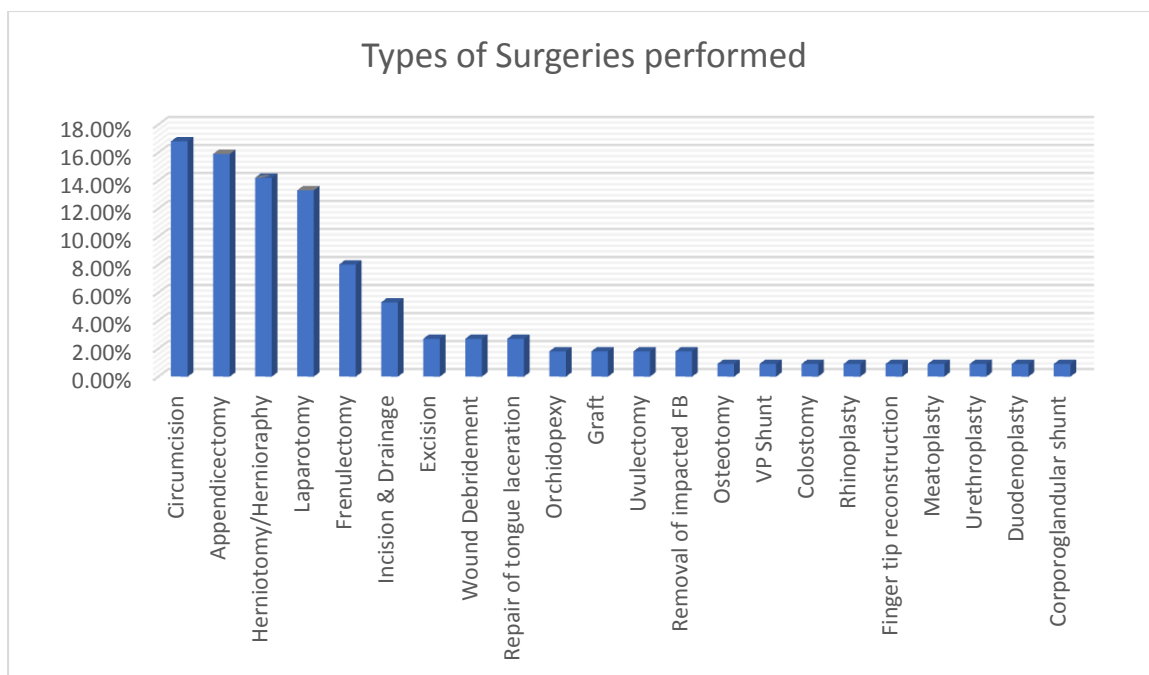


**Figure 1:** Frequency of Surgeries by month

### Types of Surgeries performed

Of 113 surgeries performed on 105 children, 45 (39.8%) were emergencies while 68 (60.2%) were elective.

The commonest surgery performed was circumcision 19 (16.8%) related [involving actual circumcision 15(79.0%), repair of poorly done circumcision ie penile re-fashioning 2(10.5%) and release of trapped circumcision rings 2(10.5%)] followed by Appendicectomy 18 (15.9%) and Herniotomy/Herniorrhaphy 16 (14.2%).



**Figure 2:** Types of Surgeries performed

VP=Ventriculo-peritoneal

### Outcome and Duration of Hospital Stay

One hundred and four (99.0%) children were discharged home while one child died giving a mortality rate of 1.0%.

Only 72 children had complete data on duration of hospital stay. Of these 72 children, 30 (41.7%) patients were discharged home within the 1<sup>st</sup> 3 days of admission while the least 16 (22.2%) were discharged after 6 days of admission, Table III.

**Table III:** Outcome and Duration of Hospital Stay

Variable	Frequency (%)
<b>Outcome, n=105</b>	
Discharged.	104 (99.0)
Died	1 (1.0)
<b>Duration of Stay (days), n=72</b>	
1-3	30 (41.7)
4-6	26 (36.1)
> 6	16 (22.2)

### Distribution of Surgeries by Sex

Based on sex distribution, more males had laparotomy 8(10.4%), incision and drainage 3(4.0%) and grafts 2 (2.6%) whereas more females had appendicectomy 9(32.1%), herniotomy/hernioraphy 5(17.9%) and frenulectomy 2(7.1%). Only males had circumcision and orchidopexy, Table IV.

**Table IV: Distribution of Surgeries by Sex**

Surgeries	Sex	
	Male, N=77(%)	Female, N=28 (%)
Circumcision	19 (24.7)	0 (0.0)
Appendicectomy	9 (11.7)	9 (32.1)
Herniotomy/Herniorraphy	11 (14.3)	5 (17.9)
Adenotonsillectomy	10 (13.0)	5 (17.9)
Laparotomy	8 (10.4)	1 (3.6)
Frenulectomy	4 (5.2)	2 (7.1)
Incision & Drainage	3 (4.0)	1 (3.6)
Excision	2 (2.6)	1 (3.6)
Orchidopexy	2 (2.6)	0 (0.0)
Graft	2 (2.6)	0 (0.0)
Removal of impacted foreign body	1 (1.3)	1 (3.6)
Uvulectomy	1 (1.3)	1 (3.6)

**Distribution of Surgeries by Age**

Circumcision and laparotomy were performed more in children less than 28 days. Herniotomy/herniorrhaphy, adenotonsillectomy, frenulectomy and incision & drainage were the commonest surgeries performed in children 29 days – 5years whereas appendicectomy, excision and removal of foreign body was mainly seen in children above 5 years, Table V.

**Table V: Distribution of Surgeries by Age**

Surgeries	Age		
	< 28 days N=16 (%)	29days-5years N=53 (%)	> 5 years N=36
(%)			
Circumcision	13 (81.3)	6 (11.5)	0 (0.0)
Appendicectomy	0 (0.0)	2 (3.8)	16 (44.4)
Herniotomy/herniorrhaphy	0 (0.0)	13 (24.5)	3 (8.3)
Adenotonsillectomy	0 (0.0)	9 (17.0)	6 (16.7)
Laparotomy	2 (12.5)	5 (9.4)	2 (5.6)
Frenulectomy	0 (0.0)	6 (11.3)	0 (0.0)
Incision & Drainage	0 (0.0)	3 (7.5)	1 (2.8)
Excision	0 (0.0)	1 (1.9)	2 (5.6)
Orchidopexy	0 (0.0)	2 (3.8)	0 (0.0)
Graft	0 (0.0)	2 (3.8)	0 (0.0)
Removal of impacted foreign body.	0 (0.0)	0 (0.0)	2 (5.6)
Uvulectomy	0 (0.0)	2 (3.8)	0 (0.0)

**Distribution of Surgeries by Duration of Hospital Stay**

The shortest duration of stay 1-3 days was observed in children who had circumcision, herniotomy/herniorrhaphy, adenotonsillectomy and frenulectomy whereas the longest duration of stay (> 6 days) was observed in children who had laparotomy, excision, grafts and wound debridement, Table VI.

**Table VI:** Distribution of Surgeries by Duration of Hospital Stay

Surgeries	Duration of Stay(days)		
	1-3, n=30(%)	4-6, n=26(%)	> 6, n=16(%)
Circumcision	2 (6.7)	1 (3.8)	1 (6.3)
Appendectomy	4 (13.3)	13 (50.0)	1 (6.3)
Herniotomy/herniorrhaphy	8 (26.7)	5 (19.2)	3 (19.0)
Adenotonsillectomy	11 (36.7)	4 (15.4)	0 (0.0)
Laparotomy	1 (3.3)	3 (11.5)	5 (31.3)
Frenulectomy	2 (6.7)	0 (0.0)	0 (0.0)
Excision	1 (3.3)	1 (3.8)	1 (6.3)
Orchidopexy	1 (3.3)	2 (7.7)	1 (6.3)
Graft	0 (0.0)	0 (0.0)	2 (12.5)
Wound debridement	0 (0.0)	0 (0.0)	2 (12.5)
Uvulectomy	1 (3.3)	1 (3.8)	0 (0.0)

## DISCUSSION

The prevalence of surgical interventions in the present study of 8.1% was lower than the 11.3%, 12.2%, 12.5%, 15.5%, 18.0% and 18.69% documented in Gambia [10], Somaliland [11], Kaduna (Northwestern Nigeria) [1], Ethiopia [12], Malawi [13] and Bangladesh [14] respectively. It was however higher than the 4.7% reported in the United States of America [15]. This varying prevalence could be attributable to the varying geographic locations and disease patterns. The low prevalence of surgical diseases in the present study could be because the study centre was a private paediatric health facility with only 38 bed capacity unlike most of the other centres which were tertiary centres and as such much bigger.

The male preponderance observed in the present study was similarly reported in all other studies [1,10,11,13,14,15,16,17]. This is not surprising as males have been observed to be more vulnerable to diseases [18]. The male preponderance in the present study could also be because circumcision was the commonest surgery performed which is done only in males.

Majority of children who had surgical interventions in the present study were of the age groups 29 days to 5 years. This was in consonance with studies carried out by Bickler & Sanno-Duanda [10], Concepcion et al [11] and Botchway et al [16] in Gambia, Somaliland and South Africa respectively. The reason for this finding could be because disease conditions are commoner among this age group [19,20,21]. In contrary however, older children above 5 years accounted for most surgeries as documented by Rabbitts & Groenewald [15] and Torborg et al [17] in United States and Somaliland respectively. This difference could be attributable to varying pattern of surgical diseases and the different geographic locations.

More than a third (39.8%) of children had emergency surgical interventions in the present study. This was comparable with the 37.0% and 38.3% documented in Benin city [3], Nigeria and South Africa [16] respectively but lower than the 73.13% and 74.67 reported in Ethiopia [12] and Bangladesh [14] respectively. It was however much higher than the 22.0% reported in Malawi [13]. This difference could be explained by the varying pattern of surgical morbidities, nearness of health facility to the population in need of healthcare, availability of qualified personnel, infrastructural development as well as the availability of insurance. It is pertinent to note that more than two-thirds of the children who had surgical interventions had health insurance in the present study. This is however much lower than that reported in the US where 95.1% were insured and only 4.8% were uninsured.

Congenital abnormalities were the commonest surgical condition observed in the present study followed by surgical infections and urogenital diseases in descending order. Congenital abnormalities being the commonest surgical condition requiring surgical interventions was also documented by Akau et al [1], Paingha & Isesoma [4], Thami et al [22], Olasinde et al [23], Concepcion et al [11], and Bhosale & Soni [24] in Nigeria, Somaliland and India respectively. This finding is not strange as the age group mostly involved in paediatric surgeries were observed to be in their 1<sup>st</sup> five years of life when congenital diseases may be prevalent. Contrary to the present study, trauma/injuries were reported to be the commonest indications for surgery by Kendig et al [13], Nessa & Dewan [14] and Birkler & Sanno-Duanda [10] in Malawi, Bangladesh and the Gambia respectively. The latter observation could be age related as observed in the Gambian study [10] where 6–11-year-olds had most surgeries. This is not surprising as this age groups are more adventurous when compared to the under-fives and are less likely to be supervised closely. Non-communicable diseases were reported as the commonest diseases requiring surgery as reported by Torborg et al [17] in South Africa. This could be explained by the difference in methodology in the classification of surgical morbidities.

Most surgeries were performed in the month of August while the least was in March. Interestingly, August coincided with the summer holidays when schools are on vacation and thus parents would be more likely to plan for their childrens' elective surgeries (which predominated in the present study) in order to avoid their children missing school. This was however not the case in a similar study carried out in a Nigerian tertiary hospital [3] where most surgical admissions were in the month of September, which usually is the beginning of school. The study however did not highlight the proportion of emergency /elective surgeries. March which was observed to be the least month surgeries took place in the present study coincided with the month when schools were in session.

The commonest surgery carried out in the present study was circumcision followed by appendicectomy and herniotomy. Similarly, Jasper & Oside [25] reported Herniotomy and appendicectomy as the commonest surgeries performed while Botchway et al [16] documented surgeries related to the gastrointestinal tract and general surgery as the predominant surgeries carried out. It is worthy of note that in the Gambia [10] however, appendicectomy which was one of the commonest surgeries performed in the present study was one of the least, the 23<sup>rd</sup> commonest surgery carried out. This could be attributed to the difference in geographic location with associated varying morbidity pattern.

The mortality rate of 1.0% reported in the present study was comparable with the 1.1% reported in South Africa [17] but lower than the 3.7%, 5.3%, 7.0%, 7.46%, 9.1% and 9.9% reported in Bangladesh [14], Gambia [10], Malawi [13], Ethiopia [26], India [24] and Kaduna, Northwestern Nigeria [1] respectively. It was however higher than the 0.8% reported in Ghana [26]. It is worthy of note that the very low mortality rate documented in the Ghanaian study [26] could be attributed to the fact that only elective cases were reported unlike the present study where emergency surgeries accounted for up to 39.8%. The different mortality rates could be due to the different geographic locations, pattern of surgical diseases and the varying standard operating procedures in the different health facilities. Varying infrastructural developments like intensive care units and availability of adequate manpower such as trained paediatric surgical nurses could also be contributing factors. The availability of paediatric surgeon-to-patient ratio as well as the nurse-to-patient ratio could also determine outcome of paediatric surgical patients. The low mortality rate of 1.0% reported in the present study could also be because of the very small sample size being a private health facility as compared to most other studies which involved larger sample sizes and as such the possibility of having more mortalities. In addition, the availability of the services of different surgical specialty as well as a nurse-patient-ratio of 1:5 could also account for a lower mortality rate

in the present study, in contrast with the nurse-patient-ratio of 1:33 reported in a Nigerian tertiary hospital [3] and in Malawi [27,28] where one paediatric surgeon provides care for more than 6 million children less than 15 years.

Majority of the children who had surgery were discharged within the first 3 days of surgery. This is not surprising as circumcision which accounted for most surgeries done is usually a day case. In addition, appendicectomy and herniotomy\hernioraphy which were also common in the present study are short stay surgeries. Laparotomy, excision, grafts and wound debridement were reported in the present study to have the longest duration of stay, greater than 6 days. This was not unusual as laparotomy, a major surgery, unlike the shorter stay surgeries needed longer in-patient care as patients are required to be on nil per oral for much longer periods. Grafts and wound debridement also required more in-patient care to allow for the graft to become established and as such a longer duration of stay in the hospital.

## **CONCLUSION**

The prevalence of surgical interventions at Tehilah Children Hospital, a private health facility in Southern Nigeria is high being 8.1% with male preponderance. Emergency surgeries constituted 39.8% with congenital abnormalities and surgical infections being the commonest indications for surgery. Circumcision was the commonest surgery carried out followed by appendicectomy. There was a mortality rate of 1.0%.

## **RECOMMENDATION**

This study therefore highlights the importance of surgical care as an essential aspect of public health even in the private health sectors in the reduction of paediatric morbidity and mortality as surgical conditions play a significant role in the overall burden of paediatric diseases especially in low-income countries. We thus advocate the development/improvement in surgical infrastructure and manpower not only in the tertiary health facilities but also in the private health sector.

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UNDER PEER REVIEW