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Upgrade from a Specialist Centre to a Teaching Hospital in Southwestern Nigeria: Paediatric Surgical Practice before and after

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Abstract

Introduction: It has been estimated that about 11% of the global burden of disease is attributable to surgically treatable diseases with the burden significantly more among children in low- and middle-income countries. Nigerian is the most populous African nation with the burden of pediatric surgical disease largely unmet. The establishment of medical school and Teaching hospitals aimed at improving infrastructure and available manpower is a strategy to address this shortfall.

Objective: To determine if a difference exists in the paediatric surgical case-mix and outcome before and after upgrading our facility into a teaching hospital and determine if a difference existed in the paediatric surgical infrastructure, and workforce before and after the upgrade.

Materials and Methods: A hospital based retrospective review conducted from 2014 to 2020 in the paediatric surgery unit of a specialized health facility upgraded into a Teaching hospital in 2018. Data was analyzed using SPSS version 23.

Results: 368 operations were performed during the study period, with M: F. 3.6:1. The age ranged from 0 to 156 months. The surgical procedures and outcome were similar in the pre- teaching hospital and the teaching hospital periods. We found appreciable upgrade to paediatric surgery infrastructural facilities but a slight decrease in the available workforce across the two periods.

Conclusion: We recommend a corresponding investment and upgrade of the workforce to fully benefit from the effect of the investment in other infrastructural facilities when upgrading health facilities.

Keywords: Paediatric Surgery, Outcome, Upgrade, Teaching hospital

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Introduction

It has been estimated that about 11% of the global burden of disease is attributable to surgically-treatable diseases with the burden significantly more among children in low and middle income countries[1]. Nigeria is the most populous country in Sub-Saharan Africa with about 54% of her population comprising of children and adolescents aged 0–19 years[2,3]. The life expectancy of Nigerians is significantly low partially due to having more deaths in children of 5 years and younger than any other country in the world, including countries experiencing widespread long-term conflict, such as Somalia[4]. A rapidly growing population not matched by infrastructural development and inadequate healthcare facilities, especially for the paediatric population has significantly contributed to this outcome[4]. Consequently, the burden of pediatric surgical disease in Nigeria remains largely unmet as this service is provided by a select few hospitals[5]. In addition, the recent upsurge in the emigration of trained health workforce from Sub-Saharan Africa (SSA) to other climes due to several push and pull factors[6-8] has further depleted the already inadequate pediatric surgical workforce.

The establishment of medical schools, teaching hospitals and residency training programs aimed at improving infrastructure and available manpower is a strategy to address this shortfall[9]. Our facility that was a stand-alone state government owned specialist hospital, was upgraded together with other state-owned facilities into the Teaching hospital of a newly established medical school in line with the above strategy.

In this article, we aimed to determine if a difference exists in the paediatric surgical case-mix and outcome before and after upgrading to a teaching hospital. Similarly, we also aimed to determine if a difference existed in the paediatric surgical infrastructure, and workforce before and after the upgrade.

Materials and Methods

Study population

The study was conducted in the Surgical section of the University of Medical Sciences, Teaching Hospital, Ondo in Southwest Nigeria. It was established as a stand-alone specialist surgical care facility offering various aspects of surgical care including paediatric surgery in 2014 and was later incorporated as the surgical arm of the University Teaching Hospital in 2018 by the State government. The Teaching hospital has evolved into a 150 bedded tertiary health care facility. The paediatric surgical cases were initially admitted in the female surgical wards before the establishment of a dedicated paediatric surgical ward. The paediatric surgery workforce consists of one consultant paediatric surgeon, one consultant anaesthesiologist who also serves other surgical units and eight nurses. We also work in collaboration with the Department of Paediatrics and Child Health, staffed with three Consultant Pediatricians. This study reviewed paediatric surgical practice including operations performed and available facilities, including human resources over a six-year period from 1st June 2014 to 30th May 2020 spanning about three years before and three years after incorporating the facility into a University Teaching Hospital.

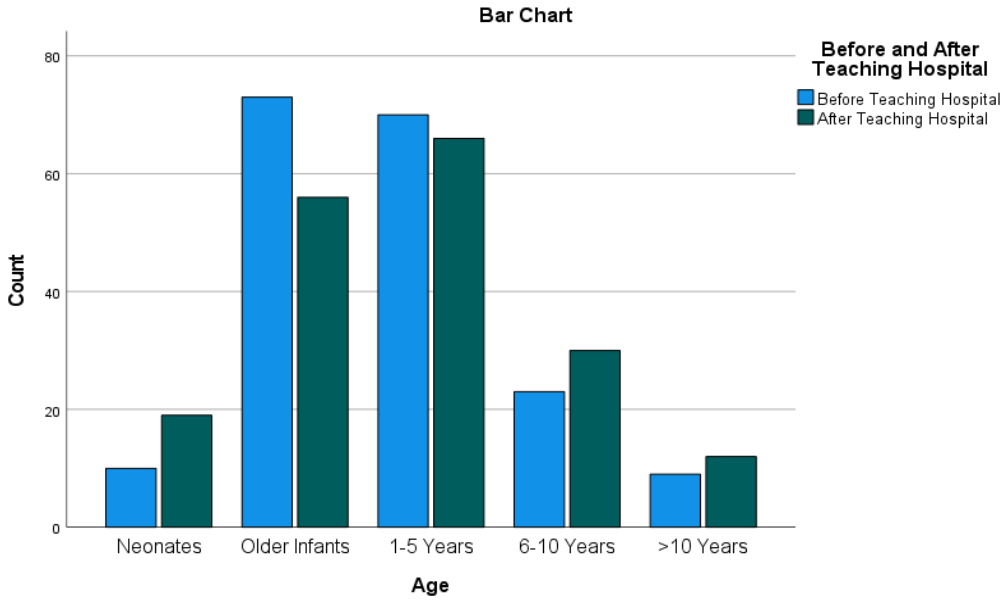
Study Design

This study was a hospital-based retrospective study where the details of surgical operations performed by the paediatric surgery unit in the study period were obtained from the operating theatre register and case files retrieved to extract data including the patients' demographics, types of surgeries, the mode of anaesthesia and the patient's outcome. Categorisation of diagnosis was based on the International Classification of Diseases 11th revision (ICD-11) for morbidity and mortality statistics. Missing cases and those with incomplete data were excluded. The details of the available Paediatric Surgery facilities and human resources before and after upgrade were also recorded. These include a dedicated paediatric surgical ward, dedicated bedspaces and incubators, neonatal intensive care unit, and dedicated operating room. The workforce includes consultant paediatric surgeon, consultant anaesthetist and other cadre of anaesthetist, resident doctors and dedicated nurses among others. Data was analyzed using SPSS version 23 where descriptive and analytical statistics were utilized. P value <0.05 was considered significant with 95% Confidence Interval.

Result

A total of 368 paediatric surgical operations were performed during the study period consisting of 185 cases before the teaching hospital and 183 cases after upgrading into a teaching hospital. We have an average for 74cases per year in the facility across the two periods. We had a total of 288 (78.3%) male patients including 153(82.7%) before the upgrade and 135(73.8%) after the upgrade. The age of our patients ranged from 0 to 156 months with a mean age of 35 ± 41.67 months. 29 (7.9%) of our patients were neonates while 129 (35.1%) and 136 (37.0%) were older infants and age 1 – 5 years respectively. The age distribution of the patients was similar between the two periods being evaluated (Figure 1).

Figure 1: Age categories of patients



Elective cases were in the majority across each period, constituting 67% and 61% of all cases in the pre teaching hospital and the teaching hospital period respectively. (Table 1)

Table 1: Types of surgery performed before and after upgrading the facility

		Before Teaching hospital	During Teaching hospital	
Type of surgery	Elective	124 (67.0%)	113 (61.7%)	237 (64.4%)
	Emergency	61 (33.0%)	70 (38.35)	131 (35.6%)
Total		185 (100%)	183 (100%)	368 (100%)

The case distribution was almost identical in the pre- and post-upgrade periods with those classified as diseases of the digestive tract being the most common and accounting for about 60% of all cases in both periods. This was followed by developmental anomalies accounting for 23.2% and 16.9% respectively in both periods. Genitourinary diseases were next accounting for less than 10% of cases in both eras. Herniotomy for hernias and hydrocoeles constituted the most common type of surgery in both periods (38.4% and 33.3%r respectively). Similarly, laparotomy for intussusception constituting 10.8% in the pre-upgrade period and 12% in the post-upgrade period formed the most common emergency procedure done in our centre during this study. Cryptorchidism accounting for 7% and 5% all procedures performed across each era was the most common developmental anomaly in this study. (Table 2)

Table 2: Diagnostic categories before and after upgrade to Teaching Hospital

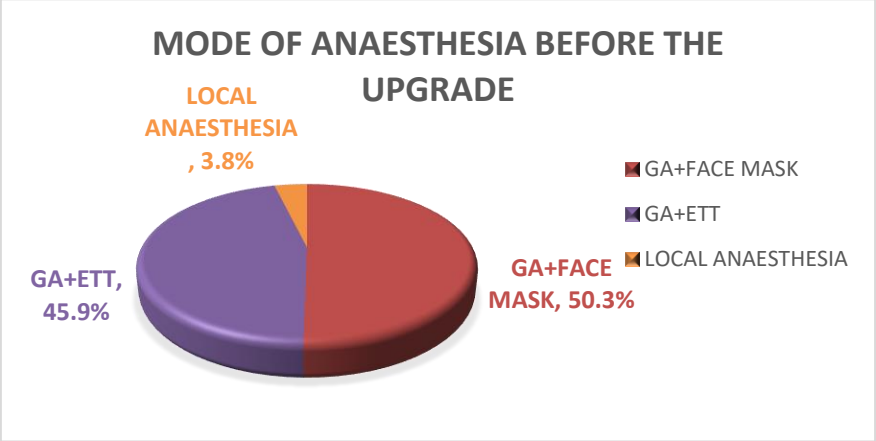
	Diagnosis	Before upgrade (%)	After upgrade (%)	Total (%)
Digestive system	Inguinal hernia/ Hydrocoele	71 (38.4)	61 (33.3)	132 (35.9)
	Intussusception	20 (10.8)	22 (12.0)	42 (11.4)
	Appendicitis	4 (2.2)	8 (4.4)	12 (3.2)
	Perforations	3 (1.6)	6 (3.3)	9 (2.4)
	Small bowel obstruction	2 (1.1)	7 (3.8)	9 (2.4)
	Umbilical hernia/Ventral hernia	1 (0.5)	5 (2.7)	6 (1.6)
	Stomas	2 (1.1)	3 (1.6)	5 (1.4)
	Thyroglossal duct cyst	1 (0.5)	3 (1.6)	4 (1.1)
	Ankyloglossia	2 (1.1)	1 (0.6)	3 (0.8)
	Brachial cyst	1 (0.5)	1 (0.6)	2 (0.5)
	Foreign body ingestion	1 (0.5)	0 (0.0)	1 (0.3)
	Subtotal	108 (58.3)	117 (63.9)	225 (61.1)
Developmental anomalies	Cryptorchidism	13 (7.0)	9 (4.9)	22 (6.0)
	Anorectal malformations	9 (4.9)	8 (4.4)	17 (4.6)
	Hirschsprung's disease	7 (3.8)	0 (0.0)	7 (1.9)
	Intestinal malrotation	3 (1.6)	1 (0.6)	4 (1.1)
	Infantile hypertrophic pyloric stenosis	2 (1.1)	1 (0.6)	3 (0.8)

	Duodenal/Intestinal atresia	3 (1.6)	2 (1.1)	5 (1.4)
	Gastroschisis/ Ruptured Omphalocoele	1 (0.5)	2 (1.1)	3 (0.8)
	Hypospadias	2 (1.1)	3 (1.6)	5 (1.4)
	Bladder exstrophy	1 (0.5)	3 (1.6)	4 (1.1)
	Disorder of Sexual Differentiation	0 (0.0)	2 (1.1)	2 (0.5)
	Posterior urethral valve	2 (1.1)	0 (0.0)	2 (0.5)
	Subtotal	43 (23.2)	31 (16.9)	74 (20.1)
Urogenital diseases	Redundant prepuce/circumcision	8 (4.3)	8 (4.4)	16 (4.3)
	Urethrocutaneous fistula	3 (1.6)	4 (2.2)	7 (1.9)
	Meatal stenosis	2 (1.1)	1 (0.6)	3 (0.8)
	Labial fusion	1 (0.5)	1 (0.6)	2 (0.5)
	Testicular torsion	0 (0.0)	1 (0.6)	1 (0.3)
	Complex genital laceration secondary to sexual assault	0 (0.0)	1 (0.6)	1 (0.3)
	Subtotal	14 (7.6)	16 (8.7)	30 (8.2)
Neoplasms	Benign	4 (2.2)	7 (3.8)	11 (2.7)
	Malignant	3 (1.6)	2 (1.1)	5 (1.4)
	Subtotal	7 (3.8)	9 (4.9)	16 (4.3)
Injury, poisoning and other consequences of external causes	Blunt abdominal injury	5 (2.7)	1 (0.6)	6 (1.6)
	Penetrating abdominal injury	2 (1.1)	3 (1.6)	5 (1.4)
	Enterocutaneous fistula	3 (1.6)	0 (0.0)	3 (0.8)
	Subtotal	10 (5.4)	4 (2.2)	14 (3.8)
Miscellaneous	Others	3 (1.6)	6 (3.3)	9 (2.5)
	Grand total	185 (100)	183 (100)	368 (100)

*Categorisation of diagnosis was based on the International Classification of Diseases 11th revision (ICD-11) for morbidity and mortality statistics

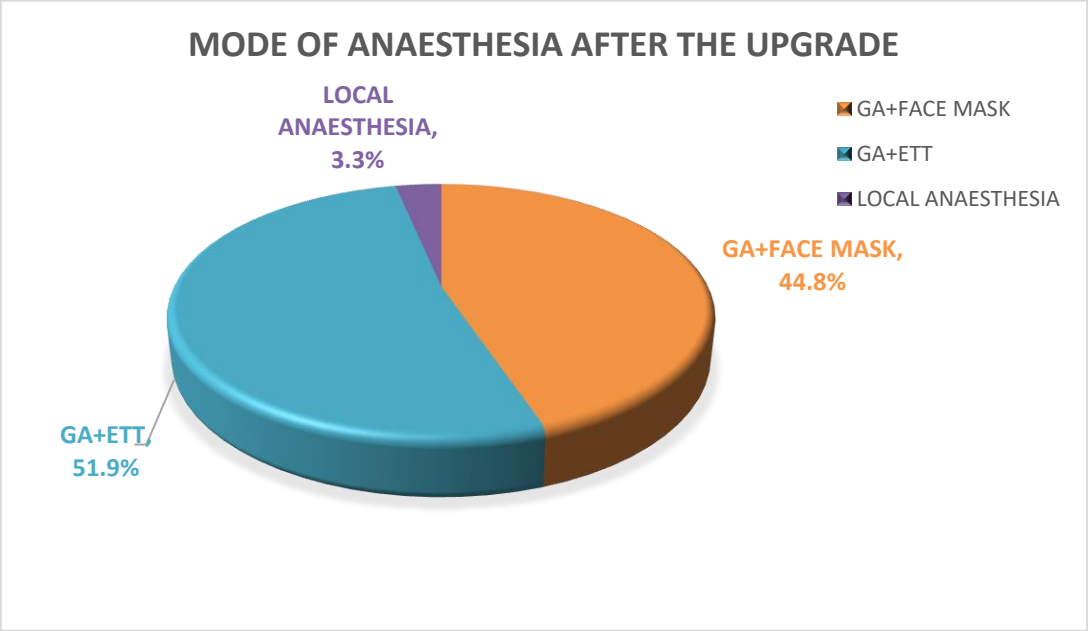
The frequency of the mode of anaesthesia administered was comparable between the two periods with general anaesthesia with endotracheal intubation at 45.9% pre-upgrade and 51.9% post-upgrade. Similarly, general anaesthesia with face mask constituted 50.3% pre-upgrade and 44.8% post upgrade. Local anaesthesia for neonatal circumcision accounted for 3.8% and 3.3% respectively. (Figures 2 and 3).

Figure 2: Frequency of mode of anaesthesia before the upgrade



GA + FACE MASK: General anaesthesia with face mask. GA + ETT: General anaesthesia with endotracheal intubation

Figure 3: Frequency of mode of anaesthesia after the upgrade



**GA + FACE MASK: General anaesthesia with face mask. GA + ETT: General anaesthesia with endotracheal intubation*

There was no death recorded during or within 24 hours of anaesthesia. We recorded three deaths during the study period out of which two deaths occurred before the upgrade. Majority of patients (99.2%) in our series were discharged alive and well. Our overall mortality rate was 0.8% and we found no statistically significant difference in the outcome of patients across the two periods. (Table 3).

Table 3: Outcome of patients pre- and post-upgrade

	Before upgrade	After upgrade	Total	p-value
	Frequency (%)	Frequency (%)	Frequency (%)	
Died	2 (1.1)	1(0.5)	3(0.8)	-
Alive and well	183 (98.9)	182 (99.5)	365 (99.2)	0.504
Total	185 (100)	183(100)	368 (100)	

We found some additional facilities that were not available in the pre-upgrade era but are now available in the teaching hospital. These include a dedicated paediatric surgical ward, 20 dedicated paediatric surgical beds/cots, two incubators, a dedicated children emergency ward, and a neonatal intensive care unit. The last two facilities are shared with Paediatrics department.

Regarding the workforce, there were eight nurses manning the paediatric surgical ward post upgrade who were not previously available. The number of available surgical staff including consultant paediatric surgeon, and consultant anaesthetist remain the same pre and post upgrade period. There was a reduction in the number of resident doctors/ medical officers and the other non-consultant

cadre anaesthetist post upgrade. There was no dedicated consultant paediatric anaesthetist or specialized paediatric nurse pre or post the upgrade. (Table 4).

Table 4: Available resources before and during the Teaching hospital period

	Resources/facilities	Before Teaching hospital period	Teaching Hospital period	Comments
Facility	Dedicated Paediatric surgical Beds/Cots	0	20	Increase
	Dedicated Incubators for paediatric surgery	0	2	Increase
	Dedicated Ward for paediatric surgery	Nil	Yes	Increase
	Children Emergency Ward	Nil	Yes	Increase
	Neonatal Intensive Care Unit	Nil	Yes	Increase
	Dedicated Operating Room for paediatric surgery	Nil	Nil	No change
Human resources	Consultant Paediatric Surgeon	1	1	No change
	Dedicated Paediatric Anaesthetist	0	0	No change
	Consultant Anaesthetist serving all surgical units	1	1	No change
	Other cadres of Anaesthetist	5	2	Reduction
	Residents /Medical Officers/ House officers	4	2	Reduction
	Dedicated Nurses	0	8	Increase
	Trained Paediatric Nurses	0	0	No change

Discussion

This study was carried out in a facility that transited from a stand-alone state government owned specialist hospital into a Teaching hospital in southwestern Nigeria. We compare the scope of pediatric surgical procedures and paediatric surgical facilities available in the facility across both periods. A total of 368 surgeries were performed in the study period with an average of 74 surgeries per year across both periods. This rate is similar to earlier report by Thanni et al in southwestern Nigeria[10]. Our finding however is less than

more recent reports of the average of 94 cases per year reported by Akau et al from northwestern Nigeria[11] and Ajao and Adeniran from southwestern Nigeria[12]. This may be due to the exclusion of neurosurgical, cardiothoracic, orthopaedic and burns and plastic cases which are not primarily handled by the pediatric surgical unit. The male preponderance in our study is similar to other reports[13,14].

The diseases of the gastrointestinal tract being the commonest group in both periods, followed by developmental anomalies and genitourinary disease similar to the report from Ogbomoso by Ajao and Adeniran[12] but differ from other earlier reports[10,11]. This may be due to the similarity in the methodology employed in the study from Ogbomoso where day cases were included in the denominator compared with earlier reports that focused more on in-patients only.

Laparotomy for intussusception is our commonest emergency procedure across both periods (10.8% and 12% respectively). This is in contrast to previous reports of trauma being the commonest presentation[10,11]. This may not be unconnected with the exclusion of neurosurgical, orthopaedic and plastic surgery cases (consisting of a lot of traumas) but which are not managed by the pediatric surgical unit in our hospital.

Regarding the outcome, there was no death attributable to anaesthesia across both periods[15]. The overall mortality of less than 1% was recorded in both the pre-Teaching and the Teaching hospital period. This is similar to earlier report by Thanni et al[10] but less than some other report from other institutions in Nigeria and SSA[13,16,17]. This disparity may be due to the inclusion of day case surgeries with relatively low mortalities in our series compared with those where such cases were excluded.

We found an upgrade is the available facilities for paediatric surgery in the Teaching hospital period when compared with the earlier period. This revealed that upgrading into a teaching hospital was accompanied by some investments to improve available facilities. Regarding human resources, we also saw an upgrade in that eight nurses were now dedicated to paediatric surgery even though none had post qualification paediatric nursing training. The medical workforce, however, did not reveal a similar trend of investments, rather, there was a reduction in the absolute numbers of non-consultant staff while those of the consultant staff remained the same in the teaching hospital period when compared to the earlier period. This may explain the similar output across both periods despite the upgrade of facilities since the workforce responsible for the use of these facilities remained the same. We opined that an improvement in the workforce might have diversified the case mix and further improved outcome in the Teaching hospital period.

Moreover, the finding of a single consultant paediatric surgeon and eight nurses over both period is dissimilar to earlier report by Osifo et-al from southern Nigeria who reported a complement of three consultant paediatric surgeons and 17 nurses about a decade ago while Lawal et-al from southwestern Nigeria reported three consultant paediatric surgeons in their own Teaching hospital[16,18]. This absence of upgrade in the medical staff may not be unconnected with the mass workforce emigration from Nigeria and

other Sub-Saharan countries to other climes due to several factors[6-8]. This may explain the reduction in the number of non-consultant staff who might have emigrated while available spaces are left because there are no trained personnel to fill them.

Conclusion

We found similarities in the case-mix and patient outcome before and during the Teaching hospital period. We also noted significant upgrades in the infrastructural facilities available for paediatric surgical practice in the Teaching hospital period depicting that the upgrade into a Teaching hospital was accompanied by significant investments. We therefore recommend such investment when upgrading any health facility. We also recommend that there should be a corresponding upgrade of the workforce to fully benefit from the effect of the upgrade of other infrastructural facilities. We recommend that the government should, as a matter of urgency address several factors perpetuating workforce emigration from our nation and further incentivize the available workforce on ground.

References

1. Butler EK, Tran TM, Nagarajan N, Canner J, Fuller AT, Kushner A, et al. Epidemiology of pediatric surgical needs in low-income countries. PLOS ONE. 2017 Mar 3;12(3):e0170968. doi:10.1371/journal.pone.0170968
2. State-of-Nigerias-Children_Summary-of-the-2024-Updated-SitAn.pdf [Internet]. [cited 2025 Aug 2]. Available from: https://www.unicef.org/nigeria/media/10591/file/State-of-Nigerias-Children_Summary-of-the-2024-Updated-SitAn.pdf
3. Vilaly MA salam E, Jones MA, Stankey MC, Seyi-Olajide J, Onajin-Obembe B, Dasogot A, et al. Access to paediatric surgery: the geography of inequality in Nigeria. BMJ Glob Health. 2021 Oct 25;6(10). doi:10.1136/bmjgh-2021-006025 PubMed PMID: 10.1136/bmjgh-2021-006025.
4. Abubakar I, Dalglish SL, Angell B, Sanuade O, Abimbola S, Adamu AL, et al. The Lancet Nigeria Commission: investing in health and the future of the nation. Lancet Lond Engl. 2022 Mar 19;399(10330):1155. doi:10.1016/S0140-6736(21)02488-0 PubMed PMID: 35303470.
5. Yap A, Halid SI, Ukwu N, Laverde R, Park P, Klazura G, et al. Cost-effectiveness of a pediatric operating room installation in Sub-Saharan Africa. Haghparast Bidgoli H, editor. PLOS Glob Public Health. 2024 Mar 27;4(3):e0001748. doi:10.1371/journal.pgph.0001748
6. Ck O, Bn A, Cn O, Co A, Kc O, Ao O, et al. Physician emigration from Nigeria and the associated factors: the implications to safeguarding the Nigeria health system. Hum Resour Health. 2022 Dec 20;20(1). doi:10.1186/s12960-022-00788-z PubMed PMID: 36539827.
7. Tankwanchi ABS, Özden Ç, Vermund SH. Physician Emigration from Sub-Saharan Africa to the United States: Analysis of the 2011 AMA Physician Masterfile. PLOS Med. 2013 Sep 17;10(9):e1001513. doi:10.1371/journal.pmed.1001513

8. Hagopian A, Ofosu A, Fatusi A, Biritwum R, Essel A, Gary Hart L, et al. The flight of physicians from West Africa: Views of African physicians and implications for policy. Soc Sci Med. 2005 Oct 1;61(8):1750–60. doi:10.1016/j.socscimed.2005.03.027
9. Uma O, Aderemi T, Uche-Orji C, Okeke S, Falola A, Ajegbemika O, et al. Scaling surgical care capacity in Nigeria: a narrative review of current practices and innovations in rural surgical workforce development. BMC Surg. 2025 Dec 1;26:8. doi:10.1186/s12893-025-03394-7 PubMed PMID: 41327146.
10. Lo T, Am S, O A. A retrospective audit of paediatric surgical admission in a sub-urban tertiary hospital. West Afr J Med. 2005 Mar;24(1). doi:10.4314/wajm.v24i1.28154 PubMed PMID: 15909702.
11. Stephen Akau K. Pattern and Outcome of Paediatric Surgical Admissions in a New Tertiary Hospital in Northwestern Nigeria. J Surg. 2017;5(5):82. doi:10.11648/j.js.20170505.13
12. Ajao AE, Adeniran JO. Spectrum of Paediatric Surgical Cases in a Private Mission Teaching Hospital in Nigeria. Afr J Paediatr Surg AJPS. 2021 Dec 14;19(1):18. doi:10.4103/ajps.AJPS_11_21 PubMed PMID: 34916346.
13. Talabi AO, Ojo OO, Aaron OI, Sowande OA, Faponle FA, Adejuyigbe O. Perioperative mortality in children in a tertiary teaching hospital in Nigeria: a prospective study. World J Pediatr Surg. 2021 Mar 23;4(1):e000237. doi:10.1136/wjps-2020-000237 PubMed PMID: 36474639; PubMed Central PMCID: PMC9716982.
14. Bickler SW, Sanno-Duanda B. Epidemiology of paediatric surgical admissions to a government referral hospital in the Gambia.
15. Harrison GG. Death attributable to anaesthesia. A 10-year survey (1967--1976). Br J Anaesth. 1978 Oct;50(10):1041–6. doi:10.1093/bja/50.10.1041 PubMed PMID: 708545.
16. Osifo OD, Aduwa IP. Pattern and Outcome of Pediatric Surgical Admissions to a Nigerian Tertiary Hospital. Ann Pediatr Surg. 2010;6(3–4):3–4.
17. Gortan M, Caravaggi P, Brooks G, Butoyi JMV, Bambara S, Nkurunziza J, et al. Epidemiology of Pediatric Surgical Conditions Observed in a First-Level Hospital in Burundi. Front Pediatr. 2021 May 28;9:681478. doi:10.3389/fped.2021.681478
18. Lawal TA, Olulana DI, Ogundoyin OO. Spectrum of colorectal surgery operations performed in a single paediatric surgery unit in sub-Saharan Africa. Afr J Paediatr Surg. 2014;11(2).