

Original Article

EPIDEMIOLOGY OF PEDIATRIC SURGERY IN RWANDA: A ONE YEAR REVIEW

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ABSTRACT

Introduction: In Rwanda, as in other Sub-Saharan Africa countries, there is insufficient data on pediatric surgical conditions. Despite the lack of Pediatric Surgeons and Pediatric Anesthesiologists, Kigali and Butare University Teaching Hospitals receive and manage children with surgical conditions. Some of these patients could benefit from the expertise of specialists trained in Pediatric surgical conditions.

Purpose: The aim of this study is to describe the pattern of pediatric surgery in Rwanda and to determine the prevalence of pediatric surgical conditions that require the expertise of a Pediatric Surgeon.

Methods: This is a retrospective study carried out between August, 2013 and July, 2014. Data were obtained from theater books and operative database. Data analysis was done by SPSS 16 and MS Excel.

Results: From August, 2013 to July, 2014, a total number of 1274 children were operated at Butare and Kigali University Teaching Hospitals.

391 (30.7) were female and 883 (69.3) were male, with a male to female ratio of 2.2:1. The age ranged between 1 day and 16 years, Mean age was 6.4 ± 4.9 years. Children under five were 45.1%. 857 (67%) children needed the Paediatric Surgery speciality expertise. 369 (29%) patients were operated at Butare University Teaching Hospital, while 905 (71%) were operated from Kigali University Teaching Hospital. Trauma and burn: 466 (36.58%), congenital anomaly: 298 (23.39%) and Surgical infections: 188 (14.76%) were the three common diagnoses in pediatric surgery.

Conclusion: Training of Pediatric Surgery sub-specialists, Anesthesiologists and Nurses will provide improved care in Rwanda. Education in trauma prevention, early screening and management of congenital anomalies, will improve service delivery to children with surgical conditions in Rwanda.

Keywords: Pediatric, Surgery, Trauma, laparotomy, Rwanda,

INTRODUCTION

Rwanda is striving to achieve the Millennium Development Goals (MDGs) set by the United Nation to be met in 2015. The MDG Number 4 targets at reducing by two-thirds, between 1990 and 2015, the mortality rate of children under five [1].

To achieve this target, the government of Rwanda has implemented several initiatives and one of them is to increase access to health care and improving health care delivery in Rwanda.

Introduction: Au Rwanda, comme dans d'autres pays d'Afrique subsaharienne, il n'y a pas de données suffisantes sur les conditions de chirurgie pédiatrique. Malgré l'absence de chirurgiens pédiatriques et d'anesthésiologistes pédiatriques, les hôpitaux Universitaires de Kigali et de Butare reçoivent et gèrent les enfants avec des pathologies chirurgicales. Certains de ces patients pourraient bénéficier de l'expertise des chirurgiens pédiatriques.

Objectif: Le but de cette étude est de décrire le modèle de chirurgie pédiatrique au Rwanda et de déterminer la prévalence des affections chirurgicales pédiatriques qui nécessitent l'expertise d'un chirurgien pédiatrique.

Méthodes : Ceci est une étude rétrospective effectuée entre Août 2013 à Juillet 2014. Les données ont été obtenues à partir des registres de la salle d'opération et à partir de la base de données de la salle d'opération. L'analyse des données a été effectuée par les logiciels: SPSS 16 et MS Excel.

Résultats: A partir d'août 2013 jusqu' au Juillet 2014, un nombre total de 1274 enfants ont été opérés. 391 (30,7) étaient du sexe féminin et 883 (69,3) étaient de sexe masculin, avec un ratio hommes-femmes de 2,2: 1. L'âge variait entre 1 jour et 16 ans, l'âge moyen était de $6,4 \pm 4,9$ ans. Les enfants de moins de cinq ans étaient de 45,1%. 857 (67%) des enfants bénéficieraient de l'expertise d'un chirurgien pédiatrique. 369 (29%) patients ont été opérés à l'Hôpital universitaire de Butare, tandis que 905 (71%) ont été opérés à partir de l'hôpital universitaire de Kigali. Traumatismes et brûlures: 466 (36,58%), anomalie congénitale: 298 (23,39%) et les infections chirurgicales: 188 (14,76%) ont été les trois premières diagnostics les plus fréquents en chirurgie pédiatrique.

Conclusion: La formation des chirurgiens, anesthésiologistes et infirmiers pédiatriques permettra d'améliorer les soins au Rwanda. Education pour la prévention des traumatismes, le diagnostic et gestion précoce des anomalies congénitales, permettra d'améliorer les services offerts aux enfants ayant des conditions chirurgicales au Rwanda.

Mots Clés: pédiatrie, chirurgie, traumatologie, laparotomie, Rwanda,

In regard to this, health care facilities are being built, community insurance program has been put in place and health care professional are being trained to meet the increasing number of people seeking medical care [10]. However, little information is known about the epidemiology of Pediatric Surgery in Rwanda.

Kigali University Teaching Hospital (CHUK) and Butare University Teaching hospital (CHUB) are two tertiary hospitals that manage most of children with surgical conditions in Rwanda.

Kigali University Teaching Hospital (CHUK) is located in the capital city of Rwanda and receives patients from the District hospitals of the Northern, East, Kigali and part of the Western provinces. Pediatric Surgery at CHUK is run by

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General and Orthopedic Surgeons; there is one visiting Pediatric Surgeon who spends three months a year.

All children with emergency surgical condition are admitted and resuscitated at Pediatric Emergency except those with trauma who get admitted and get resuscitated to adult surgical emergency.

There is one 14-bedded ward allocated for pediatric Surgery, the ward is jointly run by both surgeons and pediatricians. However due to increased number of children with surgical conditions, other patients are admitted in other different surgical and pediatric wards.

The department of Pediatric has a neo-natal intensive care unit for neonates who needs pre and post operative intensive care. There is also a Pediatric Intensive Care unit for children in critical conditions, these units is run by a permanent Pediatrician with informally trained nurses and it takes care of children with both surgical and medical conditions who are in critical care.

Butare University Teaching Hospital (CHUB) is located in the Southern Province of Rwanda and receives patients transferred from the District hospitals of the Southern, and Part of the Western Provinces. In contrast to CHUK there is no Pediatric Surgeon at CHUB, Pediatric surgical procedures are performed by General Surgeons and Orthopedists.

CHUB has 111 beds and 12 of them are allocated to Pediatric Surgery. However due to the increased number of children, some of them get admitted to other surgical wards; mixed with adults and even in Pediatric department.

Apart from neonates who get admitted in neonatology prior to surgical consult, other children with emergent surgical conditions get admitted either via Pediatric Emergency or via Surgical Emergency department.

Some challenges that hinder effective health care delivery to children with surgical conditions are; lack of Pediatric Surgeons, lack of nurses trained in pediatric surgery, and lack of well-organized Pediatric ward [1, 2].

In addition to this, there is insufficient data about the most frequent surgical conditions in Rwandan children, the outcome, mortality and morbidity.

This study aims at describing the profile of pediatric surgical procedure performed in Rwanda and to determine the prevalence of pediatric surgical conditions that require the expertise of a Pediatric Surgeon.

METHODS

This is a retrospective study that was carried out on all children with surgical conditions operated on at CHUK and CHUB between August, 2013 to July, 2014.

Children with surgical conditions who were not operated in the main operating room of CHUK and CHUB were not included in the study. Children operated on by Ear, Nose and Throat (ENT) and Ophthalmology Surgeons were not

included in this study because in the hospitals were we carried out the study, those departments as considered as standalone departments whose administration are different from the administration of Surgery department (General surgery, orthopedics, neurosurgery, urology).

The need for the expertise of a Pediatric surgeon was determined based on the index of pediatric surgery [11,12,13].

Before conducting the study we got the approval from the ethical committee of Kigali and Butare University Teaching Hospitals. Patient's information was obtained from operating room registries and operative database. Data were analysed and processed using SPSS software version 16 and MS Excel.

RESULTS

From August, 2013 to July, 2014, a total number of 1274 children were operated at CHUK and CHUB. 391 (30.7) were female while 883 (69.3) were male, with a male to female ratio of 2.2:1. The age ranged between 1 day and 16 years, Mean age was 6.4 ± 4.9 years. The under five children were 45.1% of all children who were operated on during the study period.

In this study, 369 (29%) patients were operated from CHUB, while 905 (71%) were operated from CHUK.

Table 1: Age groups

Age group	Age group	
	Frequency	Percent
Neonates	77	6.0
Infant	151	11.9
1-5 years	347	27.2
6-10 years	366	28.7
11-16 years	333	26.1
Total	1274	100.0

Table 2: Diagnosis categories

Diagnosis Category	Frequency	Percentage
Trauma and Burn	466	36.58
Congenital Anomaly	298	23.39
Gastrointestinal	188	14.76
Surgical Infection	158	12.40
Neoplasm	66	5.18
Neurosurgery	58	4.55
Uro-genital	40	3.14
Total	1274	100

Trauma and burn category was the most common diagnosis category.

Table 3: Diagnoses within group categories

Neurosurgery			
Diagnosis	Number of cases	Percentage	
Head injury	17	1.30	
Brain abscess	6	0.50	
Brain Tumor	5	0.40	
Brain oedema	1	0.10	
Encephalocele	1	0.10	
Infected V-P shunt	1	0.10	
Subtotal	31	2.50	
Surgical Infections			
Diagnosis	Numbers of cases	Percentage	
Chronic osteomyelitis	43	3.40	
Abscess	35	2.70	
Empyema thoracis	24	1.90	
Septic arthritis	15	1.20	
Pyomyositis	9	0.70	
Intra-abdominal abscess	4	0.30	
Anastomotic leak	3	0.20	
Gangrenous limb	3	0.20	
Liver abscess	3	0.20	
Ovarian abscess	2	0.20	
Fournier's gangrene	2	0.20	
Infection on hardware material	2	0.20	
Others	6	0.50	
Subtotal	151	11.90	
Congenital Anomaly			
Diagnosis	Number of cases	Percentage	
Inguinal Hernia	54	4.20	
Ano-rectal malformation	49	3.60	
Hydrocele	42	3.30	
Undescended testes	28	2.20	
Hirschsprung disease	31	2.40	
Umbilical hernia	34	2.70	
Gut atresia	25	1.30	
Hypospadias	16	1.30	
Myelomeningocele	9	0.70	
Posterior urethral valve	6	0.50	
Other	5	0.40	
Subtotal	311	23.30	
Neoplasm			
Diagnosis	Number of cases	Percentage	
Mass	25	2.00	
Nephroblastoma	13	1.02	
Lymphadenopathies	12	0.90	
Cyst	2	0.20	
Other	4	0.30	
Subtotal	56	4.42	

Gastrointestinal		
Diagnosis	Number of cases	Percentage
Intussusception	35	2.70
Intestinal Perforation	33	2.60
Appendicitis	27	2.10
Intestinal obstruction	26	2.00
Stoma	24	1.90
Hypertrophic pyloric stenosis	19	1.50
Oesophageal stenosis	5	0.40
Burst abdomen	2	0.20
Diaphragmatic hernia	2	0.20
Mesenteric cyst	2	0.20
Other	4	0.30
Subtotal	179	14.10
Trauma and Burn		
Diagnosis	Number of cases	Percentage
Fractures	338	21.20
Burn	53	3.80
Complex wounds	40	3.10
Abdominal trauma	24	1.10
Other	12	0.50
Subtotal	467	29.70
Urogenital		
Diagnosis	Number of cases	Percentage
Urethral stenosis	14	1.40
Testicular torsion	8	0.60
Hydronephrosis	4	0.30
Spermatic cord cyst	2	0.20
Phymosis	2	0.20
Other	4	0.30
Subtotal	34	3.00

Table 4: Procedures performed

Procedure	Frequency	Percent
Open reduction and internal fixation	203	15.93
Laparotomy	194	15.23
closed reduction	71	5.57
Herniotomy	67	5.26
Incision and drainage and debridement	128	10.05
Excision	53	4.16
Sequestrectomy	40	3.14
Diverting Colostomy	39	3.06
Hydrocelectomy	34	2.67
Herniorraphy	33	2.59
Orchidopexy	28	2.20
chest tube insertion	27	2.12
Other	357	28.02
Total	1274	100.00

Open reduction and internal fixation 203 (15.93%), Laparotomy: 194 (15.23%), Closed reduction: 71 (5.57%) and herniotomy: 67 (5.26%) were the most commonly performed procedures, Table 10.

Table 1: Age of the patients:

This table illustrates the age groups of the patients operated from Kigali and Butare University Teaching Hospitals. The majority of the patients were between 6 and 10 years.

Table 2: Diagnosis categories:

All the diagnoses were grouped in 7 categories. Trauma and Burn was the leading cause of surgery in both hospitals.

Table 4:
Procedures performed in Pediatric Surgery

Figure 1:

Patients who require the expertise of the pediatric Surgeon

Figure 1:

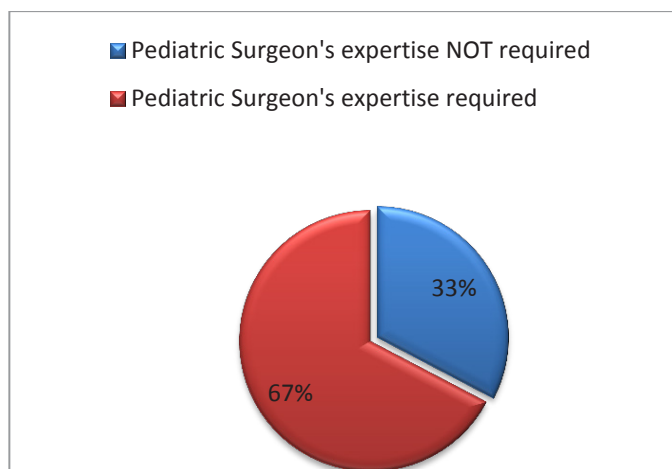


Figure 2:

Diagnosis categories and requirement of the expertise of the Pediatric surgeon

Figure 2:

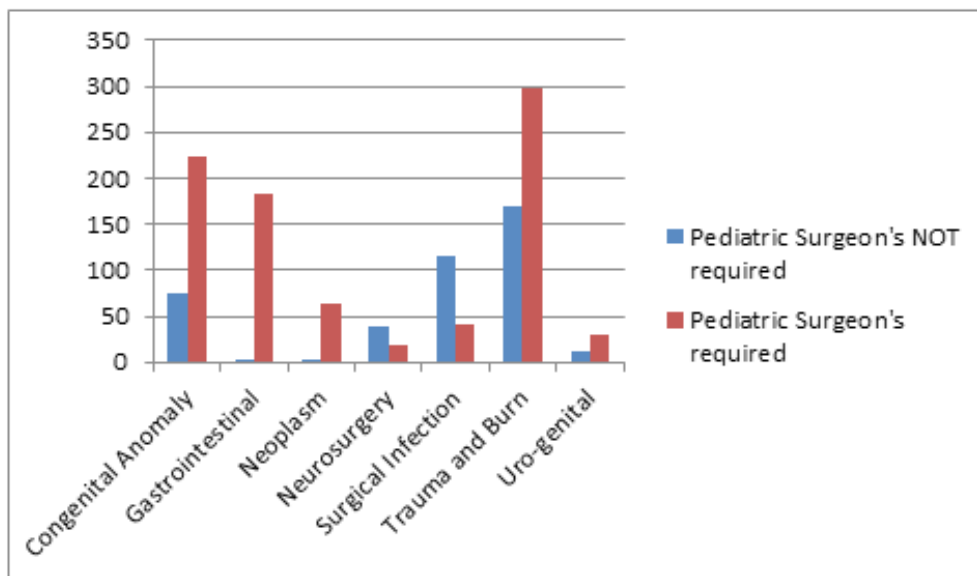
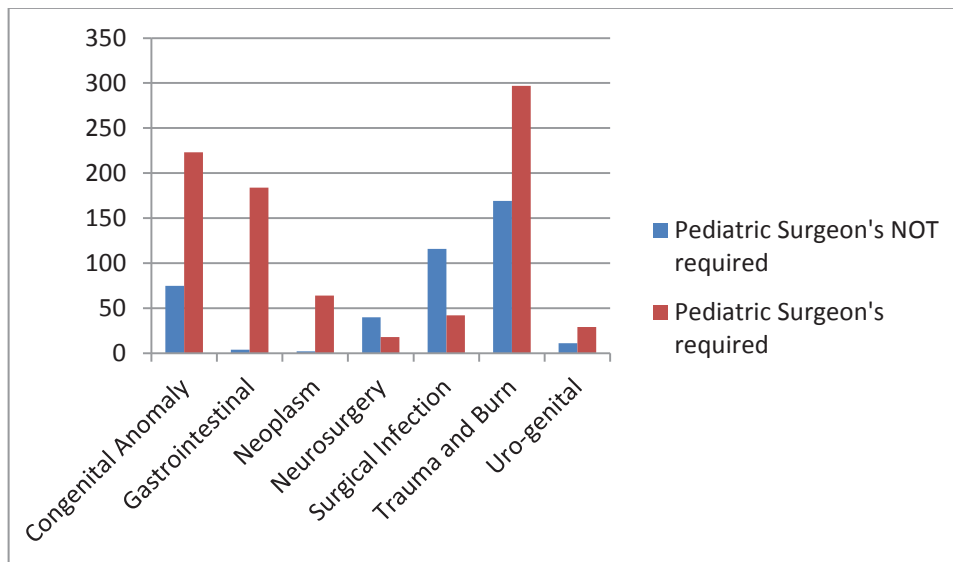


Figure 3:

Age group and requirement of a Pediatric Surgeon

Figure 2:



DISCUSSION

This study provides an overview on the pattern of pediatric surgery done in Rwanda.

In our study 369 (29%) and 905 (71%) were operated on CHUB and CHUK respectively; this is explained by the fact that CHUK is located in the capital city of Rwanda and receives more patients than does CHUB, moreover, CHUK has visiting Pediatric Surgeons teams that come once or twice a year and there are some children who get initial operations done at CHUB and then get referred to CHUK for definitive operations; this is the case for Ano-rectal malformations and Hirschsprung disease where the diverting colostomy is done at CHUB and then the children get referred to CHUK for pull through.

This study revealed that trauma and burn: 466 (36.58%), congenital anomaly: 298 (23.39%) and Surgical infections: 188 (14.76%) were the most common causes of pediatric surgery in Rwanda. These findings are similar to the ones from the study done in Gambia, where Trauma, congenital anomaly and surgical infections were the commonest causes of Pediatric surgical admissions¹.

Surgery for Trauma and Burn accounted for 36.58% of or the procedures, fractures accounted for 24.7% of all the pediatric surgery done in Rwandan referral hospitals, followed by burn with 3.8%. Stephen W. and Boto Sanno-Duanda, in their study on Epidemiology of Pediatric Surgical admissions to a government referral hospital in Gambia [2] found that Trauma and Burn were the leading cause of Pediatric Surgical admission, however, in contrast to our study, among trauma and burn category, burn were the commonest cause of Pediatric Surgical admission at 13.1% followed by fractures with 9.8%. In our study, the prevalence of burn is a bit lower than it really is as we did not include burn patients who were admitted to surgical wards but didn't get operated as they were not on theater records; for example whose initial and subsequent dressings were done at Emergency and in wards respectively.

Congenital anomalies were the second cause of Pediatric Surgery in our study with 23.39 % of all Pediatric Surgery. Within this category, Inguinal hernias were the commonest congenital anomaly encountered 4.2% followed by Ano-rectal malformation 3.6%. Paingha and Isesoma revealed the same findings in their study on The Pattern of Pediatric Surgical Admission in a Tertiary Hospital in a Semi-Urban community in the Niger Delta. However, in their study, the second common congenital anomaly was Hydrocele while for us it was Ano-rectal malformation with 3.6% of all pediatric surgical admissions. Gastrointestinal conditions 14.76% were the third cause of Pediatric Surgery in our study followed by Surgical Infection 12.40%; this is different from other studies [1, 2] where surgical Infections came before Gastrointestinal among the causes of Pediatric surgical admissions.

Among gastrointestinal category, Intussusceptions 2.7%, Small bowel perforation 2.6% and appendicular perforation 2.1% were the commonest causes of Pediatric Surgery; these findings are different from the ones found in the study done by Paingha and Isesoma where appendicitis, intestinal obstruction and pancreatic pseudocysts were on the top of the list among

gastrointestinal conditions.

Surgical infection was the fourth cause of Pediatric Surgery in our study with 11.9% of all Pediatric Surgery. These findings are different from the findings of the study done in Gambia [2] where they found that Surgical Infections were the third cause of Pediatric surgical admissions. Within Surgical infections; Osteomyelitis 43 (3.4%), and Abscesses 35 (2.7%) were the most common causes of Pediatric Surgery in our study; these findings are similar to those from the study done in Gambia [2].

CONCLUSION

The findings of this study are similar to those from other Sub-Saharan Africa. Trauma prevention mechanism, early screening and management of congenital anomalies, training of Pediatric Surgeons, Anesthesiologists and nurses will improve service delivery to children with surgical conditions.

Competing interests:

We declare that we have no competing interests.

Author's contribution:

Egide Abahuje wrote the manuscript; all other authors read and approved the manuscript.

REFERENCES

1. Stephen W. Bickler^{1, 2} & Boto Sanno-Duanda, Epidemiology of paediatric surgical admissions to a government referral hospital in the Gambia, *Bulletin of the World Health Organization*, 2000
2. Paingha J. Alagoa and Isesoma Gbobo, Pattern of Paediatric Surgical Admissions in a Tertiary Hospital in a Semi – Urban Community in the Niger Delta: a Three-Year Review, *International Journal of Tropical disease & Health* 4(1): 45-51, 2014
3. Bowman et al, Pediatric emergency and essential surgical care in Zambian hospitals: a nationwide study. *J Pediatr Surg*. 2013 Jun;48(6):1363-70.
4. Petroze RT, Calland JF et al, Estimating pediatric surgical need in developing countries: a household survey in Rwanda, *J Pediatr Surg*. 2014 Jul;49(7):1092-8.
5. Lohfa B. Chirdan, Emmanuel A. Ameh, Francis A. Abantanga, Daniel Silder, Essan A. Elhalaby, Challenges of training and delivery of pediatric surgical services in Africa, *J Pediatric Surgery* (2010) 45,610-618
6. Doruk Ozgediz, Dan Poenaru, the burden of pediatric surgical conditions in low and middle income countries, *J Pediatric Surgery* (2012) 47, 2305-2311
7. Marilyn W. Butler, Fragmented international volunteerism: need for a global pediatric surgery network, *J Pediatric Surgery* (2010) 45, 303-309.
8. Sebastian O. Ekonze, Emmanuel A. Ameh, Evaluation of relevance of Pediatric Surgery residency training in West Africa, *J Pediatric Surgery* (2010) 45, 801-805
9. www.un.org/millenniumgoals accessed on the 18th March, 2015
10. www.hrhconsortium.moh.gov.rw accessed on the 12th February, 2015
11. Mark M. Ravitch and Bruce A. Barton, The need for pediatric surgeons as determined by the volume of work and the mode of delivery of surgical care, *Surgery* 76:754–763 (November), 1974
12. James A. O'Neill Jr, Roger Vander Zwagg, Update on the analysis of the need for pediatric surgeons in the United States, *Journal of Pediatric Surgery* (1980) 5, 918-924.
13. Robert J. T. Cole D., A state-wide survey of index pediatric surgical conditions, *Journal of Pediatric Surgery*, (1975) 10, 725-732