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Surgical Management and Outcomes of Wilms Tumor in Rwanda: A Retrospective Study of Patients Operated on at the University Teaching Hospital of Kigali-Rwanda

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ABSTRACT

BACKGROUND: Wilms tumor is the most common renal tumor in children and accounts for 6-8% of all childhood malignancies and has a variable survival rate worldwide.
The aim of this study was to describe the surgical management and outcomes of care for Wilms tumor patients operated at the University Teaching Hospital of Kigali (CHUK).
METHODS: This is a retrospective chart review conducted at CHUK in Rwanda. It includes all children who had a confirmed Wilms tumor diagnosis operated from July 2012 to June 2016. Patient's demographics, staging, surgical management, and outcomes were analyzed.
RESULTS: A total of 58 patients diagnosed with Wilms tumor were identified. 52.6% were female. The median age was four years, interquartile range (IQR): 1-10 years. The majority of the children were stage II (39.7%) and the minority being stage V (5.2%). Treatment offered was in accordance with the Societe Internationale d' Oncologie Pediatrique (SIOP) protocol; 91.2% of patients received four weeks of preoperative chemotherapy and a median of 15 weeks postoperative chemotherapy (IQR: 8,26). The resection rate was 100% for those with a unilateral tumor. The spillage rate was 15.8%. At the time of the study, the mortality rate was 19.3%, recurrence was 7%, and 12.3% were lost to follow up.
CONCLUSION: The introduction of a single national protocol for treating Wilms tumor in Rwanda with a dedicated management team, including the surgical and pediatric oncology services, has led to early outcomes approaching the ones in high-income countries, but efforts also need to include earlier detection of this tumor.

Keywords (MeSH): Surgery, Outcome, Wilms tumor, Rwanda

INTRODUCTION

Wilms' tumor is the most common renal tumor in children and accounts for 6-8% of all childhood malignancies [1,2] and is associated with a variable survival rate worldwide: in developed countries, it varies (85-90%). In low, and middle-income countries, mainly African countries, it ranges around 35 to 80% [2-6].
In Rwanda, this is the most common solid pediatric

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malignancy [7,8]. The Rwanda Health system has taken non-communicable disease as a priority after noting the increased incidence and mortality rate in these conditions [9]. In 2012, the Butaro Cancer Center of Excellence (BCCE) was created with locally trained staff delivering care with the Rwanda Ministry of Health and Partners' support. In Health, a Boston-based nongovernmental organization [8,10-12]. A two-year report after the creation of BCCE followed 53 cases of Wilms' tumor with a mortality rate of up to 30.2% [8].

Children's common presentation with Wilms' tumor is a painless abdominal mass in an otherwise healthy child. Other less common presentations include weight loss, fever, hematuria or hypertension. The documented loss of weight at admission is associated with an advanced stage of the disease. The delay is related mainly to a lack of knowledge or a lack of community awareness about the condition. Poverty and traditional healers also contribute to the late presentation of the disease [2].

The management of Wilms' tumor consists of chemotherapy, surgery and or radiotherapy [3]. Globally, there are two protocols for the management of Wilms' tumor: chemotherapy, then surgery followed by postoperative chemotherapy by Societe Internationale d' Oncologie Pediatrique (SIOP) versus surgery followed by chemotherapy by National Wilms' Tumor Study (NWTS) [3,11].

In Rwanda, the SIOP protocol is used and consists of a four-week course of Vincristine and Actinomycin treatment before surgery for non-metastatic tumours [7,8]. Patients presenting with metastases receive a 6-weeks course of Vincristine, Actinomycin and Doxorubicin regimen. All the patients with Wilms' tumors are operated on at the University Teaching Hospital of Kigali (CHUK) after completing their preoperative chemotherapy course. A few cases that require partial nephrectomy are referred to King Faisal Hospital for nephron-sparing surgery. Four surgeons trained in tumor resections at CHUK have been performed, including two board-certified pediatric surgeons. We examined enrolled cases at CHUK from BCCE, their surgical management and outcomes of care.

METHODS

Study design: A retrospective chart review.

Study setting: CHUK is the main tertiary-level referral and university teaching hospital located in Kigali, Rwanda, with a catchment area of approximately seven million people. It is the only hospital in Rwanda with a board-certified pediatric surgeon, and almost all children with nephroblastoma are operated on at CHUK.

Participants: The study included all children with a confirmed diagnosis of Wilms' tumor operated on at CHUK from July 2012 to June 2016. Children with Wilms' tumor were transferred to BCCE for preoperative chemotherapy after clinical diagnosis, staging and imaging, including CT-scan at CHUK. After completing preoperative chemotherapy cycles, the patients were referred back to CHUK for tumor resection and pathology diagnosis. Following surgery, the children were admitted to the CHUK pediatric oncology ward, followed by the pediatric surgical team and pediatric oncology team. After their hospitalization, they returned to BCCE for postoperative chemotherapy based on pathology staging and perioperative staging.

Variables and outcomes: This study's primary objective was to describe the early hospital outcome of these children with nephroblastoma after surgical intervention. Early hospital outcome was defined as either death during operation or in the hospital before sending them back to BCCE for post-operative chemotherapy due to stage disease and after completion of chemotherapy. The secondary objectives were to determine the cancer characteristics found in these patients and determine which preoperative treatment they received.

Data source/measurement: Data was extracted from the hospital admission registry, patient files, and operating room logbooks from CHUK's surgical and pediatric departments. We also used BCCE logbooks to record the patient's outcome after surgery. Data were captured on a pre-established data collection tool. The treatment variables and the diagnostic criteria were defined according to documentation by the clinical team in the medical file.

Study size: All children admitted to the pediatric department of CHUK with a confirmed diagnosis of nephroblastoma after completion of pre-operative chemotherapy were enrolled, and all data were analyzed.

Quantitative variables: Variables were collected on the patient's demographics, disease characteristics, surgical management, and outcome. We defined tumor metastasis when there was an involvement of local regional lymph nodes and the following organs: liver, peritoneum, spleen or lungs.

Data management and statistical analysis: The questionnaire (data-collection tool) was explicitly designed for this study. The collected data was entered into a password protected Excel database and analyzed using Stata v13.0 (College Station, TX: StataCorp LP). Univariate analysis was performed with frequencies and percentages for categorical data and median and interquartile ranges for continuous data.

Risk to subjects: No physical, social, emotional, legal and/or financial risks were identified.
Institutional review board (IRB): IRB approval was obtained (IRB Reference code: No 358 / CMHS IRB/2016).

Confidentiality: Personal data was not used in the analysis. Each patient was assigned a unique study identifier number. A password-protected linking study ID and personal identifier (name, hospital ID) were kept separately by the principal investigator (PI). Only the researcher and the research team had access to the study data and information.

Informed consent: Only patient files were consulted. Therefore no informed consent was sought for this study.

Incentives for subjects: There were no incentives offered to patients whose data were used in this study.

RESULTS

A total of 57 patients diagnosed with Wilms' tumor were identified for this study. Of these, 52.6% were female, and 47.4% were male (Table 1).

The median age was four years (range: 1-10 years). Sixteen children were stage I (28 %), twenty-three children were stage II (39 %), nine were stage III (16%), seven were stage IV (12 %), and three were stage V (5 %) (Table 2).

Table 1: Patients' demographic characteristics

Demographics	N	%
Age (years)		
<3	20	35.1
3 to 5	18	31.6
>5	19	33.3
Sex		
F	30	52.6
M	27	47.4
Province of origin		
Kigali City	10	17.5
North	15	26.3
South	7	12.3
East	14	24.6
West	11	19.3

Forty-one children (71.9%) had no metastasis, and 16 (28.1%) (Stage III and IV) had metastasis to the loco-regional lymph nodes and the following organs: liver (25%), peritoneum (18.7%), spleen (12.5%), and lungs (43.8%).

Table 2: The clinical characteristics

Variables	N	%
Affected Side		
Left	36	63.2
Right	18	31.6
Both	3	5.2
stage		
I	16	28
II	22	39
III	9	16
IV	7	12
V	3	5
Presence of metastasis		
No metastasis	41	71.9
Metastatic	16	28.1
Site of metastasis		
(N=16)		
Liver	4	25.0
Peritoneum	3	18.7
Spleen	2	12.5
lung	7	43.8

Treatment offered was in accordance with SIOP protocol, and 91.2% of patients received four weeks of preoperative chemotherapy and a median of 15 weeks of postoperative chemotherapy (range: 8 to 26 weeks) (Table 3).The resection rate was 100% for those with the unilateral tumor. 73.7% required a resection that extended beyond nephrectomy with surrounding lymphadenectomy. The spillage rate was 15.8% (Table 3). The pathology risk group variants were: low (n=16, 28.1%), intermediate (n=18, 31.6%), high (n=1, 1.8%) and twenty two children (38.5%) had no clear specification in regards of risk stratification. The mortality rate was 19.3%, recurrence was 7%, and 12.3% were lost to follow-up during the treatment course (table 4).

Table 3: Surgical management

Preoperative Chemotherapy	**N**	**%**
Four weeks	52	91.2
Six weeks	5	8.8
Postoperative chemotherapy		
The median number of weeks, IQR	15	(8,26)
Type of Surgery		
Total nephrectomy (Unilateral)	57	100
Perioperative findings	**N**	**%**
Tumor extension		
Renal vein	12	21.1
Inferior vena cava (IVC)	1	1.7
None	44	77.2
Resection status		
Resection extended beyond nephrectomy	42	73.7
Nephrectomy only	15	26.3
Capsule status during resection		
Intact	49	85.9
Intra-operative spillage		
Yes	9	15.8
No	48	84.2
Risk group variants (N=57)		
Low	16	28.1
Intermediate	18	31.6
High	1	1.8
No pathology risk stratification	22	38.5

DISCUSSION

Wilms' tumor is the most common solid extracranial malignant tumor in children in Rwanda [1,2,6,7]. The majority of children with Wilms' tumor in our study were demographically from the Northern Province compared to the rest of the country. The Wilms' tumor is diagnosed at an early stage in high-income countries compared to late presentation in low, middle-income countries [1,7,8,12].

The peak age is between 2 and 3 years. Our study found that more than two-thirds are less than five years at presentation with a mean age of 4 years, comparable to other series in Africa [1,5,13].

Table 4: Outcomes of care

Outcomes	N	%
Mortality status (N=57)		
Alive at the time of study	46	80.7
Died at time of study	11	19.3
Additional Outcomes		
Completed treatment and alive	18	31.6
Lost to follow up	7	12.3
Recurrence	4	7
Alive and still on treatment	5	8.9

We found a slight predominance of female children in our study, which correlates to other reported series [1,4]. However, other series report male predominance or equal distribution in regard to gender [2].

Late presentation is associated with poor outcomes in Africa [5,6,11,13]. The early diagnosis dictates the overall management outcome, availability of defined chemotherapy protocol, surgery, and radiotherapy. However, surgery remains the cornerstone of treatment for Wilms' tumor. With the stage of our patients' presentation, we were still able to have a 100% resection rate which differs from experience in other LMICs [14]. In some patients, neoadjuvant chemotherapy resulted in a decreased tumor size, thus facilitating a total resection. Our study found a spillage rate of 15.8%, which is better than other series [14]. A number of studies have reported an increased number of non-operable tumors during exploration [2]. No radiation therapy was offered to our patients as we do not have this service in our country. This is comparable to most countries in sub-Saharan Africa [4]. At the time of the study, the mortality rate was 19.3%, with other different variable outcomes (Table 4). The mortality rate has improved from 30.2% two years after creating BCCE to 19.3% in our current study [8]. The number of patients lost to follow up was low compared to other series. Despite the late presentation and lack of some multidisciplinary treatment services, the advantage of one uniform protocol with the same operating team has improved overall outcomes.

There are limitations to our study that should be considered when interpreting the results. As our study used retrospective chart review, data were missing for some variables due to incomplete patient charts documentation. A routine audit of patient charts is recommended to encourage complete documentation. More prospective studies are needed for long term outcome results for the children in our settings.

CONCLUSION

The introduction of a single national protocol for treating Wilms tumor in Rwanda with a dedicated management team, including the surgical and pediatric oncology services, has led to early outcomes approaching the ones in high-income countries. Still, efforts also need to include earlier detection of the Wilm's tumor.

REFERENCES

[1] Dafalla O. Abuidris, M. E. Elimam, F. M. Nugud et.al "Wilms tumour in Sudan," Pediatr Blood Cancer 2008;50:1135–1137

[2] S. O. Ekenze and O. A. Odetunde, "The challenge of nephroblastoma in a developing country," Ann. Oncol., vol. 17, no. 10, pp. 1598–1600, 2006.

[3] Sushmita Bhatnagar "Management of Wilms ' tumor : NWTS vs SIOP," Journal of Indian Association of Pediatric Surgeons. 14(1):6-14 March 2009.

[4] T. Israels, E. Borgstein, D. Pidini, G. Chagaluka, and J. De Kraker, "Management of Children With a Wilms Tumor in Malawi , Sub-Saharan Africa," J Pediatr Hematol Oncol. 2012; 34(8):606–10

[5] Alan avidson. Mbchb, FCP Paed, Patricia Hartley Mbchb, and FCP Paed,et al. "Wilms tumour

experience in a South African centre," Pediatr Blood Cancer 2006;46:465–471

[6] Wilde J.C.H et al., "Challenges and outcome of Wilm tumour management in a resource-constrained," African Journal of pediatric Surgery.pp. 24–25, 2011.

[7] A. Kanyamuhunga, L. Tuyisenge, and D. C. Stefan, "Treating childhood cancer in Rwanda : the nephroblastoma example, Pan-african medical journal.2015;21:326. [doi: 10.11604/pamj.2015.21.326.5912]

[8] Cyprien Shyirambere,Mary Jue Xu, Shekinah Nefreteri Elmore et al. "Treating Nephroblastoma in Rwanda : Using International Society of Pediatric Oncology Guidelines in a Novel Oncologic Care Model," J Glob Oncol. 2016 Jun; 2(3): 105–113.

[9] M. O. F. Health, "Non COMMUNICABLE DISEASES Policy," no. March, 2015.

[10] N. M. Tapela et al., "Implementation Science for Global Oncology : The Imperative to Evaluate the Safety and Efficacy of Cancer Care Delivery," 2020, Journal of Clinical Oncology, 34(1): 43-52.

[11] A. Madani, S. Zafad, M. Harif, M. Yaakoubi, and S. Zamiati, "Treatment of Wilms Tumor According to SIOP 9 Protocol in," pediatric blood & cancer journal, vol. 46, no. 4, pp. 69–70, 2006.

[12] N. Tapela and A. Binagwaho, "Bringing cancer care to the poor : experiences from Rwanda," Nat Rev Cancer 2014 Dec;14(12):815-21.

[13] U. Af, "Childhood Wilms ' tumour : prognostic factors," WAJM 2007; 26(2) 222-225.

[14] J.- August, W. E. Woldeab, O. V Nyongole, and B. Frank, "Wilm ' s tumor : Presentation and outcome at Kilimanjaro Christian Medical Center," JMR 2016; 2(4): 114-117.