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Short-Term Outcomes of Pediatric Renal Transplantation in Nigeria; A Single-Center Experience

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Abstract

Background and Aim: Renal transplantation (RT) is the preferred treatment modality for children with end-stage kidney disease (ESKD). Unfortunately, RT remains inaccessible for children with ESKD in resource-constrained countries. This case-series describes a short-term follow-up of RT in three children in the Zenith Medical and Kidney Centre (ZMKC), Abuja, Nigeria.

Methods: The immediate allograft function (IAF), allograft functions and recipients' survival at 6-24 months of follow-up of three pediatric ESKD patients from January 2018 to January 2020 were described. Allograft functions were assessed using serum creatinine and Doppler ultrasound scan. RT involved the use of basiliximab and thymoglobulin for induction therapy and oral prednisolone, tacrolimus and mycophenolate mofetil for maintenance immunosuppressive therapy.

Results: Recipients including two males and one female were 9-17 years (mean age: 12 years). Primary steroid-resistant focal segmental glomerulosclerosis nephrotic syndrome, congenital posterior urethral stricture and lupus nephritis were the causes of ESKD in recipients seen over 24 months, 6 months, and 6 months, respectively. The female recipient had lupus nephritis. The IAF was excellent in all the cases. All the three children are alive with good allograft functions at the end of their respective follow-up period.

Conclusion: This case-series showed that a successful pediatric RT program is feasible in a resource-constrained setting like Nigeria.

Keywords: Pediatric; Renal Transplantation; Resource-Constrained Countries; Nigeria.

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Introduction

The first successful Renal transplantation (RT) in children was in 1996; about 42 years after the first successful RT in identical Herrick twin brothers in 1954 (1, 2). The early RTs in children were fraught with worse patient and graft survival due to problems related to technical and immunologic difficulties (3, 4). Pediatric end-stage kidney disease (ESKD) is characterized by prolonged periods of dialysis, poor nutrition and growth, and bone diseases and neurocognitive delays (5-8).

There is also an erroneous belief that a pediatric kidney is best suited for a pediatric patient, which tends to delay RT in children with attendant poor outcome (5-8).

Gladly, over the past two decades, advances in surgical techniques, a better understanding of the immune system and IT, and improved donor selection not related to donor's size and age have significantly contributed to the survival improvement of pediatric renal recipients and allografts (9-11). RT is now the preferred treatment modality in children with ESKD (9-11) with 1- and 5-year survival rates of 98% and 94% and 1- and 5-year graft survival rates of 95% and 85% from LDs and 93% and 77% from DDs, respectively (12). RT is cheaper in the long term and offers a better quality of life compared to dialysis (12). Some peculiarities in pediatric RT that differ from adults are worth

mentioning (9-11) , including the uniqueness of surgical techniques in small children, the need for pre-RT immunizations, the distinctive cause of ESKD, urologic complications, the difference in metabolism and dosing of IT, the propensity of higher post-RT viral infections, the need to optimize linear height growth and neurodevelopment, the issue of sub-optimal adherence to IT among adolescents, and the pediatric to adult transition in care (9-11). Thus, RT in children is performed in centers that take into account these peculiarities. A robust RT team comprising transplant surgeon, anesthetist, pediatric nephrologist, urologist, radiologist, psychologist, pediatric nurses and social workers are needed for optimal the outcome of RT (10, 11). The first RT in Nigeria was done at St. Nicholas, a private hospital in Lagos, in 2000 and the first RT in children was done in the same hospital in 2009 (13).

As of 2020, RT is currently being offered in eight centers across Nigeria, with a total low annual volume of RT (average of less than 100 per year) except in two private renal centers including St. Nicholas Hospital and ZMKC, Abuja (14). Between May 2015 and January 2020, ZMKC successfully did 375 RT including five children between January 2015 and January 2020. While this pediatric volume is indeed small and contrasts sharply with the volume of pediatric RT in the USA (an annual average of 700-800 transplants) (9, 15); it presents a new experience in the field of RT in a RCC where a dearth of data on RT among children is the rule. Only LDRT is done in Nigeria. Overarching barriers to LDKT in Nigeria include inadequate legislation, shortage of suitable donors, poor health infrastructures and a dearth of funds (16). Unfortunately, most Nigerians still prefer RT tourism (17, 18). DDRT is not in practice. Social unacceptability, lack of enabling law, lack of technical know-how, and lack of requisite infrastructural facilities are the barriers to DDKT in Nigeria. We present the follow-up of three pediatric ESKD patients who underwent RT from January 2018 to January 2020 at the ZMKC, Abuja, Nigeria. To the best of our knowledge, this represents the highest volume of pediatric RT done at a single-center in Nigeria. It also underscores the fact that a successful pediatric RT program is feasible in a RCC.

Methods

The permission to publish this case-series was obtained from the ZMKC Health and Research Committee as per the Declaration of Helsinki (19). Parents/caregivers also gave their informed consents. RT only occurred between recipient-donor pairs who were blood- groups compatible and who were optimally matched in terms of HLA. Clinical, laboratory, radiological and immunological assessments were done only when potential donors were blood group compatible with the recipients. LDKT complied with the Nigeria's Health Act of 2014 (20) and donors were parents and unrelated LDs older than 18 years of age. In the ZMKC RT program, absolute contraindications to RT in recipients include uncontrolled malignancies, severe neurological disability, multiple organ failure, and a positive cell crossmatch. The RT team ascertained the autonomy and the mental capacity of a potential LD to give informed consent. Informed consent was obtained after a thorough understanding of the risks and benefits associated with living donation (21).

Exclusion criteria for donors were age <18 years or >65 years, estimated glomerular filtration rate <60 mL/min/1.73 m^2, persistent significant proteinuria, uncontrollable hypertension (blood pressure needing two or more anti-hypertensive and/or end-organ damage), severe obesity, diabetes mellitus, active HBV, active HCV, HIV infection and acute malignancy (22, 23). Historical adherence to ESKD medications and dialysis were reviewed. Potential barriers to adherence were identified and addressed. Anticipated short- and long-term side effects of IT were discussed with patients and their caregivers. Psychosocial and financial evaluations of families were accessed for long-term management success and challenges.

Clinical clerkship of recipients included the cause of ESKD, duration of dialysis, number of blood transfusions, reviews on malignancies, and hematological (risks of bleeding/clotting), cardiovascular, urological, respiratory, nutritional, neuro-cognition and immunization evaluations. Cardiovascular complications that increased operative risk were particularly sought. Recipient and donor workup included the assessment of blood group compatibility, typing for HLA- A, -B and -DR (Luminex-Molecular Sequence-specific oligonucleotides), donor-specific anti-HLA antibodies in recipients, and CDC assays. All immunologic assays were done within one month to the RT in an Indian laboratory certified by the European Federation for Immunogenetics. Blood workup included serum electrolytes, creatinine, uric acid, calcium, phosphorus, magnesium parathyroid

hormone, CBC, fasting lipid profile, fasting and random blood sugar, serum total protein and albumin, liver function test and coagulation studies. Viral serology was done for CMV, EBV, Hepatitis B antigen, Hepatitis B antibody, Hepatitis C antibody and HIV antibody.

Local and blood sepsis were ruled out by blood culture, urine culture, stool culture and swab cultures of exit sites of the central venous hemodialysis access catheters. Investigations included chest X-ray, electrocardiograph and echocardiography. Abdomino-pelvic USS and CT angiography were done to assess the position, size, and morphology of renal arterial and venous blood supply in recipient-donor pairs. RT was done by the standard open retroperitoneal technique.

Renal allografts were placed extra-peritoneally in the right iliac fossa via the right Gibson incision. Ureteroneocystostomy was done using the extra-vesical technique (Modified Lich-Gregoir) with double J stent insertion.

Recipients were well hydrated before the RT and placed on heparin and/or aspirin to prevent graft thrombosis and ATN.

Intraoperative hypotension/hypovolemia was avoided with IV mannitol (0.5g/kg) and/or albumin or normal saline. Fluid management after RT depended on the urinary output, which was replaced volume for volume every 1 hour in the first 48 hours with 0.45% or 0.9% saline depending on the urinary sodium.

Maintenance fluid was given as insensible water loss replaced with 5% dextrose in 0.9% saline. Urine output was adequate if it was >2ml/kg/hour and intravascular volume was adequate when systolic blood pressure was >100mmHg and central venous pressure was >8cm water.

If there was hypovolemia, 5- 10ml/kg normal saline was given until a maximum of 20-40 ml/kg, following which dobutamine infusion (5microgram/kg/min) was given if the recipient remained hypovolemic. Induction therapy included either rATG or basiliximab depending on the immunological risk. Induction therapy with rATG (1.5 mg/kg) involved giving the first dose intra-operatively and up to 7 daily doses after transplantation. Methylprednisolone was given before each rATG dose, 10 mg/kg-maximum 1 gram before the first dose and 1 mg/kg before each subsequent dose. Two doses of basiliximab were given (10-mg doses in children <35 kg and 20-mg doses in children ≥35 kg) with the first dose given during surgery and the second on the PTD four. rATG was preferred for the recipient with HLA matching 4/6 and with a high risk of recurrent disease.

Usually, and all things being equal, drains were removed 1-3 days after transplant, urethral catheter 5-7 days, and double-J stents by 4-8 weeks (6 weeks). Maintenance IT included the use of MMF, Tac, and prednisolone. MMF was given at 1200 mg/m2/day in two divided doses and Tac at 0.25-0.3mg/kg/day in two divided doses. Tac was titrated to achieve trough levels of 10-12 ng/mL in the first month, 8-10ng/mL in the next three months, and 5-8ng/mL for 3-12 months or longer thereafter. MMF was reduced to twice-daily doses of 300mg/m2 once the optimal Tac level was attained. When ATG was used, MMF was started only when total WCC was > 4.0 x 109/L. Prednisolone was tapered at 60 mg/m2 (maximum 60 mg) for day 1-6, 30 mg/m2 for day 7-13, 20 mg/m2 for day 14-28, 15 mg/m2 every alternate day for 1-3 months, and 5 mg daily thereafter. We did not stop prednisolone but rather monitored its side effects including periodic ophthalmological examination for cataract and glaucoma.

Recipients were closely monitored for infection and other side effects of immunosuppressive therapy post-transplantation. Post-operative prophylaxes included the use of nystatin for three months, aspirin (37.5 mg for recipients <25kg, 75mg for >25kg) for three months, isoniazid and pyridoxine for six months, septrin for six months, and valganciclovir (520mg/m2 adjusted to eGFR, maximum of 900mg) for three to six months. Post-transplant hypertension was managed with amlodipine and labetalol. Post-transplant renal allograft functions were evaluated by measuring serum creatinine levels and urine output. Doppler USS for allograft was done daily in the first seven days and as needed thereafter. Protocol biopsy was not done. Patient follow-up after transplant was as follows: three times weekly in the first month after transplantation, two times weekly in the next 2–3 months, every two weeks in the next 4–6 months, every four weeks in the next 6–12 months and every three months thereafter.

Results

Table 1 summarizes the demographic, clinical, and immunological profile and the IT of three cases.

Figure 1 depicts the serum creatinine of renal allografts within the first 7 days, at 1-month, 3-month, 6-month, 12-month and 24 months follow-up of three cases.

Table 1. Characteristics of pediatric patients

Variables	Case-1	Case -2	Case -3
Age (years)	9	10	17
Gender	Male	Male	Female
Ethnicity	Yoruba	Fulani	Yoruba
Religion	Christianity	Muslim	Muslim
Cause of ESRD	Primary steroid resistant Nephrotic Syndrome	Posterior urethral stricture	Lupus nephritis
Follow-up period	2 years	6 months	6 months
Year(s) or month(s) on dialysis	5 months	2 sessions of HD within a month	12 months
Number of blood transfusions received	3	2	6
Recipient's Blood group	O Rhesus positive	A Rhesus positive	A Rhesus positive
Donor's Blood group	O Rhesus positive 30-year-old altruistic non-related man	A Rhesus positive 36-year-old altruistic non-related man	A Rhesus positive 53-year-old biological mother
Recipient's CDC-Crossmatch **T-cell** **B-cell**	Negative Negative	Negative Negative	Negative Negative
Donor's CDC-Crossmatch **T-cell** **B-cell**	Negative Negative	Negative Negative	Negative Negative
Recipient's antigens/alleles **HLA-A** **HLA-B** **HLA-DR**	A*02, A*68 B*07, B*27 DRB1*07, DRB1*13	A*02, A*03 B*40, B*44 DRB1*08, DRB1*15	A*36, A*36 B*51, B*53 DRB1*07, DRB1*11
Donor's antigens/alleles **HLA-A** **HLA-B** **HLA-DR**	A*23, A*74 B*15, B*15 DRB1*07, DRB1*13	A*02, A*30 B*42, B*44 DRB1*08, DRB1*15	A*36, A*36 B*35, B*53 DRB1*01, DRB1*11
Pre-transplant MFI	MFI 938 for DSA Class I IgG and 635 for DSA Class II IgG	MFI 400 for DSA Class I IgG and 738 for DSA Class II IgG	MFI 276 for DSA Class I IgG and 716 for DSA Class II IgG
Induction therapy	2 doses of basiliximab	2 doses basiliximab	1 dose of ATG
Maintenance therapy	MMF, Tacrolimus, Prednisolone	MMF, Tacrolimus, Prednisolone	MMF, Tacrolimus, Prednisolone

For all cases, CDC crossmatch was <10% dead cells with or without DTT for both T-and B-cells.

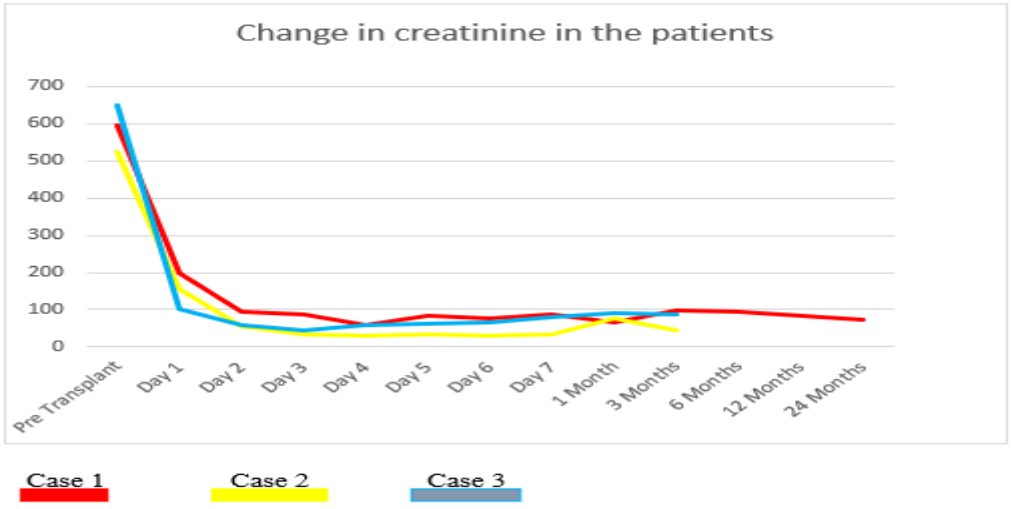

Figure 1. Serum creatinine changes in three cases

Case report

Case 1

A 24-month follow-up of a 9 –year- old boy with idiopathic FSGS NS. No history of NS in the other three siblings. No history of hearing impairment or atopy. No family history of NS, diabetes or other renal diseases. A genetic study was not done for the FSGS. Father had essential hypertension. The recipient was primarily resistant to steroid and did not also respond to cyclosporine. The child was subsequently kept on atorvastatin, lisinopril, amlodipine, hydrochlorothiazide, and other renoprotective measures. Unfortunately, massive proteinuria continued with rapid progression to hemolysis-dependent ESRD 17 months after the onset of NS. He had 18 sessions of HD over 5 months with packed cell transfusions on three occasions. He had an altruistic O Rhesus+ blood-group compatible LuDRT with a 30-year-old man, a non-HLA-DR 4/6 mismatched donor. The cumulative microbead MFI was less than 10,000. The patient had an augmented induction with two doses of basiliximab. The surgery was well tolerated. Open donor left nephrectomy was done. Maintenance IT included prednisolone, MMF and Tac. There was immediate diuresis in the theatre. Immediate post-RT complications included severe hypertension, polyuria (> 20mls/kg/hour), and hypervolemia and pulmonary edema in the first 36 hours after transplant. Hypertension (200/164 mmHg) was cautiously controlled to 128/60 mmHg by the 8th day post-transplant with a combination of IV labetalol, IV hydralazine, and amlodipine. Close monitoring of allograft function was emphasized while hypertension was being controlled. For polyuria, fluid replacement was reduced to 75% of the urinary output to abort the polyuria. The child was discharged on PTD 9 with a blood pressure of 120/60 mmHg, PCV of 38.5%, serum creatinine of 89 µmol/L, and fasting blood sugar of 5.6 mmol/L with no proteinuria, glucosuria, leucocyturia, and no nitrite but 1+ hematuria on urinalysis. There was no peri-allograft fluid collection, and no obstructive or vascular complications were found. He remained proteinuria free through the 24 months of follow-up. Post-transplant erythrocytosis was noticed 12 months post- transplantation with a PCV of 58.3%. An allograft Doppler did not reveal any evidence of arterial or venous stenosis; rather, there was good allograft perfusion and drainage with a resistive index of 0.65-0.68 of the interlobular and arcuate arteries. Although erythrocytosis was asymptomatic, the child had consecutive monthly phlebotomy to remove one blood unit on three occasions. He was subsequently placed on low-dose captopril (12.5 mg bd) over six weeks with a gradual control of the erythrocytosis to 35-38%.

Two years after RT, the allograft is functioning optimally with a serum creatinine of 74 µmol/L. The Tac level was 6 ng/ml. Figure 2 presents the Doppler USS of the allograft at 12 months of follow-up.

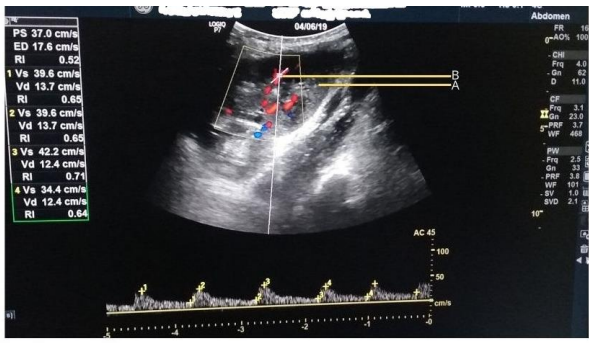

Figure 2. Doppler allograft of case 1 at 24 months follow-up

Case 2

A 6-month follow-up of a 10-year- old boy with ESKD due to CPUS diagnosed antenatally. Intravesical pressure was promptly relieved at 14 days of life via a vesicostomy. Nevertheless, a right-sided grade III vesicoureteral reflux persisted until the time of RT. In addition, the progression of CKD continued and was complicated by profound growth retardation and stunting (height of 88cm). Parents planned for pre-emptive RT but, unfortunately, the child developed uremic encephalopathy a month before scheduled RT, which required two sessions of HD and 2 intra-dialysis packed cell transfusions. The child had an altruistic A Rhesus+ blood-group compatible living unrelated 36-year old donor. Open donor left nephrectomy was done.

The HLA-mismatch was 2/6. Induction was done with two doses of basiliximab. The allograft caused copious urination on the operating table with subsequent adequate diuresis. The immediate post-RT complication was hypertension, which was cautiously managed with a combination of IV labetalol, amlodipine, and aldomet.

Close monitoring of allograft function was attended to while hypertension was being controlled. The child also had two episodes of generalized tonic-clonic convulsions (on PTD 5) managed with levetiracetam and magnesium for hypomagnesemia. He spent 16 days on admission before discharge with a PCV of 35%, serum creatinine of 69 µmol/L,

and fasting blood sugar of 4.6 mmol/L with no proteinuria, glucosuria, leucocyturia, or nitrite on urinalysis. The allograft function was excellent at the 6-month follow-up with a serum creatinine of 59 µmol/L. The child is in an optimal state of health. He is presently on maintenance IT with Tac, MMF and prednisolone. The serum Tac level was 8.5 ng/ml 6 months after the transplant.

Case 3

A 3-month follow-up of a 17-year-old girl with SLE who developed LN 5 years ago and became HD dependent since one year ago. She had blood transfusions on six occasions. She was on angiotensin receptor blocker (candesartan), MMF 250 mg daily, and prednisolone 20 mg daily before RT. Urinalysis before RT revealed no proteinuria but three red blood cells/high power field. The kidney donor was her mother. Both the mother and the patient were blood group A Rhesus positive. Induction was done with rATG. Open donor left nephrectomy was performed.

Allograft caused a copious urine output on the operating table. Only one dose of rATG was administered as the child developed profound lymphopenia (total white blood cell count: 1.1 x109/L) 16 hours after the first dose. Thus, IV methylprednisolone (500mg) was extended until the third day of the transplant, after which the child was continued on maintenance IT of tapered oral prednisolone, MMF (1 g twice daily) and Tac (5 mg twice daily).

Leucopenia lasted beyond 72 hours of transplant, for which MMF was continued at a reduced dose of 500mg BD and Valganciclovir at a reduced dose of 450 mg twice a week on the 3rd day of the transplant. However, by the 6th day, the WCC attained a normal lower value of 3.5 x109/l. The child was discharged PTD 10 with a PCV of 38.5%, total WCC of 5 x109/l, platelet count of 190 x109/l, serum creatinine of 89 µmol/L, and fasting blood sugar of 5.5 mmol/L with no proteinuria, glucosuria, leucocyturia, and nitrite but 1+ of haematuria on urinalysis. The allograft continued to function well. At the 6-month follow-up, the total WCC was 4 x109/l, serum creatinine was 102 µmol/l and PCV was 34.3%. The Tac level was 8. 9 ng/ml at the 6-month follow-up.

The Doppler examination of the allograft at the 6-month follow-up was also normal with resistive index values of 0.69 and 0.72 at the interlobar and arcuate vessels, respectively (Figure 3).

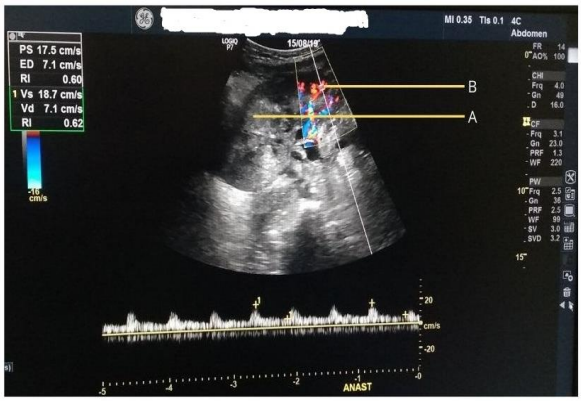

Figure 3. Doppler allograft of case 3 at 6 months follow-up

Discussion

This case-series presents the results of the short-term follow-up (6-24 months) of children who underwent RT in a RCC. The allograft and patient survival rates were 100% within the short period of follow-up. The causes of ESRD in this series were NS, CPUS and LN with a male preponderance (male: female ratio; 2:1).

The age range of the recipients was 9-17 years with a mean age of 12±3.6 years. All had LDs with one (LN) being the mother. Open left nephrectomy was performed on the three donors. The age range of the donors was 30-53 years with a mean age of 39.6±9.7 years. The commonest immediate post-RT complication was hypertension seen in two recipients (66.6%). Other complications seen in each of the three patients included PTE (33.3%), post-transplant generalized tonic-clonic convulsion (33.3%), and ATG-associated leucopenia (33.3%). None of the cases developed post-transplant peri-renal fluid collection.

Hitherto, the predominant etiologies of CKD causing ESRD among Nigerian children are CGN, NS and PUV (24-26). Apart from CGN, NS and CPUS were seen in our series. However, LN, an emerging cause of ESRD in Nigerian children (27), was also seen in this series. CPUS, which results from the inadequate fusion of the anterior and posterior urethra (28), although not as common as PUV, is a rare congenital anomaly of the urinary tract.

There is limited data on the optimal induction therapy that prevents allograft rejection and failure while minimizing serious adverse effects in children (29), and the choice of induction therapy is dependent on the center preference based on patient factors (29). We considered the three recipients in this series to be high-risk because they were

Africans and were sensitized to both HLA-I and HLA-II antigens, presumably via blood transfusions (29). Thus, anti-T lymphocyte antibodies, either ATG or basiliximab, were used for induction therapy (29). This was followed by maintenance therapy that included Tac, MMF and prednisolone (29). Acute allograft rejection was not seen in our series. Anti-infective prophylaxis was administered generously to fight emerging infections with the use of biological agents (30). We also did not carry out pre-transplant desensitization because they had low-titer donor-specific antibodies with MFI values < 5,000 (31).

In the present study, the age group was 9-17 year with a mean age of 12 years, a finding that was higher than a mean age of 10 years and the age group 6-12 year as the most common age group among children that had RT in Saudi Arabia (32). Our finding was similar to the North American Pediatric Renal Transplant Cooperative Study (NAPRTCS) 2014 annual report in which the commonest age group was 13–17 year (39.2%) with most patients (52.7%) at or below 12 years of age (33). Late presentation with ESKD and delay in assessing RT may account for the older age of the children in our series compared to the study conducted in Saudi Arabia. In our patients, RT was only possible after financial assistance from philanthropists. Unfortunately, the child with CPUS that was being prepared for a pre-emptive RT had two sessions of HD one month before the scheduled RT. This contrasts with the NAPRTCS report (33) and the study in Saudi Arabia (32) in which 25% and 9% had a pre-emptive RT, respectively.

In our study, the allograft and patient survival rates were 100% within the short period of follow-up. Emerging evidence also indicates a good patient and graft survival among children following RT in developing countries (32, 34). In Saudi Arabia, one- and four-year graft survival rates were 95.7% and 91.5% and one- and four-year patient survival rates were 100% (32). In Jordan, the one- and three-year patient survival rates were about 100% with corresponding graft survival rates of 97.1% and 91.2%, respectively (34).

Post-renal hypertension was the most common complication seen in two recipients (66.6%). Post-renal hypertension is a common occurrence in pediatric populations with an estimated prevalence of 58-89% in children (35-37). The etiology of post-transplant hypertension is multifactorial, including donor factors, recipient factors, medications, and lifestyle factors similar to those prevalent in the general population (38). Donor factors include deceased donor, older age, donor hypertension and possession of apolipoprotein L1 (APOL1) risk variant (38). Recipient factors include recurrence of original disease and hypertension, presence of native kidneys, and post-transplant obesity (38). IT including corticosteroid use, mammalian target of rapamycin (mTOR) inhibitors and calcineurin inhibitors (Tac and cyclosporine) also contribute to the development of post-transplant hypertension (38). In our series, we suspect that the presence of pre-transplant hypertension, hypervolemia, and the use of methylprednisolone and Tac contributed to post-transplant hypertension. CCBs and ACE-Is are the most common first-line medications used for the management of post-transplant hypertension (38), which were also administered in this series.

PTE, a persistently elevated hematocrit to a level greater than 51% after RT, is seen in 10-15% of graft recipients and usually develops 8-24 months after RT (39). In this series, PTE was seen 12 months after RT and was managed with three sessions of phlebotomy and captopril. The pathogenesis of PTE is unclear but predisposing factors include male gender, retention of native kidneys, smoking, transplant renal artery stenosis, a rejection-free course with a well-functioning allograft, disruption of erythropoietin regulation, mitogenic effect of the renin-angiotensin system on erythroid lineage, insulin-like growth factor 1, and androgenic stimulation (39,40). Management of PTE includes cautious expectation for a spontaneous remission and the use of ACE-Is or ARBs (39, 40). Phlebotomy may become necessary for PTE refractory to ACE-Is or ARBs (40).

The incidence of post-transplant convulsion is 20.1% in children (41) and the most reported type is a generalized tonic-clonic convulsion (42). Common etiologies include hyponatremia, hypoglycemia, hypomagnesaemia, hypokalemia, and dysglycemia (42, 43). First-line anticonvulsants include valproic acid, lamotrigine, clonazepam, and levetiracetam (42, 44).

We managed our case with magnesium and levetiracetam.

One of the cases also developed leucopenia, which could be attributed to the use of rATG. It was managed successfully by withholding further doses of rATG and halving the doses of MMF, valganciclovir, and septrin. Post-transplant leucopenia can be related to the use of immunosuppressants including ATG, MMF, Tac,

valganciclovir, and septrin (45). Unlike other series (32, 46), we did not record cases of post-transplant surgical complications. In Saudi Arabia, El Hennawy et al reported that one of their 47 recipients (2%) developed ureteric stricture (32). Moreover, Emiroğlu et al (46) reported perirenal hematoma requiring early postoperative reexploration in two patients (2.7%), lymphocele in four cases, (5.5%) and urinary leakage in one case (1.4%) in Turkey.

Our study is limited by the few cases reported.

Conclusion

With the allograft and patient survival rates being 100% within the short period of follow-up of 6-24 months, this case-series found that a successful pediatric RT program is feasible in a RCC like Nigeria.

Conflict of Interest

The authors declare no conflicts of interest.

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