BMC Nephrology

RESEARCH

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Clinical profile and outcome of kidney transplantation at Muhimbili National Hospital, Tanzania

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Abstract

Background Kidney transplantation is the definitive treatment option for **chronic kidney failure**, offering improved quality of life and extended survival. Access to kidney transplantation is limited in the Sub-Saharan Africa (SSA) region, with only a few countries with established services. Tanzania started its program five years ago, for the sustainability of the program it is important to understand the outcome. Therefore, this study was conducted to determine the clinical outcomes and survival rates of kidney transplant recipients at Muhimbili National Hospital in Tanzania, in the absence of a national transplant registry, since the inception of the program.

Methods This was a retrospective study conducted among kidney transplant recipients from live donors at Muhimbili National Hospital (MNH) between November 2017 and February 2022. Analyses were performed to assess baseline characteristics, post-transplant complications, and patient and graft survival.

Results In our study of 68 kidney transplant recipients, the majority of recipients were male (63.2%) with a mean age of 45.8 years and under medical insurance (88.2%). The predominant cause of CKD was hypertension (58.2%) with recipients undergoing dialysis for a mean duration of 14.4 months, and basiliximab being the most commonly used induction medication (57.3%). The majority of donors were males (64.7%) and had first-degree relationships with recipients (76.5%). Haploid HLA mismatch was observed in 36.8% of cases. One-year patient and graft survival rates were 91.2% and 96.7%, respectively, with infection being the primary cause of death ($n=5$), and more than half of deceased patients died with a functioning graft ($n=4$).

Conclusion Our study underscores favorable one-year patient and graft outcomes among kidney transplant recipients at Muhimbili National Hospital, Tanzania. However, challenges persist, notably with infections posing ongoing difficulties for this cohort.

Keywords Chronic kidney disease, Kidney transplantation, Muhimbili National Hospital

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Introduction

Chronic kidney disease (CKD) presents a significant health challenge globally, and the burden is disproportionately affecting SSA regions which have the least resources. Tanzania has a CKD prevalence of about 14% [1]. The high burden of CKD in Tanzania is attributed to the increasing prevalence of risk factors such as diabetes mellitus (DM), hypertension (HTN), and infectious conditions such as Human Immunodeficiency Virus (HIV) [2, 3]. There are limited care options for patients with kidney failure in SSA with the majority of patients relying on hemodialysis therapy as the main form of kidney replacement therapy (KRT). Kidney transplantation is accessible in a few countries in the region including South Africa, Kenya, Sudan, and Nigeria [4, 5].

Few countries in SSA with established programs are offering predominantly living donor transplantation which is in contrast to high-income countries with both deceased and living donation [4, 6, 7]. Good graft (80%) and patient (90%) survival rates have been achieved in high-income countries, this is attributed to availability and access to immunosuppression and prophylaxis medications, this is not the case in low-income countries as patients are paying out-of-pocket and have limited access to the modern immunosuppressive agents [7].

Tanzania has joined other countries in setting up kidney transplantation services with two transplant centers, this reflects the increasing recognition of this option as a feasible treatment of chronic kidney failure in SSA [8]. The Tanzania program which is five years old is still faced with many challenges as has been the case for other countries including a lack of supplies and difficulties in getting donors [4, 9]. Registries are useful for providing information about outcomes which is essential in assessing the progress of the program, this information may provide confidence in society and motivate kidney donation [10, 11]. In Tanzania, there is no registry and there has been no documentation of the outcome of the transplant program. The purpose of our study was to determine the clinical outcomes and survival rates of kidney transplant recipients at Muhimbili National Hospital in Tanzania, in the absence of a national transplant registry, since the inception of the program.

Methodology

This was a retrospective cohort study aimed to describe the clinical profile and determine the one-year outcome of kidney transplant recipients at Muhimbili National Hospital (MNH) between November 2017 and February 2022. MNH is the first medical facility in Tanzania to start kidney transplantation services. Kidney transplantation at MNH utilizes organs from living donors, and the immunosuppression used include basiliximab and Anti-thyroglobulin (rATG) for induction, while mycophenolate/azathioprine, tacrolimus/cyclosporine, and prednisolone are used for maintenance immunosuppression [9]. Few patients are using sirolimus or everolimus as a substitution for calcineurin inhibitors.

Data was collected using a standardized tool which was prepared in English language, these were obtained from patients' charts and the electronic patient information system. Collected information included donors' and recipients' clinical profiles, human leucocyte antigen (HLA) matching, laboratory results before and after kidney transplantation, immunosuppression, and complications. Other information collected included sociodemographic details and the relationship between donors and recipients. One-year outcome was determined based on the survival and graft function of recipients.

Collected data was entered into Statistical Package for Social Sciences (SPSS) version 25 and checked for consistency. Analysis was performed using the same software and frequency distribution and two-way tables were prepared. Descriptive data of the subject's characteristics and survival rate were described by medians or means for continuous variables and by number and percentage for categorical variables.

Results

Clinical profile of recipients

A total of 68 kidney transplantations were performed between November 2017 and February 2022 and were included in our analysis. The majority were male (63.2%), and mean age of participants was 45.8 years (Range 13–65). Most participants (63.2%) were married, more than half (51.5%) were employed, and 45.6% had a college or university education. The majority of participants (88.2%) were insured under the National Health Insurance Fund. More than half of the participants had hypertension (58.2%), and 36% had diabetes mellitus. Renal biopsy was performed for only 3 patients. The mean duration of hemodialysis before transplantation was 14.4 months. Basiliximab was more frequently used as an induction immunosuppressant (57.3%) (Table 1).

Clinical profile of donors

The donors were predominantly males (64.7%) with a mean age of 42.2 years, and the majority (76.5%) had first-degree relationships with recipients. HLA matching between donors and recipients revealed total match, haploid match, and a total mismatch in 5.9% (4/66), 36.8%, and 1.5% (1/66) respectively, (Table 2).

Outcome of transplantation

The one-year patient and graft survival rate was 91.2% and 96.7% respectively. The primary cause of death was infection ($n=5$) and two-thirds of the deceased patients died with a functioning graft ($n=4$). Throughout the 12

Table 1 Sociodemographic and clinical characteristics of kidney transplant recipients (*N* = 68)

Factors	*N* (%)
Sex	
Male	43 (63.2)
Female	25 (36.8)
Age	
< 35	26 (38.2)
36–60	34 (50)
> 60	8 (11.8)
Mean age (years)	45.8
Marital status	
Single	21 (30.9)
Married	43 (63.2)
Widowed	4 (5.8)
Education level	
Primary	17 (25)
Secondary	20 (29.4)
College or University	31 (45.6)
Occupation	
Unemployed	14 (20.5)
Employed	35 (51.5)
Retired	10 (14.7)
Students	9 (13.3)
Mode of payment	
Paying from pocket	8 (11.8)
Insured	60 (88.2)
Etiology of CKD	
Hypertension	40 (58.2)
Diabetes mellitus	24 (36)
Hepatitis B infection	2 (2.9)
Polycystic kidney disease	2 (2.9)
Duration of RRT before transplantation (months)	
Pre-emptive transplant	2 (3.0)
1–6	8 (11.7)
7–12	30 (44.1)
13–24	20 (29.4)
25–59	8 (11.8)
Mean duration of RRT before transplant (months)	14.4
Induction medication	
Basiliximab	39 (57.3)
Antithyroglobulin (rATG)	29 (42.6)

Hb-Hemoglobin, RRT-Renal replacement therapy

Table 2 Social demographic and clinical characteristics of kidney donors

Kidney donor characteristics	*N* (%)
Age (Mean/SD)	42.2 (11.5)
Sex	
Male	44 (64.7)
Female	24 (35.3)
Donor relationship	
First degree	52 (76.5)
Second degree	16 (23.5)
HLA matching	
*0/6	1 (1.5)
*1/6	2 (2.9)
*2/6	15 (22.1)
3/6	25 (36.8)
4/6	14 (20.6)
5/6	7 (10.3)
6/6	4 (5.9)

* DNA fingerprinting was also done

Table 3 Timeline of deaths and return to hemodialysis over 12 months

Duration	First quarter (1-3months)	Second quarter (4–6 months)	Third quarter (7–9 months)	Fourth quarter (10–12 months)
Number of deaths	2	1	2	1
Number of patients returning to HD	0	1	0	2

HD-Hemodialysis

Table 4 Post-transplant complications (*N* = 68)

Complication	*N* (%)
Delayed graft function	**4 (5.8)**
Intraoperative bleeding	**2 (2.9)**
Perinephric collection	**3 (4.4)**
High drain output	**2 (2.9)**
Urine retention	**2 (2.9)**
Iatrogenic pleural effusion	**1 (1.4)**
Hematoma on the graft site	**1 (1.4)**
Graft ureteric fibrosis	**2 (2.9)**

months, the highest number of deaths [2] occurred in the first and third quarters. (Table 3)

Transplant related complications

Transplant complications reported in graft recipients included delayed graft function (30.8%), perinephric collection (23%), intra-operative bleeding (15.4%), urine retention (15.4%), and perinephric hematoma (7.7%), Table 4.

Discussion

This study was conducted to determine the outcome of kidney transplant recipients after establishing the program at Muhimbili National Hospital, Tanzanian in November 2017. Sixty-eight kidney graft recipients were included in this study and information regarding the clinical profile and one-year outcomes of recipients were evaluated. Our findings indicate good patient and graft survival, comparable to outcomes reported in similar settings [4, 12]. However, the 1-year mortality rate is still higher compared to developed countries, where survival rates following live donor kidney transplants are typically better [13, 14].

Among patients who were alive by one year, the one-year graft survival in our study showed good outcomes comparable with kidney transplant outcomes reported in various other settings globally [6, 12, 15, 16]. This outcome is attributable to several factors including the selection of relatively young recipients with low risk of

comorbid conditions, and the high likelihood of good short-term surgical outcomes [17]. Additionally, all donors were related to the recipients and most had a good HLA matching as they are first-degree relatives. Good HLA matching is an indicator of genetic compatibility and has been reported to reduce the incidence of graft rejection [18, 19]. The choice of recipients was deliberately made in this new program to promote kidney transplantation as a viable intervention for CKD in the Tanzania community and to foster confidence in the program from the community and trust among prospective donors for the sustainability of the program.

Complications are commonly reported following kidney transplantation [20]. In this study, we observed several complications including intraoperative bleeding, perinephric collection, hematoma, urine retention, and delayed graft dysfunction. Notably, one recipient developed an iatrogenic pleural effusion resulting from complications related to central line insertion. This underscore the importance of rigorous post-transplant monitoring to ensure timely detection and management of any arising complication or adverse event. The complication rate noted in our study is comparable to other reports, although vascular complications reported from other studies were not observed in our cohort [20, 21, 21].

Muhimbili National Hospital was the first center to establish kidney transplantation in Tanzania, and now Tanzania has two centres offering kidney transplantation services. The outcome of this study indicates the viability of establishing these services in low-income settings with the potential for good outcomes as was advocated in the Bamako resolutions of 2008 [22].

Our study has provided valuable insights into the operationalization of kidney transplantation in Tanzania and the remarkable one-year outcome. However, it has several important limitations including a short follow-up and the retrospective nature of the study with its inherent challenges of data collection bias and missing information. The relatively small sample size further limits the robust and predictive analyses to identify factors influencing transplant success.

In conclusion, our study provides valuable results showing kidney transplant recipients' clinical characteristics and one-year outcomes at Muhimbili National Hospital in Tanzania. We observed a significant proportion of patients achieving a good one-year survival compared to our settings in Sub-Saharan Africa but lower to developed settings, with a favorable graft survival rate mirroring global kidney transplantation trends.

Acknowledgements
We thank the Muhimbili National Hospital for approving the research and providing access to patient's information.

Author contributions
J.S. conceptualized the study designed the methods and wrote the first draft of the manuscript. J.M., D.M., and G.V. participated in designing the methods and analyzing the data. P.K. M.N. and D.B. participated in data collection, entry, and results writing. F.F reviewed the final draft.

Funding
The author(s) received no financial support for the research, authorship, or publication of this article.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethical approval
The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. The research protocol was reviewed and approved by the Institutional Review Board (IRB) of Muhimbili National Hospital, Clinical Research, Training and Consultancy Unit with reference number MNH/IRB/I/2022/061. For this retrospective cohort study, the requirement for informed consent was waived by the IRB of the MNH as the research involved the use of existing data and posed no more than minimal risk to the participants.

Consent for publication
Not Applicable. The manuscript does not contain identifying images or personal/clinical details that could compromise participant anonymity.

Competing interests
The authors declare no competing interests.

Received: 27 July 2024 / Accepted: 19 September 2024
Published online: 28 September 2024

References

1. Stanifer JW, Maro V, Egger J, Karia F, Thielman N, Turner EL, et al. The epidemiology of chronic kidney disease in Northern Tanzania: a population-based survey. PLoS ONE. 2015;10(4):1–12.
2. Ploth DW, Mbwambo JK, Fonner VA, Horowitz B, Zager P, Schrader R et al. Prevalence of CKD, diabetes, and hypertension in Rural Tanzania. Kidney Int Rep. 2018;3(4):905–15. https://doi.org/10.1016/j.ekir.2018.04.006
3. Mwemezi O, Ruggajo P, Mngumi J, Furia FF. Renal dysfunction among HIV-infected patients on antiretroviral therapy in Dar es Salaam, Tanzania: a cross-sectional study. Int J Nephrol. 2020;2020.
4. Bamgboye EL. Kidney transplantation in Sub-Saharan Africa: history and current status. Kidney360. 2023;4(12):1772–5.
5. Furia FF, Shoo J, Ruggajo PJ, Kilonzo K, Basu G, Yeates K et al. Developing nephrology services in low income countries: a case of Tanzania. BMC Nephrol. 2019;20(1).
6. Boenink R, Kramer A, Tuinhout RE, Savoye E, Åsberg A, Idrizi A, et al. Trends in kidney transplantation rate across Europe: a study from the ERA registry. Nephrol Dialysis Transplantation. 2023;38(6):1528–39.
7. Garcia-Garcia G, Harden P, Chapman J. The global role of kidney transplantation. Indian J Nephrol. 2012;22(2):77–82.
8. Matsha TE, Erasmus RT. Chronic kidney disease in sub-Saharan Africa. Lancet Glob Health. 2019;7(12):e1587–8. https://doi.org/10.1016/S2214-109X(19)30467-X
9. Furia FF, Shoo JG, Ruggajo PJ, Mngumi JW, Valentine G, Muhiddin MA et al. Establishing kidney transplantation in a low-income country: a case in Tanzania. Ren Replace Ther. 2024;10(1).
10. Rosa-Diez G, González-Bedat MC, Luxardo R, Ceretta ML, Ferreiro-Fuentes A. Step-by-step guide to setting up a kidney replacement therapy registry: the challenge of a national kidney replacement therapy registry. Clin Kidney J. 2021;14(7):1731–7.
11. Davids MR, Caskey FJ, Young T, Balbir Singh GK. Strengthening renal registries and ESRD research in Africa. Semin Nephrol. 2017;37(3):211–23. https://doi.org/10.1016/j.semnephrol.2017.02.002

12. Ghelichi-Ghojogh M, Ghaem H, Mohammadizadeh F, Vali M, Ahmed F, Hassanipour S et al. Graft and patient survival rates in kidney transplantation, and their associated factors: a systematic review and meta-analysis. Vol. 50, Iran J Public Health. 2021. https://creativecommons.org/licenses/by-nc/4.0/
13. Poggio ED, Augustine JJ, Arrigain S, Brennan DC, Schold JD. Long-term kidney transplant graft survival—making progress when most needed. Am J Transplant. 2021;21(8):2824–32.
14. Rezapour S, Yarmohammadi A, Tavakkoli M. One-year survival rate of renal transplant: factors influencing the outcome. Transpl Res Risk Manage. 2017;9:49–56.
15. Ghelichi-Ghojogh M, Mohammadizadeh F, Jafari F, Vali M, Jahanian S, Mohammadi M et al. The global survival rate of graft and patient in kidney transplantation of children: a systematic review and meta-analysis. BMC Pediatr. 2022;22(1).
16. Arogundade FA. Kidney transplantation in a low-resource setting: Nigeria experience. Kidney Int Suppl (2011). 2013;3(2):241–5.
17. Beerli N, Denhaerynck K, Binet I, Dahdal S, Dickenmann M, Golshayan D et al. Age at time of kidney transplantation as a predictor for mortality, graft loss and self-rated health status: results from the Swiss transplant cohort study. Transpl Int. 2022;35.
18. Shi X, Lv J, Han W, Zhong X, Xie X, Su B et al. What is the impact of human leukocyte antigen mismatching on graft survival and mortality in renal transplantation? A meta-analysis of 23 cohort studies involving 486,608 recipients. BMC Nephrol. 2018;19(1).
19. Manski CF, Tambur AR, Gmeiner M. Predicting kidney transplant outcomes with partial knowledge of HLA mismatch. Proc Natl Acad Sci U S A. 2019;116(41):20339–45.
20. Minkovich M, Gupta N, Liu M, Famure O, Li Y, Selzner M et al. Impact of early surgical complications on kidney transplant outcomes. BMC Surg. 2024;24(1).
21. Lempinen M, Stenman J, Kyllönen L, Salmela K. Surgical complications following 1670 consecutive adult renal transplantations: a single center study. Scand J Surg. 2015;104(4):254–9.
22. Persy VP. Prevention and transplantation in chronic kidney disease: what is achievable in emerging countries? Meeting report: Bamako meeting December 4–6, 2008. Nephron Clin Pract. 2010;115(2):c122-32. https://doi.org/10.1159/000312875. Epub 2010 Apr 22. PMID: 20413991. Nephron Clin Pract. 2010;155(2):122–32.

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