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Renal transplantation and quality of life in Tanzania

Onesmo A. Kisanga[1], Francis F. Furia[1,2*], Paschal J. Ruggajo[1,3], Eden E. Maro[3]

[1]Renal Unit, Muhimbili National Hospital, P. O. Box 65000 Dar es Salaam, Tanzania
[2]Department of Pediatrics and Child Health, School of Medicine, Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam, Tanzania
[3]Department of Internal Medicine, School of Medicine, Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam, Tanzania

***Corresponding author:**

Francis F Furia

Muhimbili University of Health and Allied Sciences

P. O. Box 65001,

Dar es Salaam, Tanzania

Email: fredrick.francis78@gmail.com

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Abstract

Background
Renal replacement therapy (RRT), which includes dialysis and kidney transplantation, is the treatment of choice for patients with end stage renal failure (ESRF). Most sub-Saharan African countries have not developed renal transplantation services and are relying on referring patients to overseas countries. This study was carried out to describe renal transplantation experience in Tanzania.

Methods
Forty-four renal transplant recipients were recruited in this study. Standardized questionnaire and Swahili version of standard form – 36 (SF-36) were used to collect socio-demographic information, clinical data, laboratory test results and health related quality of life information.

Results
Ages of transplant recipient ranged from 21 to 66 years with mean age of 45.9 ± 10.5 years. The leading causes of end stage renal failure among participants was hypertension 58.8% (25/44) followed by glomerulonephritis 15.9% (7/44). Twenty-eight (63.6%) of transplantations were paid by the government. Most of the donors (97.7%) were living out of which 26 (59.1%) were siblings and 11 (25%) were second-degree relatives (cousins and nephews). Most common complication noted following transplantation was diabetes mellitus 9 (20.5%) and 3 (6.8%) had chronic rejection. Mental health was the domain with highest mean score (75.6 ± 14.3) and role physical had the least mean score (44 ± 45.6).

Conclusions
Hypertension was the leading cause of ESRF in this study. Most of the donors were siblings and the costs of transplantation were largely covered by the government. There is a need for concerted effort to establish local kidney transplantation services in Tanzania.

Keywords*:* Renal transplantation, quality of life in transplantation, Tanzania.

Background

Non-communicable diseases (NCDs) are reported to contribute to premature deaths globally. Chronic kidney diseases (CKDs) worsen the outcome in most NCDs [1-3]. Global prevalence of CKD is estimated to range between 11-13% with majority, and its burden being 3-4 times higher in sub-Saharan Africa as compared to developed countries [4,5]. Studies conducted in Tanzania have documented high burden of CKD, Stanifer et al and Ploth et al reported community prevalence of 7% and 12.4% in studies conducted in Kilimanjaro and Kisarawe, respectively [6,7]. Causes of CKD reported from studies conducted in Tanzania include diabetes mellitus, hypertension, HIV disease and chronic glomerulonephritis [6-9].

Sub-Saharan Africa, which hosts the highest burden of CKD is faced with many challenges in providing care for patients with CKD. The region has disproportionately lower number of trained health personnel, limited facilities for provision renal services including diagnostic equipment [5,10,11]. Tanzania has made significant improvement in the last decade with improved facilities for provision of renal services including haemodialysis units [12].

Renal replacement therapy is the optimal therapy for patients with ESRF. Three options for renal replacement therapy are available, which include haemodialysis, peritoneal dialysis and renal transplantation. Renal transplantation is the definite form of renal replacement therapy that provides better outcome as compared to dialysis [13].

Several countries in sub-Saharan Africa including South Africa, Kenya, Nigeria and Sudan are providing renal transplantation services [13-17]. Tanzania was referring patients with ESRF to overseas, as is the case for other Sub-Saharan African countries with no established renal transplantation services. Between 1981 and 1987 ten patients with ESRF were sent to St Thomas Hospital in United Kingdom for transplantation [18]. Subsequently patients from Tanzania were referred to India and

few to Kenya and other countries for renal transplantation. Tanzania started offering renal transplantation services in 2017, prior to 2017 patients were referred for kidney transplantation overseas and the government of Tanzania through the ministry responsible for health was paying for the required costs [19]. This study was conducted to describe the clinical profile and determine the quality of life of ESRF patients who had received kidney transplantation services by 2009.

Methods

This was a cross-sectional, descriptive study carried out in five health facilities, which were providing services for patients with CKD and ESRF to determine the quality of life following kidney transplantation. Muhimbili National Hospital (MNH), Regency Medical Centre, Hindu Mandal Hospital, Agha Khan Hospital and TMJ Hospital were selected conveniently as they were the only facilities offering services for patients with CKD and ESRF. All adult patients aged 18 years and above who had been treated with kidney transplantation by 2009 were eligible for this study. These five hospitals were providing services for patients with CKD and patients who had undergone renal transplantation were doing clinics in those hospitals. At the time of this study, there was no established kidney transplantation clinic in any of the involved facilities, and these patients were attending general medical clinics.

Data used in this study were collected using standardized self-administered Kiswahili questionnaires and Kiswahili translated SF-36 [20]. Information collected included socio-demographic data; age, sex, marital status, education and employment, clinical and medical information related to kidney transplantation. All participants had pre-transplant evaluation and surgeries outside Tanzania, therefore their discharge summaries were used to collect information about transplant surgery including native kidney disease, Human Leucocytic Antigen (HLA) typing, relationship with donors, immunosuppression drugs used and immediate post-transplantation complications. Immediate post-transplant complications included urinary tract infection, pulmonary tuberculosis, cytomegalovirus (CMV) and polyoma virus (BKV) infections.

As part of data collection participants underwent physical examination and their weight and height were recorded and used to calculate their body mass indices. Blood (10 mls) specimens were drawn from participants' cubital vein for laboratory evaluations. These specimens were sent to MNH within two hours of collection and were analysed in the Central Pathology Laboratory at MNH. Complete blood count was analysed using Cell-dyn 3500R Analyzer, and Abbot-Architect Chemistry analyser was used to check for random blood glucose and serum creatinine. Serum creatinine was defined as normal when ≤ 1.5 mg/dL, mild to moderately elevated when > 1.5 ≤ 2.5 mg/dL and severe when > 2.5 mg/dL. Graft dysfunction was defined as serum creatinine > 1.5 mg/dL at the time of participant recruitment.

This study was approved by Muhimbili University of Health and Allied Sciences Senate Research and Publications Committee and research permissions were granted by hospital administration of all involved hospitals. All participants were requested to provide informed written consent prior to recruitment. Data were entered into Statistical Package for Social Sciences version 18 and were checked for consistence and analysed using the same software. Student T-test were used to determine association between independent and dependent variables and a p value <0.05 was considered as a cut off for statistical significance.

Results

Demographic characteristics of study participants

The demographic and clinical characteristics of recipients and donors are summarized in Table 1. Forty-four transplant patients were recruited into this study of which 36 (81.8%) were males. The ages of participants ranged from 21 to 66 years with mean age of 45.9 ± 10.5 years. Thirty-seven (84.1%) were married, 6 (13.6%) were single and one patient was widowed. Thirty-one (70.5%) of participants had college education and 28 (63.6%) had full time employment.

Table 1: Demographic and clinical characteristics of recipients and donors

Variable	Number (%)
Age of recipients	
Above 45 years	21 (47.7)
18 - 45 years	23 (52.3)
Sex of recipients	
Male	36 (81.8)
Female	8 (18.2)
Marital status of recipients	
Single	6 (13.6)
Married	36 (86.4)
Level of education	
Primary education	4 (9.1)
Secondary education	10 (22.7)
College education	30 (68.2)
Native kidney disease of recipients	
Hypertension	27 (61.4)
Glomerulonephritis	4 (9.1)
Diabetes mellitus	2 (4.5)
Hypertension and diabetes mellitus	5 (11.4)
Polycystic kidney disease	3 (6.8)
Others	3 (6.8)
Duration of graft	
Less than 6 months	12 (27.3)
6 up to 12 months	3 (6.8)
12 up to 24 months	11 (25.0)
More than 24 months	18 (40.9)
Presence of graft dysfunction	9 (20.5)
Yes	35 (79.5)
No	
Age of donors	9 (20.5)
18-30 years	18 (40.9)
31-40 years	16 (36.4)
More than 40 years	
Sex of donors	29 (65.9)
Male	14 (31.8)
Female	
Relation of donors to recipients	
Brother/sister	26 (59.1)
Daughter/son	3 (6.8)
Spouse	3 (6.8)
Cousin/nephew	11 (25.0)

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Among the graft recipients 25 (56.8%) had normal serum creatinine while 16 (36.4) and 3 (6.8%) had mild to moderate and severely elevated serum creatinine, respectively, mean serum creatinine was 1.73 ± 1.1 mg/dL (1.0-6.8 mg/dL). Other laboratory test included mean blood urea nitrogen (BUN) 8.5 ± 5.1 mmol/L (5.1-36.0 mmol/L), random blood glucose 6.1 ± 2.0 mmol/L (4.1-13.4 mmol/L) and haemoglobin 12.1 ± 1.5 g/dL (7.6 – 14.5 g/dL).

Native kidney diseases

Native kidney diseases that were recorded in the participants' summaries included hypertension which was noted in 59.1% (26/44) of participants followed by diabetes mellitus 18.2% (8/44), glomerulonephritis 15.9% (7/44) and polycystic kidney disease 6.8% (3/44). In one participant the cause of renal disease was unknown.

Kidney transplantation information

The financing of kidney transplantation was mainly provided by the government through the then Ministry of Health and Social Welfare for 28 (63.6%) of the participants, 15 (34.1%) were sponsored by their employers and 5 (11.4%) were self-sponsored or supported by their families. The cost of immunosuppressants were paid for by the government for 15 (34.1%) participants, employer for 15 (34.1%) and self-sponsored or family support for 14 (31.8%).

The mean duration from time of transplantation was 766.8 ± 905.7 days (minimum 58 days, maximum 4380 days). Immunosuppression regime for the participants were as follows; twenty (45.5%) of the participants were on cyclosporine, prednisolone and mycophenolate, 11 (25%) were on tacrolimus, prednisolone and mycophenolate, 7 (15.9%) were on sirolimus, prednisolone and mycophenolate, 4 (9.1) were on azathioprine and prednisolone, and 2 (4.5%) on evorolimus, prednisolone and mycophenolate.

Forty-three (97.7%) of the donors were living and 1 (2.3%) was cadaveric, and among living donors 29 (65.9%) were males and 14 (31.8%) were females. Age range of living donors was 19 to 54 years with mean age of 36.8 ± 8.1 years. Twenty-six (59.1%) of the living donors were siblings to the recipients, 11 (25%) were second-degree relatives (cousins and nephews), 3 (6.8%) were spouses, 3 (6.8%) were sons or daughters. HLA antigen matching was total in 12 (27.3%), haplomatch in 17 (38.6%) and single antigen match in 14 (31.8%).

Complications which were noted after transplantation included diabetes mellitus 9 (20.5%), tuberculosis 3 (6.8%), urinary tract infection 3 (6.8%), cytomegalovirus infection 2 (4.5%) and 3 (6.8%) developed malignancy (Kaposi' sarcoma). Two (4.5%) of the participants had acute rejection and 3 (6.8%) had chronic rejection.

Quality of life of kidney recipients

Mental health is the domain which was noted to have the highest mean score (75.6 ± 14.3) among the domains assessed while role physical scored the least mean score, **Table 2**. Participants in this study had significantly lower mean score for all domains as compared to general population except for general health for which no difference was noted, **Table 3**.

Table 2: Mean score of eight scales of SF 36 for recipients

Scale	Mean score	Standard deviation	Minimum score	Maximum score
Social function	69.5	25.0	0	100
Role emotional	51.0	43.5	0	100
Physical function	64.4	22.0	15	100
Role physical	44.9	45.6	0	100
Bodily pain	70.5	17.9	12	90
Vitality	65.3	17.2	15	95
General health	63.0	19.9	25	97
Mental health	75.6	14.3	44	100

Table 3: Comparison of mean scores of recipients and general population.

Variable	Social functioning	Role emotional	Physical functioning	Bodily pain	Vitality	General health	Mental health
N (44)	69.5 ±25.0	51.0± 43.5	64.4 ±22.2	70.5 ± 17.9	65.3±17.2	63.0±19.9	75.6±14.3
N (3802)	88.2 ± 18.5	86.3± 30.8	93.8 ±12.3	82.8± 24.7	74.9±18.5	62.9±18.6	82.2±18.5
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	0.5141	0.0092

Discussion

This study was conducted among kidney transplant recipient who had received transplant surgery by 2009. These patients had their transplantation performed outside Tanzania as this service was not available in the country at the time of this study. A total of 44 patients who had been transplanted and visited the facilities in which this study was carried out were recruited.

Conditions, which were presumed to be native kidney diseases responsible for CKD and ESRF were predominantly hypertension, diabetes mellitus and glomerulonephritis, these conditions have been reported as the leading causes of CKD globally and in sub-Saharan Africa [2,5]. Other reported causes of CKD included polycystic kidney diseases. Defining the native kidney disease is usually challenging in most resource limited settings, as the diagnosis requires histologic definition which is difficult as many patients present late to health facilities making it difficult to obtain renal biopsy [21]. Hypertension which was noted as the predominant cause might be the mere complication of renal failure, making it prudent therefore to keep in mind possibilities of other causes including herbal intoxications and infectious diseases which are prevalent in the region [22, 23].

Most of the participants in this study received support from the government for their kidney transplantation treatment. Support from the government may be a good

approach to ensure services are accessed universally regardless of ability to pay. However, it is not clear which criteria were utilized in referring patients, making it difficult to determine whether access to this service was equitable. Reports from other studies have not indicated support from government for kidney transplantation overseas, making kidney transplantation services to be accessible only to those with high socio-economic status [24-26]. Although government support for kidney transplantation is a noble way of availing these expensive services to patients with ESRF, there were serious concerns regarding sustainability of the services, as well as cost-effectiveness of the program. This program has however served as a pilot to inform different stakeholders in Tanzania on feasibility of local kidney transplantation services established in the country currently.

All kidney grafts were obtained from live relatives of participants except for one recipient. This model was based on strict regulations set in India where services were solicited. Using relatives of ESRF patients is used to ensure no exploitation of donors who may be recruited through coercions. There are reports of illegal organ trade that may be futile for both donors and recipients in sub-Saharan African countries and resource limited settings [26,27]. The preliminary donor evaluation was done in Tanzania with exception of tissue matching, which was performed in India following which the referral process was initiated. This strict protocol ensured no organ trade took place, but there was serious exclusion to services in cases of recipients who failed to get suitable related donors as they were not able to recruit un-related donors. All participants were on three immunosuppression medications, with 45% on cyclosporine, mycophenolate and prednisolone while only 4 were on azathioprine based immunosuppressants. All recipients were receiving the recommended immunosuppressants, which account for their well-maintained renal function noted in this study. Complications noted in this study are like other studies in sub-Saharan Africa and included diabetes mellitus, tuberculosis, urinary tract infections, CMV infection, malignancies, acute and chronic graft dysfunction [13, 28].

Renal transplantation is reported to result in improved quality of life, this was also demonstrated in this study as depicted in the assessed quality of life as compared to general population [29]. This relatively good quality of life noted in this study shows the improved outcome of ESRF patients who get kidney transplantation, and is a good indicator that kidney transplant recipients will be able to resume their productive lives, as majority were in their prime age in carrier development.

Through this model of regulated travel for transplantation, Tanzania has demonstrated that it is possible to curb illegal organ trade with well-coordinated organ transplantation services even when they are obtained out of the country. Lesson learned through this program has been important in the establishment of local kidney transplantation programs in Tanzania, which were introduced in 2017 and 2018 for Muhimbili National Hospital and Benjamin Mkapa Hospital, respectively [12,19].

Limitation

A limitation noted in this study was the small number of participants, this might be due to recruitment of participants in Dar es Salaam city alone therefore missing some transplant recipients who were residing out of Dar es Salaam and those who did not visit these facilities at the time of data collection. Generalizability of these findings may be difficult given the small numbers. Additionally, methods used for testing patients prior to transplantation and immediately post-transplantation could not be ascertained as no information was included in patients' discharge summaries.

Conclusions

Patients who received kidney transplantation were noted to have hypertension, diabetes and glomerulonephritis as the main causes of kidney diseases. More than half of the donors were siblings who were relatively young. The government paid most of the transplantation costs. Kidney transplantation recipients were noted to have good quality of life, which may be taken as a clear justification to put effort in

developing and strengthening the locally established kidney transplantation services in Tanzania.

Authors' contributions

OAK designed the study, collected data, performed data analysis and wrote preliminary report. FFF performed additional analysis and prepared this manuscript. PJR participated in manuscript preparation. EEM supervised study design, data collection and analysis. All authors have read and approved this manuscript.

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