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Factors associated with health-related quality of life among kidney transplant recipients in Bhutan

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ABSTRACT

Introduction: The health-related quality of life (HRQoL) of kidney transplant recipients (KTRs) is a crucial metric for assessing transplant outcomes. While HRQoL generally improves after kidney transplantation, KTRs often face significant HRQoL issues. **Methods:** A cross-sectional study was conducted among 100 KTRs by performing face-to-face interviews using a KTQ-25 tool in a tertiary care hospital. The tool included information about physical symptoms, fatigue, fear/uncertainty, appearance, and emotions of KTRs. The objective was to assess the influence of sociodemographic factors on the HRQoL of KTRs. **Results:** Out of 130 transplant recipients, 100 participated in this study, of which 48% were females. Hypertension was the cause of kidney failure in 53 participants. The overall mean±SD score of HRQoL was 4.3 ± 0.8, among which physical symptoms scored 4.9 ± 1.0, fatigue 4.4 ± 1.1, fear/uncertainty 4.2 ± 1.0, appearance 4.0 ± 1.3, and emotions 4.2 ± 1.4. Unemployment, long duration on dialysis, and donor relationship were significantly associated with the physical symptoms, emotions and uncertainty/fear (p value <0.05). **Conclusion:** The overall health-related quality of life of kidney transplant recipients was low, influenced by factors such as unemployment, extended periods on dialysis, and receiving kidneys from non-related donors. Similar research must be conducted among patients undergoing dialysis.

Keywords: *Bhutan; Health-Related Quality of Life; Kidney Transplantation; KTQ-25*

INTRODUCTION

The incidence and prevalence of Chronic Kidney Diseases (CKD) are increasing worldwide. Of the 336 million men and 417 million women estimated to have impaired kidney function globally, 1.7 million men and 1.3 million women were treated with dialysis[1]. Among the various causes of kidney failure, hypertension and diabetes mellitus are the primary causes of CKD in both high and low-income countries[2].

For most CKD patients on the renal transplant waitlist, dialysis is an immediate choice of treatment[3]. During dialysis, patients often experience fatigue, depression, insomnia and other challenges such as loss of employment, infections and hospitalisation. Nearly 25% of dialysis patients discontinue dialysis due to these complications[4]. Kidney transplantation has improved the health-related quality of life (HRQoL) of people with CKD with a significant improvement in HRQoL observed immediately in the first few months of transplantation[5].

After the transplantation, Kidney Transplant Recipients (KTRs) have good social skills and are happy with their health, enabling them to engage in leisure activities and lead normal lives[6]. However, these outcomes are not universal. KTRs can suffer graft loss due to a lack of post-transplant care and social support[7]. Therefore, the evaluation of HRQoL of KTRs is becoming increasingly important. It not only determines the efficacy of medical interventions, but it can also improve the process of clinical decision making. Furthermore, it can evaluate the quality of care, and help understand the causes and consequences of differences in healthcare. In fact, recognizing the value of assessment on HRQoL has become an important clinical outcome[8,9]. The World Health Organization defines quality of life as an individual's perception of their position in life, taking into consideration the culture and value systems in which they live. It also takes into consideration their goals, expectations, standards and concerns[10].

The prevalence and incidence of CKD in Bhutan are not known, but the risk factors for kidney disease are common and increasing. The majority of patients with CKD in Bhutan are managed with hemodialysis, while a few undergo peritoneal dialysis. In 2016, there were approximately 610 patients who required haemodialysis; an increase of 50-fold from 2.86 patients per million in 1998 to 144.29 per million in 2015[11]. Eligible CKD patients are referred to India for kidney transplants, where the Royal Government of Bhutan bears the entire cost[12]. From the registration list of patients receiving immunosuppressive

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agents maintained by the pharmacy department, the first kidney transplant in a Bhutanese patient was done in 1994. Since then, 8 to 12 kidney transplant surgeries are performed yearly on average.

According to records from the Bhutan Kidney Foundation, there were 130 KTRs in the country as of 2021 (personal communication, November 2021). Post-transplant, all KTRs have to seek nephrology services from the Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) in Thimphu, the only hospital in the country offering such services. As a result, KTRs face challenges in availing post-transplant healthcare services. Given Bhutan's predominantly mountainous terrain, many KTRs reside one to two days' drive from JDWNRH, which disrupts both family and work commitments when travelling for follow-up appointments, imposing a considerable financial strain[13]. Additional barriers include limited access to specialists and difficulties in securing timely appointments.

To our knowledge, Bhutanese KTRs have never undergone a HRQoL assessment. This study aims to assess the factors associated with HRQoL amongst KTRs.

METHODS

Study design and setting

This cross-sectional study was conducted at the JDWNRH spanning seven months, from January to July 2022. JDWNRH is a tertiary care hospital located in Thimphu, the capital city of Bhutan. It is the only hospital that provides nephrology services to the country's entire population, including facilities for monitoring levels of immunosuppressive agents amongst transplant recipients. The study was conducted at the pharmacy department's therapeutic drug monitoring unit, where KTRs from all across the country come for their immunosuppressive medication refills, after being seen by a nephrologist between one to three months.

The study was conducted in line with the principles of the Declaration of Helsinki and upon receiving approval from Bhutan's Research Ethics Board of Health (REBH/Approval/2021/077) and site clearance from the JDWNRH, where the study was conducted.

Study participants

Eligible participants were identified at the outpatient pharmacy during their visits for their medication refill and tacrolimus drug-level monitoring. KTRs above the age of 18 years, who had their transplantation surgery before December 2021 and without any acute illness, including psychiatric or physical conditions, and receiving tacrolimus-based immunosuppressive regimens were potential participants. KTRs hospitalised one week before the commencement of the study and those with graft failure requiring reinitiation of haemodialysis were excluded.

Eligible participants were approached for recruitment. They were enrolled after voluntarily signing the informed consent form after being informed about the study. Once enrolled, participants were interviewed face-to-face by the study investigator in a language they understood (English or Dzongkha or local dialect) using a questionnaire.

A purposive sampling technique was applied. As per the registry in 2021, 130 KTRs were recorded so enrolment continued until the sample size was met.

Materials and data collection

The KTQ-25 tool developed by Laupacis and colleagues, involving fifty KTRs and clinical experts, was used for collecting HRQoL information[14]. A copyright clearance was sought from the original publisher with permission to use the tool in this study. The KTQ-25 tool consists of 25 items under five domains to assess physical symptoms (6 items), fatigue (5 items), fear/uncertainty (4 items), appearance (4 items), and emotional symptoms (6 items). The participants were asked to rate their response to each symptom based on how bothersome it had been in the past two weeks, using a Likert scale ranging from 1= "None of the time" to 7 = "All the time". A mean score of 1 indicated the highest possible state of HRQoL with minimum symptoms, while a score of 7 indicated the lowest HRQoL with maximum symptoms. A mean score of 3.5 was set as the mean cut-off point score, delineating low from high HRQoL. The total score for each domain was summed and divided by the number of items in the domain.

In addition to the KTQ-25 tool, a questionnaire that included sociodemographic details, physical parameters, and clinical variables was used for data collection. Physical parameters included weight, height, systolic and diastolic blood pressure. These parameters and details about immunosuppressive drugs, were obtained from the participants' medical book. Laboratory values included levels of immunosuppressive drug concentration, haematocrit (HCT), fasting blood sugar (FBS), serum creatinine and urea. These were prospectively tested during the study period.

Before being used in the study, the questionnaire was piloted amongst 20 KTRs. The reliability of the questionnaire was assured with a Cronbach alpha score of 0.8.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 28.0 was used for statistical analysis. Descriptive analysis was performed to describe sociodemographic characteristics, the results of which were expressed as mean with standard deviation (SD). The rating on HRQoL was analysed, and results were presented as minimum, maximum and mean SD scores. The relation between sociodemographic factors and HRQoL was analysed using the non-parametric Mann–Whitney U test for two categorical variables and the Kruskal–Wallis test for more than two categorical variables. Linear regression was used to assess the relationship between HRQoL and clinical characteristics of continuous variables. The significant value was set at $p<0.05$.

RESULTS

Sociodemographic characteristics

The study had 100 KTRs participating, among which 48 (48.0%) were females. The mean ± SD age was 42.85 years ± 11.37. The oldest participant was a 69-year-old man. As depicted in Table 1, majority (81, 81.0%) were married, majority (75, 75.0%) had some form of formal education and 52 (52.0%) were unemployed.

Table 1: Sociodemographic characteristics of KTRs seeking post-transplant services from JDWNRH during the time period of January to July 2022, N=100

Characteristics	N(%)
Sex	
Male	52 (52.0)
Female	48(48.0)
Age groups	
15-25	3(3.0)
26-35	27 (27.0)
36-45	31 (31)
46-55	22 (22.0)
56-65	15 (15.0)
66-75	2 (2.0)
Mean age ± SD	42.85±11.37
Marital Status	
Married	81 (81.0)
Single	17 (17.0)
Divorced	2 (2.0)
Education Level	
No formal education	25 (25.0)
Primary school	13 (13.0)
Junior high school	4 (4.0)
High school	22 (22.0)
Diploma	5 (5.0)
Undergraduate	21 (21.0)
Postgraduate	3 (3.0)
Monastic education	7 (7.0)
Occupation	
Employed	48 (48.0)
Unemployed	52 (52.0)

Clinical characteristics

Hypertension was the sole causative factor of kidney failure in 53 (53.0%) participants and was a contributory factor in 2 (2.0%). As depicted in Table 2, 62 (62.0%) participants had undergone dialysis for less than a year before their kidney transplant while 6 (6.0%) did not undergo dialysis before renal transplantation. At the time of enrolment, the median time since transplantation was 5 years with a range of less than 1 year to over 27 years. Four (4.0%) of the KTRs had undergone a second transplant surgery. A majority (78,78.0%) of the participants had co-morbidities, the commonest of which was hypertension (57, 57.0%).

HRQoL and its determinants among kidney transplant recipients

The overall mean KTQ-25 score was 4.3 ± 0.8. As depicted in Table 3, the highest mean ± SD scores were for physical symptoms (4.9 ± 1.0) followed by fatigue (4.4 ± 1.1) while the least mean ± SD score was for appearance (4.0 ± 1.3).

There was a statistically significant association in the mean scores of fatigue and physical symptoms with HRQoL ($p<0.05$) among the elderly aged 66 to 75 years. Similarly, there was a significant association of HRQoL with physical symptoms ($p=0.014$), uncertainty/fear ($p=0.046$), and the emotional domain ($p=0.022$) amongst unemployed KTRs. There was a significant association of HRQoL with appearance ($p=0.014$) amongst obese KTRs. There was also a significant association of HRQoL pertaining to uncertainty/fear of rejection ($p=0.023$) and physical symptoms ($p=0.038$) amongst non-related and related donors. The association between HRQoL and other sociodemographic factors is detailed in Table 4.

A linear regression was run to assess the relationship between HRQoL and clinical parameters including BMI, fasting blood glucose, haematocrit and eGFR. As depicted in Table 5, BMI is a significant predictor of HRQoL ($p < 0.05$).

DISCUSSION

The study uses the KTQ-25 tool, which is well-suited for evaluating HRQoL specifically among KTRs, ensuring relevance and accuracy in capturing the unique challenges KTRs face. This study highlights the applicability of KTQ-25 as an assessment tool as well as the implications of cultural, healthcare, and demographic factors on the HRQoL amongst KTRs.

Males slightly outnumbered females (52% versus 48%) in our study. Although there was no statistically significant association of HRQoL with sex, the mean HRQoL score across all domains were higher for females, indicating that females are affected more with a lower HRQoL. Gender disparities in health-seeking behaviour, where females may report symptoms more frequently, could influence these findings. Females tend to report low physical and emotional well-being more often due to biological and psychosocial differences. Furthermore, they might

experience higher levels of fatigue, depression, and anxiety, which greatly lowers HRQoL[15].

Table 2: Clinical characteristics of KTRs seeking post-transplant services from JDWNRH during the time period of January to July 2022, N=100

Characteristics	N(%)
Cause of kidney failure	
Hypertension	53 (53.0)
Diabetes mellitus	3 (3.0)
Hypertension + diabetes mellitus	2 (2.0)
Glomerulonephritis	4 (4.0)
Renal stone	4 (4.0)
Nephrotoxic agents	6 (6.0)
IgA nephropathy	6 (6.0)
Autosomal dominant polycystic kidney disease	1 (1.0)
Unknown	21 (21.0)
Duration of dialysis before transplantation	
No dialysis	6 (6.0)
<1 year	62 (62.0)
1-2 years	26 (26.0)
>2 years	6 (6.0)
Time since transplant	
<1 year	5 (5.0)
1-5 years	46 (46.0)
6-10 years	41 (41.0)
11-15 years	5 (5.0)
16-20 years	2 (2.0)
21-25 years	0 (0.0)
26-30 years	1 (1.0)
Donor Relation	
Related	53 (53.0)
Nonrelated	47 (47.0)
Comorbidities	
Hypertension	57 (57.0)
Diabetes mellitus	9 (9.0)
Hypertension + diabetes mellitus	12 (12.0)
No comorbidities	22 (22.0)
BMI (kg/m^2)	
Underweight	7 (7.0)
Normal weight	52 (52.0)
Overweight	34 (34.0)
Obese	7 (7.0)

Table 3: Health-related quality of life indicators amongst KTRs seeking post-transplant services from JDWNRH during the time period of January to July 2022, N=100

KTQ indicator	Mean ± (SD) *	Minimum	Maximum
Physical Symptoms	4.9±1.0	3.7	7.0
Fatigue	4.4±1.1	2.0	6.4
Uncertainty/Fear	4.2±1.0	1.5	6.5
Appearance	4.0±1.3	1.0	6.5
Emotional	4.2±1.4	1.0	7.0
Overall KTQ-25 score	4.3±0.8	2.3	6.1

*Classification of mean score:
Mean score > 3.5 indicates high level of bothering symptoms, corresponding to low HRQoL
Mean score of 3.5 indicates moderate level of bothering symptoms, corresponding to moderate HRQoL
Mean score < 3.5 indicates low level of bothering symptoms, corresponding to high HRQoL

Among the five domains of HRQoL, KTRs in our study had the highest mean scores for physical symptoms (4.9 ±1.0), followed by fatigue (4.4 ±1.1), indicating that these two parameters constituted the most bothersome symptoms contributing to low HRQoL. KTRs suffer from physical symptoms due to a combination of the underlying effects of kidney disease and the long-term impact of immunosuppressive therapy[16]. In Nepal, KTRs with agricultural occupations were found to have physical symptoms associated with lower HRQoL[17]. This observation aligns with the findings of our study, wherein unemployed KTRs had physical symptoms, emotional symptoms and uncertainty/fear as being associated with HRQoL ($p<0.05$). Similar findings have been reported from studies conducted in the USA, Slovak Republic, Italy and Nepal[18,19]. Economic instability limits access to healthcare resources, nutritious food and social engagements, affecting the overall quality of life.

A study from the Netherlands has reported that KTRs are significantly more fatigued (39%) compared to matched controls. Fatigued KTRs had higher BMI[20]. Our study noted that BMI was a significant predictor of HRQoL although fatigue was not significantly associated with HRQoL among obese KTRs. In fact, amongst our KTRs, those who were on extended periods of dialysis prior to the renal transplant had fatigue associated with HRQoL.

Our study findings indicated a statistically significant association ($p<0.05$) of HRQoL with fatigue and physical symptoms among the elderly aged 66 to 75 years. Similar

Table 4: Mann-Whitney U test and Kruskal Walis test results comparing quality of life scores by sociodemographic parameters amongst KTRs seeking post-transplant services from JDWNRH during the time period of January to July 2022, N=100

Variables	Physical symptoms	Fatigue	Uncertainty / fear	Appearance	Emotions
Sex					
Male	4.8±0.8	4.3±1.1	4.2±1.1	4.0±1.3	3.9±1.3
Female	5.0±0.8	4.4±1.2	4.3±1.0	4.2±1.2	4.4±1.4
	p value[a]	**p value[a]**	**p value[a]**	**p value[a]**	**p value[a]**
	0.30	**0.90**	**0.90**	**0.80**	**0.10**
Age					
15-25	4.0±0.0	2.9±0.4	4.2±1.0	4.0±1.4	5.3±0.8
26-35	4.6±0.6	4.1±1.1	4.3±1.0	4.3±1.3	4.0±1.4
36-45	4.9±0.8	4.2±1.0	4.1±1.0	4.1±0.9	4.1±1.2
46-55	5.2±0.8	4.7±0.9	4.2±1.0	3.9±1.3	4.5±1.4
56-65	5.1±0.8	4.7±1.3	4.4±1.1	3.7±1.5	3.8±1.6
66-75	5.7±0.4	5.4±0.8	4.6±0.8	3.1±0.2	5.4±0.3
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.01*	**0.02***	**0.73**	**0.63**	**0.23**
Marital status					
Married	5.0±0.8	4.4±1.1	4.3±1.0	4.0±1.3	4.2±1.5
Single	4.5±0.6	4.2±1.0	4.3±1.2	4.0±1.0	4.0±1.0
Divorced	4.6±0.4	4.3±0.9	3.6±0.5	3.6±0.2	4.9±0.1
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.07	**0.69**	**0.61**	**0.76**	**0.66**
Employment status					
Employed	4.7±0.8	4.2±1.0	4.0±1.0	3.8±1.4	3.8±1.4
Unemployed	5.1±0.8	4.5±1.1	4.4±1.0	4.2±1.0	4.5±1.3
	p value[a]	**p value[a]**	**p value[a]**	**p value[a]**	**p value[a]**
	0.01*	**0.13**	**0.04***	**0.23**	**0.02***
Education level					
No formal education	4.9±0.7	4.6±1.0	4.2±1.0	4.2±0.9	4.5±1.1
Primary School	5.2±0.7	4.3±1.0	4.6±1.0	3.7±1.2	4.4±1.4
Junior high school	5.1±1.0	4.5±1.9	4.4±0.7	4.3±1.5	3.7±1.6
High School	4.8±0.9	4.3±1.2	4.3±1.0	4.4±1.2	4.5±1.4
Diploma	4.6±0.8	4.5±0.7	3.8±0.9	4.1±1.2	4.0±1.3
Undergraduate	4.7±0.8	4.0±1.1	4.3±1.0	3.7±1.4	3.6±1.5
Postgraduate	4.9±0.9	4.2±1.7	3.3±1.4	3.0±2.2	4.0±1.6
Monastic education	5.1±0.6	4.6±1.1	3.8±1.2	3.4±0.5	3.5±1.0
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.61	**0.88**	**0.58**	**0.25**	**0.25**
BMI					
Underweight	4.8±0.8	3.9±1.4	4.3±0.8	2.7±1.0	2.9±1.7
Normal weight	4.9±0.8	4.4±1.0	4.3±1.0	4.0±1.2	4.3±1.3
Overweight	5.0±0.7	4.3±1.2	4.2±1.1	4.0±1.2	4.1±1.3
Obese	4.7±0.6	4.6±0.9	3.9±0.6	4.5±1.2	4.5±1.4

	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.75	**0.77**	**0.71**	**0.04***	**0.23**
Duration of dialysis					
No dialysis	5.8±0.9	5.0±1.5	4.5±0.8	3.3±1.4	4.3±1.9
<1 year	4.7±0.7	4.1±1.0	4.1±1.0	3.8±1.2	4.0±1.4
1-2 years	5.0±0.7	4.5±1.2	4.5±0.9	4.5±1.2	4.5±1.2
>2 years	5.4±0.6	5.1±0.7	4.5±1.2	3.9±0.8	4.3±1.0
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.004*	**0.04***	**0.31**	**1.06**	**0.50**
Type of donor					
Related	4.8±0.7	4.1±0.9	4.0±1.0	4.0±1.3	4.0±1.3
Nonrelated	5.0±0.8	4.6±1.2	4.4±1.5	4.1±1.1	4.4±1.4
	p value[a]	**p value[a]**	**p value[a]**	**p value[a]**	**p value[a0.]**
	0.03*	**0.18**	**0.02***	**0.65**	**0.05***
Duration post-transplantation					
Less than 1 year	4.4±0.8	3.8±1.6	4.2±1.3	3.7±1.2	3.1±1.8
1-5 years	4.7±0.7	4.1±1.0	4.1±1.0	3.9±1.2	4.0±1.4
5-10 years	5.1±0.7	4.6±1.0	4.3±0.9	4.1±1.1	4.5±1.2
10-15 years	4.9±0.7	4.7±1.1	4.6±1.4	4.7±1.2	4.1±1.4
15-20 years	5.0±1.4	5.2±1.4	4.7±1.0	4.5±1.4	3.5±0.5
25-30 years	4.5±0.0	4.0±0.0	2.2±0.0	1.0±0.0	2.6±0.0
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.12	**0.30**	**0.50**	**0.39**	**0.22**
Immunosuppressive regime					
Tac + Myc + Pred	4.8±0.7	4.3±1.1	4.1±1.0	3.9±1.2	4.1±1.4
Tac + Eve + Pred	4.9±0.6	4.8±1.0	5.1±1.0	4.6±1.1	4.4±1.3
Tac + Pred	6.6±0.0	5.0±0.0	4.7±0.0	2.5±0.0	4.3±0.0
Tac	6.0±0.0	5.8±0.0	4.7±0.0	3.0±0.0	3.8±0.0
Tac + Aza	4.7±0.9	4.3±1.1	4.0±0.9	4.9±0.8	4.9±1.4
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.29	**0.49**	**0.19**	**0.83**	**0.78**
Co-morbidities					
Hypertension	4.8±0.7	4.3±1.0	4.2±1.0	4.2±1.1	4.3±1.3
Diabetes mellitus	5.1±1.0	4.7±1.1	3.7±1.0	3.7±1.3	4.1±1.5
Hypertension + Diabetes mellitus	5.1±0.6	4.5±1.2	4.6±1.0	4.1±1.5	4.0±1.3
None	4.9±0.9	4.1±1.3	4.3±1.1	3.5±1.3	4.0±1.6
	p value[b]	**p value[b]**	**p value[b]**	**p value[b]**	**p value[b]**
	0.57	**0.49**	**0.29**	**0.22**	**0.96**

Tac: tacrolimus, Myc: mycophenolate, Eve: everolimus, Aza: azathioprine, Pred: prednisolone,
a Mann Whitney U test, b Kruskal Wallis test.
*p value < 0.05

Table 5: Relationship between the clinical parameters and HRQoL amongst KTRs seeking post-transplant services from JDWNRH during the time period of January to July 2022, N=100

Dimensions	Variables	Beta coefficient	t -value	95% CI	P Value
Physical symptoms	Intercept	31.9	8.42	24.4 – 39.4	0.001
	BMI (kg/m2)	-.110	-.854	-.365 - .146	0.40
(R^2 =0.18)	Fasting blood glucose (mg/dL)	-.000	-.030	-.032 - .030	0.97
F= 4.0	Haematocrit (%)	-.130	-1.63	-.287 - .028	0.10
	eGFR (ml/min/1.73 m2)	-.028	-1.12	-.078 - .022	0.30
Fatigue	Intercept	25.15	5.53	16.13 - 34.17	0.001
(R^2 =0.15)	BMI (kg/m2)	-.110	-.714	-.416 - .196	0.50
F= 3.3	Fasting blood glucose (mg/dL)	-.007	-.380	-.043 - .030	0.70
	Haematocrit (%)	-.164	-1.72	-.353 - .025	0.02
	eGFR (ml/min/1.73 m2)	-.022	-.729	-0.82 - .038	0.50
Uncertainty/Fear	Intercept	17.0	4.82	10.0 - 24.0	0.001
(R^2 =0.06)	BMI (kg/m2)	-.053	-.441	-.290 - .185	0.70
F= 1.1	Fasting blood glucose (mg/dL)	.022	1.508	-.007 - .050	0.10
	Haematocrit (%)	.023	.318	-.123 - .170	0.70
	eGFR (ml/min/1.73 m2)	-.034	-1.46	-.081 - .012	0.20
Appearance	Intercept	10.6	2.59	2.507 - 18.80	0.005
	BMI (kg/m2)	.441	3.170	.165 - .718	0.005
	Fasting blood glucose (mg/dL)	.008	.506	-.025 - .041	0.60
	Haematocrit (%)	.014	.160	-.157 - .184	0.90
	eGFR (ml/min/1.73 m2)	-.019	-.710	-.073 - .035	0.50
Emotions	Intercept	28.8	4.21	15.26 - 42.42	0.001
(R^2 =0.13)	BMI (kg/m2)	.485	2.08	-.024 - .946	0.005
F= 2.7	Fasting blood glucose (mg/dL)	-.020	-.736	-.075 - .035	0.40
	Haematocrit (%)	-.237	-1.65	-.520 -.047	0.10
	eGFR (ml/min/1.73 m2)	-.066	-1.46	-.157 - .024	0.14

R^2 (R-Squared) explains model strength; F, explains the overall significance of the model.

findings were reported by a study in Indonesia where HRQoL of KTRs were assessed using the World Health Organization's Quality of Life (WHOQoL-BREF) questionnaire. Nearly 62% of their participants aged more than 65 years had poor QoL with a statistically significant difference ($p<0.05$)[21]. This is likely because elderly population experience a greater burden of age-related conditions such as frailty, directly impacting physical symptoms.

Literacy affects an individual's ability to navigate healthcare systems, comprehend medical advice and adhere to prescribed treatments. Low literacy may limit access to health-promoting information and social engagement opportunities, worsening physical and emotional components of HRQoL. Although one-fourth of our study participants had no formal

education, there was no statistically significant association of HRQoL scores with education status amongst the KTRs. Contrary to our findings, studies in Indonesia and Nepal have reported that KTRs with higher education levels have higher HRQoL19,21. The possible reason for this difference in finding could be due to the fact that ours is such a close-knit society that even if the KTR does not have formal education, his/her family and social support ensure that he/she is able to navigate healthcare systems.

We found that our KTR participants with monastic education had the lowest mean scores (3.5±1.0) on the emotional component of HRQoL, indicating that they have better emotional HRQoL. This must be because monks engage in regular meditation practice, which have been shown to reduce stress, improve emotional regulation, and enhance overall mental health[22].

Studies have shown a significant association between the extended period of dialysis received before the transplantation and an increased risk of physical symptoms after transplantation[5,23,24]. Similar finding was reported in our study.

Forty-seven percent of our study participants had received allografts from a non-related donor. Despite the lack of renal transplantation services in the country, living nonrelated donors are eligible to donate their organs after fulfilling the criteria of being genetically, legally or emotionally related to the recipient[25]. Literature states that there is no difference on graft survival or patients' survival rates based on whether the organ donor was related or nonrelated. Factors such as recipients age, donor age, HLA matching, and re-transplants does not impact outcomes[26]. However, our study noted a significant association of HRQoL with uncertainty/fear (p=0.02), physical symptoms (p=0.03) and emotional component (p=0.05) amongst KTRs with non-related donors.

Our study findings indicate that fasting blood sugar, haematocrit and eGFR did not have a statistically significant relationship with HRQoL. Although decreased haematocrit levels and low eGFR are clinical indicators of progressive kidney disease[27], these did not have a statistically significant relationship with HRQoL of KTRs in our study.

CONCLUSION

The study concludes that the overall HRQoL of kidney transplant recipients in Bhutan is low, despite the government's support for kidney transplant surgery and referrals. Factors influencing HRQoL include unemployment, extended periods on dialysis prior to the renal transplant, and receiving kidneys from non-related donors. These findings can assist policy makers in planning interventions to improve the HRQoL with a specific focus on the implicated factors. We recommend conducting a similar study among patients with chronic kidney diseases undergoing haemodialysis.

LIMITATIONS

The study is limited by the recruitment of patients from a single centre. This is evidenced by the recruitment of only 100 of the 130 KTRs in the country, over the study period of seven months. This may have impacted the internal validity, as patients from remote districts, who likely didn't make it to JDWNRH, might have different experiences. This limits the generalizability of the findings to the entire population of KTRs in Bhutan.

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AUTHORS CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

CD: Study design, data collection, and analysis, manuscript preparation

KN: Study design, data collection, and analysis, manuscript revision

TT: Study design, manuscript revision

Authors agree to be accountable for all respects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

None

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