Health Related Quality of Life of Long-Term Kidney Transplantation Recipients

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Background: Health related quality of life (HRQOL) is an important issue for long-term kidney transplantation (KT) patients. Nevertheless, few studies have focused on long-term HRQOL in KT recipients with a functional graft. Thus, the aim of this study is to describe the long-term (10-year) HRQOL of KT recipients.

Methods: This is a cross-sectional and correlational design. The Medical Outcome Survey (MOS SF-36) questionnaire was used to collect data on HRQOL. The data were collected from November 2009 to September 2010 at a medical center in Northern Taiwan.

Results: A total of 88 patients were interviewed. The mean years after transplantation was 14.48 (SD = 3.9). The mean score of each of the HRQOL subscales ranged from 59.4 to 82.5. The mean scores on the bodily pain (BP) subscale were the highest and, on the general health (GH) subscale, the lowest. Compared to the general population, with the exception of the BP subscale, long-term KT patients had a lower mean score (poorer HRQOL) on all subscales. Age, gender, serum creatinine level, and employment status were significantly related to HRQOL.

Conclusion: HRQOL of long-term KT patients was, overall, poorer than that of the general population. When comparing the HRQOL of KT patients with that of the general population, one should take into account age and gender. Finally, the physical, psychological, and social adjustment domains of HRQOL of KT patients warrant further attention.

(Biomed J 2013;36:243-251)

Key words: employment, kidney transplantation, long-term health related quality of life

At a Glance Commentary

Scientific background of the subject

Health related quality of life (HRQOL) is an important issue for kidney transplantation patients as the survival rate has increased. Studies had showed that the short-term HRQOL of KT patients is fair to good. However, the HRQOL of long-term kidney transplantation patients is not clear.

What this study adds to the field

The health related quality of life (HRQOL) of long-term kidney transplantation patients is moderate and poorer than that of the general population. The difference in HRQOL was greater in older patients as compared with the general population. Age, gender, serum creatinine level, and employment status also had a significant relationship with HRQOL.

Kidney transplantation (KT) is a major treatment for end-stage renal disease (ESRD) patients. The number of KTs that have been performed has increased past decade, and the survival rate of graft patients has improved. From 1999 to 2008, the one-year patient survival rate has increased from 94.3% to 96.7%, and the one-year graft survival has increased from 87.5% to 92.1%.[1] According to the Taiwan Bureau of National Health Insurance (2009), among 2,054 kidney graft recipients, from 1997 to 2007, the one-year survival rate was 96%, and the five-year survival rate was 93%.[2] Based on these survival rates, the goal of advanced medical treatment is the promotion of health related quality of life (HRQOL) in these patients.[3-7] HRQOL research takes a wider view of health and considers it a multifaceted concept. This view of HRQOL encompasses the physical, psychological, and social domains of one's well-being

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Received: Nov. 14, 2011; Accepted: Oct. 23, 2012

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DOI: 10.4103/2319-4170.113186

and considers both objective and subjective dimensions of health.[3,8,9]

As noted above, the survival rate of KT patients has increased dramatically during the past decade. Thus, the HRQOL of these patients has become an area of concern for clinicians and researchers. It is hoped that KT patients with a functional graft who have survived beyond the 10-year mark should have HRQOL that is comparable with the general population. If this is not the case, however, then we need to understand the cause. Unfortunately, few studies have focused on HRQOL in such patients. Moreover, an understanding of the HRQOL of long-term KT patients can be taken into consideration in the treatment decision process.[4] Additionally, such an understanding can provide a foundation for pre-transplantation counseling and for developing interventions that respond to patients' needs.[10]

The most commonly used instrument to measure HRQOL is the Medical Outcome Survey-Short Form 36 (MOS SF-36).[8,9] The MOS SF-36 has eight subscales that are used to evaluate physical, mental, and social well-being: Physical functioning (PF), role-physical (RP), bodily pain (BP), general perception of health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH).[11] The MOS-SF questionnaire is a generic health-related HRQOL scale and, thus, can be used for a variety of populations, regardless of the disease diagnosis, as well as for the general population. Thus, it was a suitable instrument for a comparison of subjective HRQOL between a specific disease or treatment group and the general population.[8,12]

Studies that include patients at different post-transplantation stages and that use the MOS SF-36 to measure HRQOL have found that the HRQOL of KT patient was moderate and acceptable. Taken together, the results of these studies showed that the mean score for each of the eight subscales of the MOS SF-36 ranged from 51 to 86 (possible range of 0 to 100). In previous research, higher mean scores were seen for the PF, SF, and BP (indicating no pain-related impact) subscales,[12-14] and the lowest mean scores were seen for the GH and VT subscales.[12-15] A major limitation of these studies, however, was that KT recipients were in different post-transplantation stages, which could have resulted in an under- or overestimate of HRQOL in these patients. As such, these studies do not provide reliable data on HRQOL for long-term KT survivors.

Studies that focus on long-term HRQOL in KT recipients are scarce. Karam *et al*., using a quantitative methodology, examined the HRQOL of 229 KT patients and compared their data with those of the general healthy population.[4] The results indicated that the KT patients had poorer physical health, psychological health, and personal functioning as well as an overall poorer perception of HRQOL than did a healthy population. The exceptions to this were social and role functioning, for which the results were comparable to those of a healthy population. Karam *et al*., were pioneers of research on HRQOL of long-term organ transplant survivors. Their study, however, used a disease-specific tool, "The National Institute of Diabetes and Digestive and Kidney Disease Transplantation Quality of Life Questionnaire," to measure the HRQOL. As such, the patients may have scored lower (poorer HRQOL) in disease-specific domains, which would result in an overestimation of the gap in HRQOL between KT patients and the healthy population. Nevertheless, the generic health-related HRQOL instrument was more suitable for comparison purposes because it was comprised of questions broad enough to be applicable to a wide variety of populations and disease states.[8]

Using the MOS SF-36, Neipp *et al*., studied the HRQOL of 139 kidney transplantation patients who survived beyond 15 years. The results of the MOS SF-36 showed that the mean score for the eight subscales ranged from 51 to 87. The highest score was for the RE subscale, and the lowest scores were for the VT and GH subscales. When compared to the mean scores of the general U.S. population, scores of long-term survivors on the SF, RP, RE, and MH subscales were comparable, but scores on the PH, VT, BP and GH were lower.[16]

Both social and physical factors can influence HRQOL. For example, research has shown that KT patients who are employed have better HRQOL than do those who are unemployed.[13,16] Additionally, KT patients with diabetes had poorer physical function, perceptions of health, and social functioning than did KT patients who did not have diabetes.[16,17] Age and gender also are related to HRQOL, as are graft function and hypertension status.[16,18] Additional research is needed, however, on the relationship between these factors and long-term HRQOL.

In summary, according to the literature, the short-term HRQOL of KT patients is fair to good. The HRQOL of long-term KT patients with a functional graft had been assumed to be comparable to that of the general healthy population. However, the HRQOL of long-term KT patients is not clear because few studies have focused on long-term HRQOL, and the instruments used in HRQOL research have varied, making the results incomparable. Thus, the aim of this study is to describe the long-term HRQOL of KT patients with a functional graft of over ten years through the use of a generic health-related HRQOL instrument.

METHODS

This cross-sectional study used a correlational design. The MOS SF-36 questionnaire was used to collect data on HRQOL. The data were collected at a medical center in Northern Taiwan from November 2009 to September 2010.

Sample

Convenience sampling was used to recruit participants. Patients who had received kidney transplants were recruited. To be included in the study, participants had to (1) have received a kidney transplant before 1998; (2) be at least 18 years old at the time of data collection; (3) have a functional graft; (4) be in stable medical condition; and (5) regularly follow up at the study unit. According to the data provided from the study site, 445 patients had received kidney transplants from 1981 to 1998. Of these patients, 140 fit the inclusion criteria. A total of 88 patients were interviewed during the data collection period (November 2009 to September 2010), yielding a response rate of 62.9%. The reasons for the exclusion of 52 patients were did not return to the clinic, changed follow-up hospital, or had not returned the questionnaire after being reminded. We compared the basic demographic characteristics of participants and non-participants, and the data revealed that there were no significant differences in average of age (years) (49 vs. 50, $p = 0.56$), gender (number of male) (40 vs. 27, $p = 0.57$), mean serum creatinine level (mg/dl)(1.49 vs. 1.36, $p = 0.19$), or average years after transplantation (14.4 vs. 14.7, $p = 0.64$) between these two groups.

Ethical considerations

The study was approved by the research ethics committee of the study site (Institutional Review Board, 98-1465B). Prior to the study, the patients were informed of the purpose of the research. Participants were assured of their right of refusal to participate or to withdraw from the study at any stage. The participants' names were removed from the data.

Study variables and measure

HRQOL was measured by the MOS SF-36, Taiwan version, which was developed to measure physical and mental health as well as general well-being.[11,19,20] The 36-item instrument consists of eight aggregate scales: Physical functioning (PF), role-physical (RP), bodily pain (BP), vitality (VT), general perception of health (GH), social functioning (SF), role-emotional (RE), and mental health (MH). This scale has mainly been used to assess HRQOL in KT patients.[9] The possible range of scores for each subscale is 0 to 100. Higher scores indicate better HRQOL. The Cronbach's α for internal consistency reliability for each of the eight subscales in this study was .65-.90. The demographic and treatment-related data were collected by a questionnaire that concerned demographic data, diabetes mellitus (DM), hypertension, serum creatinine level, immune-suppressant regimens, former and current employment status, and social activity after transplantation.

Data collection

From November 2009 to September 2010, patients who met the inclusion criteria during the outpatient visit were invited to participate in this study. If they agreed to participate, then their written consent was obtained. A self-administered questionnaire was given and was returned immediately when the patient finished answering the questionnaire. A stamped envelope was provided if the patient wanted to finish the questionnaire at home. Clinical data were retrieved from participants' medical records, with their and the study site's permission.

Data analysis

Statistical analyses were performed with SPSS statistical software, Version 17.0 (SPSS, Inc., Chicago, IL). Descriptive statistics (e.g., means, standard deviations, frequencies, percentages) were used to describe the demographic characteristics, disease-related factors, and HRQOL. Independent-sample *t*-tests were used to determine differences in HRQOL based on demographic data. Pearson correlations were used to analyze the relationship between the study variables. One sample *t* -test was used to compare the HRQOL between this study finding and the general population. The multiple linear regression plus forced enter method was used to examine the influential factor of HRQOL.

RESULTS

A total of 88 patients (40 males and 48 females) were included in this study. The mean years after transplantation was 14.48 (SD = 3.9). The mean ages at operation and at the time of the study were 34.6 (SD = 11.0) and 49.1 (SD = 10.5), respectively. The mean serum creatinine level was 1.49 (mg/dl), which indicated that patients had stable renal function. Most participants (n = 78, 95.1%) received a deceased kidney transplantation. Most of the patients were employed at the time of data collection ($n = 57$, 64.8%). Basic demographic data are shown in Table 1.

A total of 12 (13.6%) patients had DM, and 45 (51.7%) had hypertension and needed medication [Table 1]. The most common daily recreational activities were watching television (63.2%), sightseeing (47.1%), and hiking (34.5%) (not shown in the Table). As seen in Table 2, the immunosuppressive therapy was as follows: (1) CNI-based double (n = 27, 31.1%), with 19 cyclosporine and 8 tacrolimus; (2) single regimens (n = 14), with 6 cyclosporine, 2 tacrolimus, 3 mycophenolate mofetil, 2 sirolimus, and 1 steroid; (3) CNI-triple ($n = 20$), with 11 cyclosporine and 9 tacrolimus; (4) CNI-quadruple ($n = 7$), with 3 cyclosporine and 4 tacrolimus; and (5) CNI-free (n = 20). In regard to medication adherence, 33 patients reported that they had adhered, and the other 55 patients (63.2%)

reported that they had forgotten to take their medication.

The results showed that the mean scores of the eight HRQOL subscales ranged from 59.4 ± 21.6 to 82.5 ± 19.1. The scores' high-to-low sequence was as follows: BP, PF, SF, RE, MH, RP, VT, and GH (82.5 ± 19.1, 80.2 ± 21.0, 76.5 ± 18.5, 70.0 ± 40.4, 68.4 ± 16.9, 67.9 ± 40.2, 61.4 ± 17.1 and 59.4 ± 21.6, respectively). The BP subscale had the highest mean score, which indicated that patients were not affected by pain-related distress. The mean score of GH was the lowest, which indicates that patients perceived limitations in their health functioning [Table 3 and Figure 1].

Table 1: Demographic data as seen in the study (*N*=88)

Item	Category	*n*	%	Mean	SD
Age				49.1	10.5
Age at KT				34.6	11.0
Years after KT				14.8	3.9
Creatinine				1.5	0.8
Social activity				3.8	1.8
Gender	Male	40	45.5		
	Female	48	54.5		
Religion (*n*=86)	No	25	29.1		
	Yes	61	70.9		
Marital status	No	22	25.0		
	Yes	66	75.0		
Education	Elementary School	13	14.8		
	Junior High School	12	13.6		
	High School	35	39.8		
	College	10	11.4		
	University	16	18.2		
	Graduated University	2	2.3		
Job status	No	31	35.2		
	Yes	57	64.8		
Job type (*n*=56)	Officer	10	11.4		
	Worker	13	14.8		
	Business	9	10.2		
	Farmer	2	2.3		
	Service	18	20.5		
	Free	4	4.5		
Unemployed	No work pre-operation	7	22.6		
	Retired	12	38.7		
	Student	2	6.4		
	Housework	10	32.3		
Method (*n*=82)	Living	4	4.9		
	Cadaver	78	95.1		
Adherence	No	55	63.2		
	Yes	33	36.8		
DM	Yes	12	13.7		
	No	76	86.3		
Hypertension	Yes	45	51.1		
	No	43	48.9		

Abbreviations: SD: Standard deviation; KT: Kidney transplant; DM: Diabetes mellitus

Table 2: Current immunosuppressant regimen as seen in the study

Item	*n*	%
Single	14	15.9
CNI-based double	27	30.7
CNI-based triple	20	22.7
CNI-based quadruple	7	8.0
CNI-free	20	22.7

We used the results of the Tseng, Lu, and Tsai (2001) national health database study for comparison purposes.[19] In Tseng *et al*.'s study, 17,515 healthy Taiwanese males and females, age 12 and above, served as participants. The data showed that the mean scores of eight subscales of the total sample ranged from 68.2 to 92.2. The PF subscale had the highest score and the VT subscale the lowest [Table 3 and Figure 1]. A one-sample *t*-test was used to compare the differences between the findings of our study and for the general population (Tseng *et al*.'s study).

Our long-term KT patients, in comparison to the general population, had significantly lower mean scores on seven subscales: PF (80.2 vs. 92.2), RP (67.9 vs. 83.6), GH (59.4 vs. 69.2), VT (61.4 vs. 68.2), SF (76.5 vs. 86.8), RE (70.0 vs. 79.4) and MH (68.4 vs. 73.0). This indicates that the HRQOL of long-term KT patients was poorer than that of the general population. Mean scores on the remaining subscale, BP, were similar to those of the general population (82.5 vs. 84.8) [Table 3]. Female long-term KT recipients had significant lower mean scores for PF (76.2 vs. 90.5), RP (67.7 vs. 80.9), GH (58.5 vs. 67.0), VT (58.7 vs. 65.6), and SF (77.3 vs. 85.7) than did females in the general population. This indicates that female long-term KT recipients had mean scores on the BP, RE, and MH subscales that were comparable to those of the general female population. Additionally, males had significantly lower mean scores on the five subscales of PF, RP, GH, VT, and SF. These data indicated that, whether female or male, long-term KT recipients experience more limited well-being in terms of

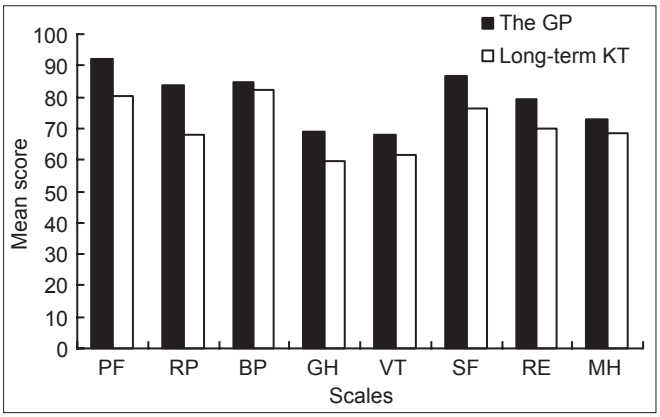

Figure 1: The mean score of quality of life subscales as seen in the study.

physical functioning, role functioning, health perceptions, vitality and social functioning [Table 4].

In terms of age-related comparisons, our study had very few participants in the age ranges of 12-17, 18-24, 25-34, and 65 years and older. Thus, we focused on three age groups: 35-44, 45-54, and 55-64 years, as shown in Table 5. There was no significant difference between the two groups except for the mean score on RE (95.5 vs. 82.2); our sample had significantly higher scores on RE than did the general population in the 35-44 age group. This indicates that long-term KT recipients in this age group have a HRQOL that is comparable to that of the general population. Patients in the 45-54 age group had lower mean scores on the PF (81.7 vs. 92.4) and SF (80.5 vs. 88.1), as compared to the general population. Patients in the 55-54 age group not only had lower mean scores on the PF (71.2 vs. 84.5) and SF (67.5 vs. 84.3) but also had lower scores on the RP (50.0 vs. 72.8) and RE (50.6 vs. 78.6) subscales. As shown in Table 5, HRQOL seems to decrease as age increases in both groups. In addition, the differences between long-term KT patients and the general population became more pronounced as both populations increased in age.

Pearson correlations and independent-sample *t*-tests were used to examine the relationships among study variables and the HRQOL. The results showed that age was negatively correlated with scores on the PF, RP, and

Table 3: Score on the medical outcome survey quality of life scale

	PF		RP		BP		GH		VT		SF		RE		MH	
	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*
The GP (*n*=17515)	92.2± 16.1	0.00**	83.6± 33.2	0.00**	84.8± 19.4	0.28	69.2± 21.2	0.00**	68.2± 18.6	0.00**	86.8± 17.1	0.00**	79.4± 36.7	0.03*	73.0± 16.5	0.01*
Long-term KT (*n*=88)	80.2± 21.0		67.9± 40.2		82.5± 19.1		59.4± 21.6		61.4± 17.1		76.5± 18.5		70.0± 40.4		68.4± 16.9	

Abbreviations: PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health perception; VT: Vitality; SF: Social function; RE: Role-emotional; MH: Mental health; M±SD: Mean±standard deviation; *p<0.05; **p<0.01

Table 4: The health related quality of life of long-term kidney transplantation recipients and general population by gender

Gender	Group	PF		RP		BP		GH		VT		SF		RE		MH	
		M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±D	*p*
Female	GP (*n*=8844)	90.5± 17.3	0.00**	80.9± 35.3	0.03*	82.1± 20.3	0.54	67.0± 21.9	0.02*	65.6± 19.2	0.01*	85.7± 17.4	0.01*	77.5± 37.3	0.19	70.9± 16.8	0.13
	Long KT (*n*=48)	76.2± 25.1		67.7± 40.2		80.3± 20.0		58.5± 23.4		58.7± 18.2		77.3± 19.4		69.4± 42.8		66.9± 18.0	
Male	GP (*n*=8651)	93.9± 14.6	0.00**	86.4± 30.7	0.01*	87.9± 18.0	0.36	71.5± 20.2	0.01*	70.9± 17.9	0.01*	87.8± 16.5	0.00**	81.2± 34.6	0.09	75.0± 15.9	0.06
	Long KT (*n*=40)	85.1± 13.4		68.1± 0.8		85.2± 17.8		60.5± 19.5		64.6± 15.3		75.6± 17.6		70.8± 37.8		70.2± 15.5	

Abbreviations: PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health perception; VT: Vitality; SF: Social function; RE: Role-emotional; MH: Mental health; *p<0.05; **p<0.01

Table 5: The health related quality of life of long-term kidney transplantation recipients and general population in three age groups

Age Gp (Years)	Group	PF		RP		BP		GH		VT		SF		RE		MH	
		M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*	M±SD	*p*
35-44	GP (*n*=3500)	95.5± 10.5	0.31	87.6± 29.9	0.55	85.5± 18.2	0.05	70.9± 19.9	0.55	68.8± 18.2	0.29	88.2± 15.4	0.16	82.2± 33.9	0.01*	73.5± 16.4	0.32
	Long KT (*n*=15)	91.3± 15.1		91.6± 26.1		91.2± 9.6		67.6± 20.2		63.3± 19.2		82.5± 14.7		95.5± 17.2		68.5± 18.7	
45-54	GP (*n*=2866)	92.4± 13.6	0.01*	83.8± 32.7	0.08	83.8± 19.7	0.60	66.6± 21.2	0.27	68.1± 18.9	0.19	88.1± 16.1	0.01*	82.3± 34.0	0.36	74.0± 17.5	0.25
	Long KT (*n*=34)	81.7± 18.3		72.0± 38.3		81.9± 20.8		62.7± 19.8		64.1± 17.4		80.5± 16.6		76.4± 37.1		70.4± 17.6	
55-64	GP (*n*=1663)	85.4± 19.1	0.02*	72.8± 40.5	0.02*	79.2± 21.7	0.74	59.5± 22.5	0.32	63.8± 20.3	0.02	84.3± 19.2	0.01*	78.6± 37.9	0.01*	71.6± 18.0	0.23
	Long KT (*n*=25)	71.2± 27.4		50.0± 44.4		77.7± 21.9		54.4± 24.8		58.4± 16.6		67.5± 21.3		50.6± 46.2		67.2± 17.7	

Abbreviations: PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health perception; VT: Vitality; SF: Social function; RE: Role-emotional; MH: Mental health; *p<0.05

BP subscales ($r = -0.25$, $p = 0.021$; $r = -0.21$, $p = 0.047$; $r = -0.22$, $p = 0.04$, respectively). The serum creatinine data were negatively correlated with scores on the RP, GH, and SF subscales ($r = -0.28$, $p = 0.009$; $r = -0.26$, $p = 0.019$; $r = -0.33$, $p = 0.002$, respectively). Female patients had a lower mean score on the PF than did male patients (76.2 vs. 85.1, $p = 0.038$). Comparing to unemployed patients, patients who were employed had better mean scores on the PF (83.7 vs. 73.8, $p = 0.034$), RP (76.3 vs. 52.4, $p = 0.013$), GH (63.6 vs. 51.6, $p = 0.012$), RE (78.3 vs. 54.8, $p = 0.016$), and MH subscales (71.6 vs. 63.3, $p = 0.039$). Patients with or without DM and hypertension did not differ in terms of HRQOL. Marital status and religious belief also were not related to HRQOL. The results are shown in Tables 6 and 7.

To examine the influential factor of HRQOL, the independent variables that were significantly correlated with HRQOL were entered into the multiple regression model. The significant level was set at 0.05. The issue of multicollinearity was examined and assured. The results of regression were shown in Table 8. Age had negative influence on the PF (beta = −0.28), RP (beta = −0.25), BP (beta = −0.28), and RE (beta = −0.21) subscale respectively. It indicated that with age increasing the four subscales of HRQOL will decrease. Serum creatinine also had negative influence on the RP (beta = −0.25), BP (beta = −0.21), GH (beta = −0.23), and SF (beta = −0.33) subscales. While employed patients had better score of RP (beta = 0.20), GH (beta = 0.22), RE (beta = 0.23), and MH (beta = 0.24) subscales, male recipients had better PF (beta = 0.27) subscale. However, no influential factors were found to associate with the VT subscale. The results were shown in the Table 8.

In summary, the HRQOL of long-term KT patients is poorer than that of the general population, except in regard to bodily pain (BP subscale). In terms of gender, male long-term KT patients had poorer HRQOL than did the female recipients. Older long-term KT patients also did not have a HRQOL comparable to that of their peers in the general population. Finally, recipients with poorer graft function and who were unemployed also had poorer HRQOL.

Table 6: Correlations of age, creatinine, and the eight subscales of health related quality of life (n=88)

	PF	RP	BP	GH	VT	SF	RE	MH
Age	–0.25*	–0.21*	–0.22*	–0.10	–0.05	–0.18	–0.16	0.05
Creatinine	–0.16	–0.28*	–0.21	–0.26*	–0.10	–0.33**	–0.19	–0.19

Abbreviations: PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health perception; VT: Vitality; SF: Social function; RE: Role-emotional; MH: Mental health; *p<0.05; **p<0.01

DISCUSSION

Our study participants had the highest mean scores for the BP subscale, which indicated that their HRQOL was not affected by their perception of pain, while the lowest scores were seen on the GH subscale. These findings were similar to those of Neipp *et al*. The major difference was seen in scores on the BP subscale. Our finding revealed that patients felt most satisfied about their not being in pain. The may be

Table 7: Differences in the eight subscales of health related quality of life for demographic factors and morbidity

Variable	PF	RP	BP	GH	VT	SF	RE	MH
	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD
Job								
No (n=31)	73.8±24.7*	52.4±44.4*	79.8±18.6	51.6±22.8*	56.9±18.3	75.0±20.1	54.8±45.9*	63.3±19.2*
Yes (n=57)	83.7±17.9	76.3±35.4	84.0±19.4	63.6±19.9	63.8±16.1	77.4±17.7	78.3±34.7	71.6±15.0
Gender								
Female (n=48)	76.2±25.1*	67.7±40.2	80.3±20.0	58.5±23.4	58.7±18.2	77.3±19.4	69.4±42.8	66.9±18.0
Male (n=40)	85.1±13.4	68.1±40.8	85.2±17.8	60.5±19.5	64.6±15.3	75.6±17.6	70.8±37.8	70.2±15.5
Marital								
No (n=22)	81.5±20.8	63.6±42.7	85.7±16.2	61.8±22.4	60.4±18.9	77.8±16.7	77.2±36.2	68.1±19.3
Yes (n=66)	79.8±21.2	69.3±39.6	81.5±20.0	58.6±21.5	61.7±16.6	76.1±19.2	67.6±41.7	68.4±16.2
Religion								
No (n=27)	85.4±18.8	62.0±41.5	84.9±21.3	58.5±20.3	64.0±17.0	75.5±16.3	66.6±44.0	67.6±19.4
Yes (n=61)	79.0±21.4	70.9±39.3	81.2±18.2	60.7±21.9	61.2±16.6	77.4±19.4	71.5±39.3	69.6±14.7
DM								
No (n=76)	81.7±17.7	68.0±39.3	81.9±19.9	59.7±20.6	61.0±16.4	76.3±18.3	72.0±39.5	67.8±17.3
Yes (n=12)	71.2±17.9	66.6±49.2	85.8±14.5	55.8±28.4	62.5±22.2	77.0±21.2	61.1±46.7	71.6±15.6
HT								
No (n=43)	83.5±14.9	66.0±40.5	81.1±19.6	61.8±24.0	64.4±18.3	77.0±20.0	69.0±41.9	68.5±17.4
Yes (n=45)	77.2±25.3	69.4±40.9	83.7±19.0	56.8±19.2	58.3±15.6	75.8±17.3	71.8±39.5	68.2±16.8

Abbreviations: PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health perception; VT: Vitality; SF: Social function; RE: Role-emotional; MH: Mental health; *p<0.05

Table 8: Influential factors of the eight subscales of health related quality of life (*n*=88)

Variable	PF	RP	BP	GH	VT	SF	RE	MH
	beta, *p*	beta, *p*	beta, *p*	beta, *p*	beta, *p*	beta, *p*	beta, *p*	beta, *p*
Age	–0.28, 0.01*	–0.25, 0.02*	–0.28, 0.01*	–0.03, 0.74	–0.02, 0.86	–0.16, 0.14	–0.21, 0.05*	0.08, 0.46
creatinine	–0.15, 0.14	–0.25, 0.01*	–0.21, 0.05*	–0.23, 0.04*	–0.08, 0.43	–0.33, 0.003**	–0.15, 0.13	–0.16, 0.13
Job (1=yes)	0.13, 0.21	0.20, 0.05*	–0.01, 0.90	0.22, 0.05*	0.16, 0.16	–0.03, 0.75	0.23, 0.03*	0.24, 0.02*
Gender (1=men)	0.27, 0.01**	0.07, 0.46	0.19, 0.07	0.03, 0.75	0.16, 0.15	–0.02, 0.80	0.07, 0.45	0.10, 0.32
Adjusted R^2	0.15	0.17	0.09	0.07	0.01	0.09	0.12	0.06
F	4.64	5.38	3.14	2.74	1.38	3.09	3.89	2.45
p	0.002**	0.001**	0.02*	0.03*	0.24	0.20*	0.006**	0.05*

Abbreviations: PF: Physical function; RP: Role-physical; BP: Bodily pain; GH: General health perception; VT: Vitality; SF: Social function; RE: Role-emotional; MH: Mental health; *p<0.05; **p<0.01

because our study participants were younger than those in the Neipp *et al*., study (mean age 49 vs. 55 years). Younger individuals may experience or report less pain prevalence or a lower severity of pain.[16]

Our results also showed that long-term KT patients had poorer scores on all of the subscales except the BP subscale, as compared to the scores of the general Taiwanese population. These findings partially supported those of Neipp *et al*.[16] They found that mean scores on four subscales, PF, BP, GH, and VT, were poorer than the scores of the general U.S. population. As noted, our findings for the BP subscale were different from those in Neipp *et al*.'s study. The different characteristics of study populations may have caused these differences. Therefore, when we consider differences in HRQOL among studies, we should look at each of the domains of HRQOL rather than the global score for HRQOL. In summary, the results of both our study and of Neipp *et al*.'s revealed that there was a need for the improvement of HRQOL in the physical, psychological, and social adjustment domains for long-term KT patients.

The results also suggest that, when comparing HRQOL between the general population and long-term KT patients, one should consider gender and age. The results showed that, when gender was considered, the mean scores for KT patients on the PF, RP, GH, VT, and SF subscales were significantly lower than those of the general population. In Tseng *et al*.'s study, the data for the general healthy male population indicated that they had a higher HRQOL than did male KT patients.[19] Thus, there were clear differences in HRQOL between male long-term kidney transplantation patients and males in the general healthy population. Cornella *et al*., also found that male KT recipients reported more limitations, as compared with the general male healthy population, for the subscales of SF, BP, VT and GH.[18]

Patients who received kidney transplantation more than 10 years prior and who were in the age group of 55-64 years scored lower on the four subscales PF, RP, SF, and RE than did the same age group of the general healthy population. These lower scores were due to the impact of physical functioning and emotional stress on role performance and social function. These results support those of a previous study that investigated HRQOL among KT patients who received a kidney at 60 years old or above. The results on the MOS SF-36 showed that patients older than 60 years had poorer social function, more pain perception, poorer health perception, and poorer vitality as compared to the general population.[18] This may be due to the fact that, although physical functioning may improve after kidney transplantation, the subjective perception of HRQOL remained the same or even poorer because the patients might still have been affected by another chronic illness.[18]

Patients in the age group of 35-44 years had scores that were similar to those in the same age group in the general healthy population. The reason may be that the improvement of physical functioning may be more noticeable in younger patients, which then may result in a smaller gap between KT patients and general population. This result also provides justification for transplantation to be undertaken in young ESRD patients as a means to effectively improve HRQOL.

The prevalence rate of DM in our study was 15%, which is similar to that of other studies.[15,17,21] DM is a major morbidity after kidney transplantation and, as such, warrants attention. Hypertension also is a common morbidity after kidney transplantation. The prevalence of hypertension in this study was 51.7%, which is similar to that found in other studies.[22] Nevertheless, DM and hypertension did not show a significant influence on HRQOL. This result differs from that of previous studies that show that patients with DM or hypertension will have poor HRQOL.[16,17] DM and hypertension are often correlated with high-dose immune-suppressant treatment, steroid treatment, or patient age. Moreover, our study did not collect data on the severity of these diseases. If the severity was low, the diseases may not have had a significant impact on the subjective perception of HRQOL. This is another area that warrants further study.

Nearly 60% of our sample was employed, a percentage that is higher than seen in the previous research. In the Neipp *et al*., study, only 29% of patients were employed.[16] Raiz and Monroe also found that only 50% of 411 kidney

transplant recipients were employed after transplantation.[23] In addition, van der Mei *et al*., in a systemic review, found the rate of employment of kidney transplantation patients to range from 18-82% (each study had different definition of employment).[24] However, the latter two studies did not focus on long-term KT patients. This may be because patients with a long-term functional graft and stable health condition have the energy needed for employment. This argument will need to be further investigated, however. Our study also found that employed patients had better HRQOL, particularly in terms of physical and role functioning, than did unemployed patients.[13,16,25] However, the association between employment and PF subscale was not significant statistically in multivariate analysis. The ability to work is a major aspect of HRQOL, as it can indicate one's ability to fulfill role functions and demands, leading to an increase in one's self-esteem. Moreover, employment provided resources for economic support and social networks.[13,16]

The majority of study participants received a deceased donor transplantation. This was due to the time that the kidney transplantation was performed. The first kidney transplantation patient of the study site received a kidney in 1981.[26] The number of living donor kidney transplantations has not increased since then. Deceased organs were the major source for kidney transplantations from the 1980s through the 1990s.

Van der Mei *et al*., found that recreation, leisure activity, and unpaid work can increase the social participation of kidney transplantation patients. Thus, these activities have been suggested by van der Mei *et al*., to be included as indicators of social function recovery.[27] The major type of recreation for our participants was static recreation, e.g., watching television. Some patients, however, reported traveling and hiking as recreational activities. Gordon *et al*., who studied 88 kidney transplantation patients, also found that the patients tend to engage in more static activity after receiving a transplant.[28] This may be due to a decrease in exercise endurance and muscle strength.

Adherence to the immune-suppressant regimen was most important to graft patient survival.[29,30] However, nearly 60% of our participants reported forgetting to take their medication. This was higher than what was seen in a meta-study that showed a non-adherence rate of 35.6% in kidney transplant recipients.[30] In the present study, non-adherence may have been overestimated because all that was asked was whether patients forgot to take their medication. In addition, previous research has shown that forgetting is a major factor in regard to medication non-adherence.[31] The problem may be caused by poor memory or interference from daily trivial matters rather than from patient intent to non-adhere.

CONCLUSIONS

Using the MOS SF-36, we found the HRQOL of kidney transplantation patients to be moderate. Well-being, in terms of the physical domain, was good, but patients had a perception of generally poor health. The mean scores for HRQOL of long-term KT patients were poorer than those of the general population, except for scores on the BP subscale. The difference in HRQOL was greater in older patients as compared with the general population. Age, gender, serum creatinine level, and employment status also had a significant relationship with HRQOL.

The results suggest that healthcare professionals should continue to improve the health status of KT patients. This will not only increase their physical well-being but also can mitigate the limitations of role functions and then can increase the physical domain of HRQOL. Notably, the social function domain of HRQOL among KT patients has not received sufficient attention. Healthcare professionals should work with professionals in other disciplines such as vocational rehabilitation to develop programs for vocational training, social activities, and volunteer participation to improve patients' social functioning domain of HRQOL. The skills needed for psychological and emotional adjustment, along with those for self-care, should be included in the post-transplantation education protocol as a means to help patients to cope with negative feeling and stress, which will lead to improvement in the psychological domain of HRQOL.

In the present study, DM and hypertension did not show a significant impact on HRQOL. These diseases, as related to KT patients, warrant further research. It is useful to continue monitoring the extent and the impact of DM and hypertension among KT patients. Employed patients had better HRQOL than did unemployed patients, and employment was an indicator of social function. Thus, KT patients should be encouraged to keep their jobs or to return to the workforce.

Limitations

Although the response rate was over 60%, and the analysis indicated that the sample was fairly representative of the all kidney transplantation patients in the study unit, the generalizability of the results is limited due to the small sample, and its being drawn from only one study site. A larger-scale study is recommended to gather more data on long-term kidney transplantation patients' HRQOL. This study used a cross-sectional design, so it could not show the trajectory of change in HRQOL. As such, a longitudinal study is recommended.

Our study asked long-term KT patients only whether they forgot to take their medication. Although it was not the main purpose of this study, this method was used simply to reveal the full context of medication non-adherence.

Multiple methods that include serum drug level monitoring and electronic monitoring are suggested for future study as a means to investigate the relationship between medication adherence and HRQOL in long-term KT patients.

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