

What Factors Really Matter? Health-related Quality of Life for Patients on Kidney Transplant Waiting List

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Abstract

Introduction: Waiting times for kidney transplant are long in Singapore. Health-related quality of life (HRQoL) of patients might be affected as a result of the stress of the long wait and the uncertainty of being called to undergo a surgical operation. This study aimed to measure the HRQoL of patients on the kidney transplant waiting list and to identify factors which could impact on the HRQoL scores in this group of patients. **Materials and Methods:** This was a cross-sectional study of kidney transplant waiting list patients managed at a tertiary renal unit using the SF-36. A SF-36 normative calculator was used to generate HRQoL scores for the Singapore general population matched with the study cohort's age, gender and ethnicity. **Results:** There were 265 respondents with a response rate was 81%. Our study shows that HRQoL scores for the kidney transplant waiting list patients were lower than the population norms across all subscales and were clinically significant for General Health, Role Physical, Bodily Pain, Social Functioning and Mental Component Summary scores. Factors such as being Chinese, married, employed and undergoing haemodialysis predicted better HRQoL scores after adjusting for possible confounders. Age, gender, educational level, household income, history of kidney transplant, duration on the transplant waiting list and years on dialysis did not significantly influence SF-36 across all subscales scores. **Conclusion:** Kidney transplant waiting list patients had worse HRQoL compared to the general population. Factors such as ethnicity, marital status, employment status, and type of dialysis treatment significantly influenced patients' perception of their HRQoL.

Ann Acad Med Singapore 2013;42:657-66

Key words: Dialysis, Kidney failure patients, SF-36

Introduction

Singapore has the fifth highest incidence of kidney failure in the world, with about 750 people being diagnosed with kidney failure every year.^{1,2} Kidney transplantation is generally accepted as the best treatment option as it provides survival advantages³ and is a cost-effective option available.⁴ However, waiting times before actual transplant are long with an average waiting time of 7 years.⁵ This waiting period is clinically impactful, and negative feelings might be evoked as a result of the stress of the long wait, the uncertainty of being called to undergo a surgical operation as well as the fear of transplant rejection or wondering how long the graft will last.

Emerging research suggests that health-related quality

of life (HRQoL) of patients on renal replacement therapy can predict their future morbidity and mortality.⁶ This could be due to its multifactorial construct that describes individuals' perceptions of physical, psychological and social functioning.⁷ However, most published studies only examined the HRQoL of general kidney failure patients without specifically measuring the HRQoL for patients on kidney transplant waiting lists. Among these studies, Fukuhara et al reported that haemodialysis patients on 3 continents, consisting of the United States, 5 countries in Europe (France, Germany, Italy, Spain, and the United Kingdom) and Japan, had much lower scores in all generic HRQoL subscales than their respective population norm values.⁸ Furthermore, Karaminia and colleagues found that

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psychological disorders are prevalent among end-stage renal disease patients⁹ and being on the waiting list itself for a transplant was found to cause symptoms of anxiety, fear of surgery, emotional problems, and alterations in mental health among liver failure patients.¹⁰

The studies published on the quality of life of patients on kidney transplant waiting lists have limitations in that they were not written in the English language,¹¹ did not report the analysis of scores for the different domains of HRQoL¹² or did not measure the HRQoL of the patients.¹³ Nonetheless, from these studies, patients on kidney transplant waiting lists reported less satisfaction with their life than those patients who were not in the waiting list.¹² Patients awaiting a cadaveric donor have been reported to have a greater risk for anxiety and more severe depressive disorders than patients with an available living-related donor.¹¹ In contrast, Diaz-Dominguez et al reported that the patients on the kidney transplant waiting list had better perception of quality of life as compared to heart and liver failure patients in the transplant waiting list¹⁴ and another study in Japan demonstrated comparable HRQoL of patients awaiting kidney transplant to transplant recipients.¹⁵ These 2 studies, however, were limited by their relatively small sample sizes of patients on the transplant waiting list, only 44 and 49 patients respectively. Furthermore, both studies did not examine the impact of socio-demographic and other relevant factors on the HRQoL of these patients.

Socio-demographic factors (for examples, age, gender, educational level, ethnicity, employment status)^{16,17} and type of dialysis treatment (for example, peritoneal dialysis versus haemodialysis)¹⁸ play an important role in influencing HRQoL of patients. We further hypothesised that duration on dialysis, duration on the transplant waiting list and history of transplant experience might also play important roles in influencing HRQoL. With the standard of healthcare in Singapore being comparable with other developed countries,^{19,20} it is now timely to understand and identify the factors that could impact on the HRQoL of kidney failure patients on the transplant waiting list in order to develop a more holistic approach in managing and improving the well-being of these patients.

Our study sought to: (i) measure the HRQoL of dialysis patients on the kidney transplant waiting list, (ii) compare the HRQoL of the study cohort with that of a matched general population through the use of the Study Short Form 36-Item Health Survey (SF-36) normative calculator; and (iii) identify factors which could impact on the HRQoL of kidney failure patients on the transplant waiting list.

Materials and Methods

This was a cross-sectional study performed on patients

with kidney failure on the transplant waiting list from May 2009 to September 2009. Experienced research nurses were trained to conduct the survey in this study. Kidney failure patients on the transplant waiting list were recruited from a tertiary renal unit in Singapore. Potential patients received a letter to inform them of the upcoming study. Informative posters were also put up in dialysis centres to invite eligible patients to participate in the study. Respondents needed to be older than 21 years. The study was approved by the SingHealth Centralised Institutional Review Board and the survey was conducted after obtaining informed consent from participants. Information assessing demographic, socioeconomic and other information related to the duration and management of chronic kidney disease was also collected through the survey for all participants.

Instrument

The SF-36 is a widely used generic self-reported quality-of-life assessment instrument to estimate HRQoL of patients with kidney failure.²¹ It consists of 8 multi-item subscales that evaluate various aspects of physical and psychological functioning and well-being, each ranging from 0 to 100 with higher scores indicating better health. These subscales are: (i) Physical Functioning; (ii) Role-physical; (iii) Bodily Pain; (iv) General Health Perceptions; (v) Vitality; (vi) Social Functioning; (vii) Role-emotional; and (viii) Mental Health. In addition, the 8 subscales are aggregated into 2 summary measures: Physical Component Summary (PCS) and Mental Component Summary (MCS) scales.¹⁷ The scores for the 8 subscales of the SF-36 were calculated using QualityMetric's QM Certified Scoring Software 2.0™. The calculation of country specific PCS and MCS scale scores for Singapore used in this study were obtained from Thumboo et al¹⁷ using the method recommended by the developers of the SF-36.²² The SF-36 questionnaires were registered and provided by QualityMetric Incorporated.

A SF-36 normative calculator was used to generate HRQoL scores for the Singapore general population matched with the study cohort's age, gender and ethnicity. The calculator was developed by Yeo MHM et al²³ based on the raw data from a Singapore population-based study²⁴ to compute mean SF-36 subscales scores for the Singapore general population with known ethnic, gender and age characteristics. The use of the calculator enables minimal need to recruit normal controls to compare against for Singapore HRQoL studies using the SF-36.²³

Statistical Methods

Analyses included means and standard deviations for the crude baseline scores. All SF-36 subscales scores were tested for their normal distributions. Independent-samples

t-test or Kruskal Wallis tests were used as appropriate.

In the multivariate analysis, all variables were coded as dichotomous variables, with the exception of age being treated as a continuous variable. Each subscale from SF-36 was used as the dependent variable in a separate linear regression model (that is, a total of 10 models, 8 from the SF-36 subscales and 2 from the summary scales). Colinearity was checked for the tolerance measure, which gives the strength of the linear relationships among the independent variables, with values above 0.4 considered acceptable.²⁵ Statistical analyses were performed using SPSS17 software (SPSS Inc. Chicago). Statistical significance for all tests was set at 5%. Minimal clinically significant difference for the SF-36 is defined as mean differences greater than 5 points for scales score and greater than 3 points for summary scores.²⁶

Results

Patient Characteristics

A total of 265 patients participated in the study. The response rate was 81%. The mean age of the study cohort was 47.8 ± 8.0 years (median = 49 years; range, 21 to 60 years) with 55.5% being female. The study cohort was predominantly Chinese (78.1%), employed (58.9%), married (72%) and had at least secondary school education (65.3%). Additional socio-demographic information is displayed in Table 1.

HRQoL Scores

A. Univariate Analysis

The Kolmogorov-Smirnov test showed normal distribution of SF-36 scales scores; hence, parametric test, i.e. independent-samples T-test was used in the analyses. Table 2 shows the SF-36 mean subscales scores of the kidney transplant waiting list by patient characteristics. HRQoL scores for patients on the kidney transplant waiting list were lower than the population norm in all 8 subscales and the 2 summary scores. The worst subscale score for patients on the kidney transplant waiting list when compared to the general population, in terms of the highest mean difference, was General Health (mean score = 56.3 ± 17.9 ; mean difference = 12.7). This was followed by Role-physical (mean score = 72.9 ± 26.6 ; mean difference = 10.5), Social Functioning (mean score = 75.9 ± 22.7 ; mean difference = 7.1), Bodily Pain (mean score = 74.5 ± 24.7 ; mean difference = 6.1) and Mental Component Summary (mean score = 46.2 ± 10.6 ; mean difference = 3.9). Better HRQoL subscales scores were seen among Chinese, male patients, employed patients (versus those who were unemployed, housewives or retirees) and those treated with haemodialysis (versus peritoneal dialysis).

Table 1. Socio-demographic Characteristics of Participants

	Patients on transplant waiting list, number (%)
Number	265
Age (years), mean $\pm$ SD	47.8 ± 8.0
Gender	
Male	118 (44.5%)
Female	147 (55.5%)
Not specified	0
Ethnicity	
Chinese	207 (78.1%)
Malay	42 (15.8%)
Indian	11 (4.2%)
Others	4 (1.5%)
Not specified	1 (0.4%)
Educational level	
Primary education and lower	90 (34.0%)
Secondary education	117 (44.2%)
A level and higher	56 (21.1%)
Not specified	2 (0.8%)
Household income	
Less than S\$1000 monthly	64 (24.2%)
S\$1000 to less than S\$2000	93 (35.1%)
S\$2000 to less than S\$5000	79 (29.8%)
S\$5000 or more	20 (7.5%)
Not specified	9 (3.4%)
Marital status	
Married	191 (72%)
Single	52 (19.6%)
Divorced/widowed	19 (7.2%)
Not specified	3 (1.1%)
Employment status	
Employed	156 (58.9%)
Housewife or retired	74 (27.9%)
Unemployed	31 (11.7%)
Not specified	4 (1.5%)
Type of dialysis treatment	
Haemodialysis	226 (85.3%)
Peritoneal dialysis	37 (14.0%)
Not specified	2 (0.8%)
Duration on dialysis (years)	
Less than 5 years	118 (44.5%)
5 to 10 years	113 (42.6%)
More than 10 years	33 (12.5%)
Not specified	1 (0.4%)
Duration on the transplant waiting list (months), mean $\pm$ SD	67.48 ± 45.01 (median = 60.0 months; range, 1 to 240 months)

SD: Standard deviation

Table 2. SF-36 Mean Scales Scores of the Kidney Transplant Waiting List by Patient Characteristics

	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Patients on the transplant waiting list (WL) (n = 261)	77.9 ± 19.3	72.9 ± 26.6	74.5 ± 24.7	56.3 ± 17.9	61.6 ± 19.2	75.9 ± 22.7	77.6 ± 23.2	71.5 ± 17.7	49.9 ± 46.2	46.2 ± 10.6
General population (GP)	80.7 ± 24.5	83.4 ± 30.0	80.6 ± 20.3	69.0 ± 16.8	64.2 ± 16.4	83.0 ± 19.4	81.6 ± 33.7	74.1 ± 16.4	51.8	50.1
Difference (WL-GP)	-2.8	-10.5	-6.1	-12.7	-2.6	-7.1	-4.0	-2.6	-1.9	-3.9
Age (years)										
50 and less (n = 149)	79.4 ± 17.5	72.4 ± 27.6	75.3 ± 24.0	55.3 ± 18.4	59.9 ± 20.0	75.0 ± 77.1	77.8 ± 23.1	71.2 ± 18.3	50.3 ± 7.5	45.6 ± 11.2
51 and above (n = 116)	76.0 ± 21.4	73.6 ± 25.2	73.4 ± 25.7	57.5 ± 17.4	63.8 ± 18.0	77.1 ± 22.1	77.2 ± 23.5	71.8 ± 16.9	49.4 ± 7.6	47.0 ± 9.7
Gender										
Male (n = 118)	81.7 ± 15.1*	75.3 ± 23.3	77.9 ± 22.7*	56.2 ± 18.0	62.9 ± 19.5	76.7 ± 20.9	81.6 ± 20.9*	73.0 ± 18.0	51.2 ± 6.1*	46.7 ± 10.9
Female (n = 147)	74.9 ± 21.8*	71.0 ± 28.8	71.7 ± 25.9*	56.3 ± 17.9	60.6 ± 19.0	75.4 ± 24.1	74.4 ± 24.5*	70.3 ± 17.4	48.8 ± 8.3*	45.8 ± 10.3
Ethnicity										
Chinese (n = 207)	79.2 ± 18.4*	74.7 ± 25.6*	77.9 ± 23.4†	55.2 ± 17.3	63.3 ± 19.2*	76.7 ± 22.5	79.7 ± 22.0*	72.9 ± 16.5*	50.6 ± 7.1*	46.7 ± 10.1
Others (n = 57)	72.9 ± 22.0*	66.1 ± 29.2*	61.7 ± 25.2†	59.8 ± 20.1	55.6 ± 18.4*	72.6 ± 23.1	70.2 ± 26.1*	66.8 ± 20.8*	47.1 ± 8.2*	44.2 ± 12.2
Household income level										
Less than S\$2000 (n = 157)	78.8 ± 19.0	72.2 ± 25.4	74.5 ± 25.2	57.3 ± 18.6	61.9 ± 19.5	77.1 ± 22.3	76.4 ± 24.1	69.8 ± 18.8*	49.9 ± 7.2	46.1 ± 10.8
S\$2000 and above (n = 98)	77.8 ± 18.0	74.8 ± 26.9	75.3 ± 23.2	55.2 ± 16.7	62.3 ± 17.7	75.6 ± 21.9	79.7 ± 22.0	75.3 ± 15.0*	50.1 ± 7.6	46.9 ± 9.7
Marital status										
Married (n = 191)	76.9 ± 19.1	72.7 ± 26.6	74.1 ± 24.8	57.0 ± 17.6	62.1 ± 19.7	76.6 ± 21.9	78.2 ± 23.0	72.9 ± 17.7*	49.6 ± 7.5	46.8 ± 10.6
Single/separated/widowed (n = 71)	80.9 ± 19.0	73.7 ± 26.3	76.0 ± 24.1	54.1 ± 18.3	59.9 ± 17.8	74.1 ± 23.6	75.7 ± 23.9	67.4 ± 16.9*	50.8 ± 7.2	44.3 ± 10.0
Educational level										
Primary education and lower (n = 90)	76.2 ± 21.8	74.1 ± 24.5	75.1 ± 23.9	57.3 ± 19.2	61.5 ± 19.8	77.8 ± 20.2	78.1 ± 22.4	69.3 ± 20.1	50.2 ± 6.8	46.1 ± 11.3
Secondary education and higher (n = 173)	78.7 ± 18.0	72.0 ± 27.7	74.3 ± 25.3	55.6 ± 17.3	61.7 ± 19.1	74.7 ± 23.9	77.3 ± 23.8	72.4 ± 16.2	49.7 ± 7.9	46.2 ± 10.3
Types of dialysis treatment										
Haemodialysis (n = 226)	78.8 ± 19.2	74.8 ± 26.2*	76.0 ± 23.5*	57.1 ± 17.5	62.6 ± 18.8	78.2 ± 21.4†	78.3 ± 23.5	71.9 ± 17.4	50.4 ± 7.5*	46.8 ± 10.3*
Peritoneal dialysis (n = 37)	73.9 ± 17.9	63.5 ± 24.7*	66.6 ± 30.0*	51.6 ± 20.0	56.8 ± 20.3	63.2 ± 25.9†	74.1 ± 21.3	70.0 ± 18.4	47.1 ± 6.5*	43.0 ± 11.4*
Employment status										
Employed (n = 156)	81.4 ± 17.0†	77.4 ± 24.5*	78.9 ± 22.1*	57.4 ± 16.4	63.8 ± 18.2*	79.0 ± 21.5*	83.0 ± 21.0†	74.0 ± 16.4*	51.6 ± 6.7†	47.5 ± 9.7*
Unemployed, housewife or retired (n = 105)	72.8 ± 21.4†	66.6 ± 28.0*	68.5 ± 26.9*	55.6 ± 19.0	59.1 ± 20.2*	72.4 ± 23.2*	70.6 ± 24.1†	68.3 ± 19.1*	47.4 ± 8.0†	44.8 ± 11.3*

PF: Physical functioning; RP: Role-physical functioning; BP: Bodily pain; GH: general health; VT: Vitality; SF: Social functioning; RE: Role-emotional functioning; MH: Mental health; PCS: Physical Component Summary; MCS: Mental Component Summary
Values presented as mean ± standard deviation; *P < 0.05; †P < 0.001

Table 2. SF-36 Mean Scales Scores of the Kidney Transplant Waiting List by Patient Characteristics

	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
History of previous kidney transplant										
Yes (n = 27)	80.2 ± 17.1	74.3 ± 20.2	80.7 ± 18.6	57.7 ± 19.5	65.8 ± 19.8	79.6 ± 21.7	76.2 ± 21.5	72.6 ± 19.9	50.3 ± 5.7	48.3 ± 10.9
No (n = 207)	77.5 ± 19.8	72.5 ± 27.3	73.7 ± 25.4	56.3 ± 17.4	60.8 ± 19.5	75.1 ± 22.7	77.1 ± 23.8	71.2 ± 17.9	49.7 ± 7.8	45.9 ± 10.7
Duration on the transplant waiting list (months)										
36 months and less (n = 84)	77.7 ± 19.6	72.4 ± 27.6	75.7 ± 23.6	55.4 ± 16.4	62.6 ± 19.2	74.0 ± 23.1	81.2 ± 22.3	72.1 ± 15.5	50.0 ± 8.0	46.2 ± 10.0
37 months and above (n = 156)	78.5 ± 19.3	73.8 ± 26.3	75.0 ± 25.2	55.2 ± 18.3	61.3 ± 19.4	76.2 ± 22.6	76.1 ± 23.8	71.0 ± 18.4	50.1 ± 7.5	45.9 ± 10.7
Duration on dialysis (years)										
Less than 5 years (n = 118)	77.7 ± 20.0	72.4 ± 27.6	75.4 ± 24.7	55.1 ± 17.5	61.5 ± 20.2	73.8 ± 22.3	78.8 ± 23.4	71.4 ± 17.5	49.9 ± 7.7	45.8 ± 10.9
5 years and above (n = 113)	77.9 ± 18.8	73.1 ± 25.7	73.5 ± 24.8	57.0 ± 18.3	61.6 ± 18.5	77.4 ± 22.9	76.5 ± 23.2	71.4 ± 17.9	49.8 ± 7.3	46.4 ± 10.3

PF: Physical functioning; RP: Role-physical functioning; BP: Bodily pain; GH: general health; VT: Vitality; SF: Social functioning; RE: Role-emotional functioning; MH: Mental health; PCS: Physical Component Summary; MCS: Mental Component Summary

Table 3. Multiple Linear Regression of SF-36 Scales Scores and Related Factors

Predictor variable	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Age (years)	−0.21	0.04	−0.06	0.32	0.13	0.09	−0.08	0.11	−0.07	0.12
Gender										
Male (n = 118)	0	0	0	0	0	0	0	0	0	0
Female (n = 147)	−2.10	4.24	2.21	3.93	2.57	5.10	−0.19	1.76	0.17	2.14
Ethnicity										
Chinese (n = 207)	0	0	0	0	0	0	0	0	0	0
Others (n = 57)	−7.23*	−4.60	−14.08*	5.71	−8.01*	−2.67	−7.80	−6.73*	−2.68*	−2.62
Household income level										
S\$2000 and less (n = 157)	0	0	0	0	0	0	0	0	0	0
S\$2001 and above (n = 98)	−2.21	0.14	−2.38	−3.84	−0.58	−4.60	−0.96	3.77	−0.86	−0.34
Marital status										
Married (n = 191)	0	0	0	0	0	0	0	0	0	0
Single/separated/widowed (n = 71)	−0.78	−3.38	−4.85	−4.18	−5.33	−6.88	−8.83*	−8.20*	−0.97	−4.35*
Employment status										
Employed (n = 156)	0	0	0	0	0	0	0	0	0	0
Unemployed, housewife or retired (n = 105)	−7.60*	−10.24*	−10.26*	−4.67	−4.24	−5.88	−10.82*	−5.04	−3.62*	−2.97
Types of Dialysis Treatment										
Haemodialysis (n = 226)	0	0	0	0	0	0	0	0	0	0
Peritoneal dialysis (n = 37)	6.61	−1.04	−6.92	1.34	4.43*	0.95	1.96	3.83	−0.33	0.78

PF: Physical functioning; RP: Role-physical functioning; BP: Bodily pain; GH: General health; VT: Vitality; SF: Social functioning; RE: Role-emotional functioning; MH: Mental health; PCS: Physical Component Summary; MCS: Mental Component Summary
Values presented as coefficient (β), *P <0.05

HRQoL for the patients on the kidney transplant waiting list was not influenced by age, educational level, a history of kidney transplant, duration on the transplant waiting list or years on dialysis. The subscales scores were not significantly different among groups of patients for the above-mentioned variables stratified according to the categories as detailed in Table 2. All the factors which did not significantly impact on all the SF-36 subscales in the current study were not evaluated further in our multiple linear regression analysis. In correlation analysis, some scales were shown to be significantly correlated with age when age was treated as a continuous variable. Therefore, age was entered into the multiple linear regression model together with the other factors such as gender, ethnicity, household income, marital status, employment status and types of dialysis treatment.

B. Multivariate Analysis

The colinearity check was satisfactory with all the tolerance values above 0.4, indicating no linear relationship among the independent variables. The various factors that significantly influenced the respective SF-36 subscales in the univariate analysis had differing influence on different subscales after adjusting for each other in the multiple linear regression models.

In our multiple linear regression models, age, gender and household income no longer significantly influenced SF-36 scores across all subscales as detailed in Table 3.

Ethnicity remained a significant influencing factor on Physical Functioning, Bodily Pain, Vitality, Mental Health and Physical Component Summary scales with non-Chinese scoring significantly worse. Being married significantly and positively influenced Role-emotional and Mental Component Summary scores.

Employment status significantly influenced all the subscales of the SF-36 in the univariate analysis with the exception of General Health. However, in the multivariate analysis, being employed did not significantly influence scores in Vitality, Social Functioning, Mental Health and Mental Component Summary as well as General Health. Vitality was the only scale that remained significantly associated with higher scores as a result of undergoing haemodialysis as compared to those on peritoneal dialysis.

Discussion

Our study shows that HRQoL scores for patients on the kidney transplant waiting list were lower than the population norms across all subscales and were clinically significant for General Health, Role Physical, Bodily Pain, Social Functioning and Mental Component Summary scores.

This suggests that patients on the kidney transplant waiting list perceive their HRQoL as being worse than that of the Singapore population norm in the areas of limitation in performing physical activities, problems with work or other daily activities as a result of physical health, experiencing bodily pain, interference with normal social activities due to physical or emotional problems and are affected adversely mentally. Our study concurs with existing data that report the negative impact of end-stage renal disease on patients' perceived HRQoL.⁸ In the multivariate analysis, we found factors such as ethnicity, marital status, employment status and type of dialysis treatment significantly influence patients' perceived HRQoL.

Chinese patients had clinically significantly better HRQoL scores in 4 of 8 SF-36 subscales even after adjusting for possible confounding factors. This was consistent with the findings from a population-based study in Singapore where Chinese had the highest scores in most SF-36 subscales as compared with the other ethnicities.¹⁷ The differences in SF-36 scores among different ethnic groups were possibly attributable to differences in unmeasured determinants of HRQoL in terms of culture, identity or minority status²⁷ and may include psychosocial or disease-related factors among ethnic groups.¹⁷

Married patients reported better HRQoL scores than those patients who were single, separated and widowed, suggesting that good support from spouse and children has beneficial effects on HRQoL. This was especially so for mental health, as evidenced by higher scores in the Mental Health and Mental Component Summary scales as well as in reducing limitations in work or other daily activities as a result of emotional problems as evidenced by higher scores for the Role-emotional scale. Family support helps patients in coping and managing the illness, as well as in times of stressful situations.²⁸ Akman et al also reported that a lower percentage of depression was observed among married patients on a renal transplantation waiting list, suggesting that spouses adapt quickly and provide support to their partners.¹²

We also found that being employed significantly improved patients' Physical Functioning, Role-physical, Bodily Pain, Role-emotional and Physical Component Summary scores. This concurred with the findings of Cameron et al that employment is an important factor that can improve quality of life of end-stage renal failure patients.²⁹ Being employed could provide patients social network connections with more positive social and financial support than those who are unemployed. However, it is also possible that those who were still able to withstand the stress of being actively employed could be in a better health as compared to their unemployed counterparts.

There is currently considerable uncertainty and

controversy on the HRQoL of haemodialysis compared with that of peritoneal dialysis patients.^{18,30} A meta-analysis which included 52 studies, 44 haemodialysis groups (30,372 patients) and 20 peritoneal dialysis patient groups (3262 patients), demonstrated that SF-36 scores among haemodialysis patients compared with peritoneal dialysis patients were not statistically significantly different.³¹ However, our study showed that patients who were undergoing haemodialysis reported better HRQoL in all the SF-36 dimensions as compared to those undergoing peritoneal dialysis with Role Physical, Bodily Pain, Social Functioning, Physical Component Summary and Mental Component Summary scales scores being statistically and clinically significantly different in the univariate analysis. Even after adjusting for other possible confounding variables, significantly higher scores in Vitality persisted for the haemodialysis group. This suggests that patients undergoing peritoneal dialysis in the current study feel more tired and worn out as compared to the haemodialysis group. One possible reason for this could be the intensity of the daily dialysis schedule on the peritoneal dialysis group as compared to a 3-times-a-week schedule for patients undergoing haemodialysis.

Previous studies in patients undergoing renal replacement therapies have reported that female patients were more depressed and anxious with lower HRQoL than males.^{12,16} This suggests that there may be social, socioeconomic status, perceptions of life and physiological differences between genders for this phenomenon.³² Our study further supports existing data with male patients scoring better in Physical Functioning, Bodily Pain, Role Emotional and Physical Summary in the univariate analysis. However, these differences were shown not to be statistically significant after adjusting for the other variables in our multivariate analysis. This merits further research to confirm this phenomenon for Singapore or Asian population.

In the multivariate analysis, we found that age was not associated with any of the SF-36 dimensions. While age was not a significant predicting factor for HRQoL in some studies for transplant and dialysis patients,^{16,32} other studies for similar groups of patients have reported that lower HRQoL was observed with increasing age.^{15,33} Abdel-Kader et al reported that increasing age was correlated with higher HRQoL scores in patients with chronic kidney disease.³⁴ Given the mixed evidence regarding age as a predictor of HRQoL scores, further studies are warranted to confirm our observation. Similar to the findings from other studies in patients undergoing renal replacement therapies,^{32,35} no SF-36 subscales scores were influenced by educational level in our study. Likewise, household income was another factor that did not impact on any of the SF-36 dimensions for patients on the transplant waiting list.

Surprisingly, whether one has undergone prior transplantation did not influence the scores in any of the subscales. Previous studies suggest that patients appeared more concerned about their present condition, but remained unconcerned about a previous experience such as rejection and hospitalisation.^{15,33} Likewise, duration on the transplant waiting list and years on dialysis were the other factors that did not exert any influence on all the subscales of the SF-36 in the current study.

There are, however, some limitations to our study. First, information on clinical biomarkers and presence of comorbidities were not captured in our study as no centralised system for capturing such data was available. However, some studies have demonstrated that clinical data such as urea kinetic modeling (Kt/Vurea) level had little or no effect on the majority of HRQoL outcome variables.^{33,36} A study also found that haemoglobin concentration was not correlated with SF-36 subscales scores.³³ Likewise, comorbid conditions did not relate systematically to psychological well-being in a meta-analysis.²⁹ Furthermore, kidney failure patients in Singapore need to undergo stringent selection criteria in order to be listed in the kidney transplant waiting list. Thus, these patients are considered homogenous in many of their clinical statuses.³⁷

Second, a disease-specific instrument was not used in this study although it could be more sensitive in detecting changes in the HRQoL of patients as a result of disease related issues. However, a general HRQoL instrument like the SF-36 was used because it was one of the primary objectives of our study to evaluate the difference in HRQoL of patients on the transplant waiting list as compared with the Singapore population norm. This would not have been possible with the use of a disease-specific instrument.

Third, this was a cross-sectional study of patients from a single tertiary renal unit. Therefore, the results might be limited in their generalisability. However, the patients from this renal unit comprise more than 60% of the total of renal patients in Singapore. In addition, with a non-response rate of only 19%, it would appear that our sample would be a reasonably good representation of the target population in Singapore in terms of the socio-demographic characteristics.

Fourth, the current study was unable to provide the standard deviations for general population means for PCS and MCS as a result of the limitation of the SF-36 calculator that we used to generate the population norms. This is because the SF-36 calculator used generated an estimate of the PCS and MCS mean scores by multiplying constant coefficients to all 8 domains for the sample population required. Hence, it did not rely on individual PCS and MCS scores. However, this does not impact significantly the conclusions of our study as we have examined the impact of being on the kidney transplant waiting list based on the

individual domains and not just on the summary scores.

Further studies could be performed to explore the difference in HRQoL scores between this cohort of patients on the transplant waitlist and other non-transplant waitlist dialysis patients as well as whether they have the same factors influencing the scores. A study comparing the HRQoL scores before and after the inclusion of the patients onto the kidney transplant waiting list would also be valuable in evaluating the impact of being on the waiting list.

Conclusion

In conclusion, patients on the kidney transplant waiting list experience significantly poorer HRQoL than the general population, particularly in the aspects of General Health, Role Physical, Bodily Pain, Social Functioning and Mental Component Summary scales when assessed using the SF-36. Factors such as ethnicity, marital status, employment status and type of dialysis treatment significantly influenced patients' perception of their HRQoL. These findings suggest non-Chinese, single, unemployed patients who are retirees or housewives could be more vulnerable to having a lower HRQoL. A more holistic management of the patient could be adopted by health professionals who interact with these patients in being more sensitive in identifying day-to-day problems that patients might encounter for early intervention. Support groups might also be useful for these patients. HRQoL is an important area to be evaluated and addressed particularly with the burgeoning problem of chronic kidney disease both locally and internationally.

Acknowledgments

This study was supported by grant NKFRC/2008/07/28 from the Venerable Yen Pei-National Kidney Foundation Research Fund, a fund specifically for research in kidney diseases. The authors express sincere appreciation to Ms Keng Yong Koh, Ms Christina Oh Mei Ai, all nurses and staff in facilitating the study, as well as all the participants for their contribution in the study.

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