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# Cross cultural adaptation and validation of the Malay Kidney Disease Quality of Life (KDQOL-36™)



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## Abstract

**Background:** In Malaysia, the prevalence of chronic kidney disease is high (9.1%). To date, no questionnaire that specifically assesses the health-related quality of life of patients with chronic kidney disease has been validated in Malaysia. Malay is the national language of Malaysia and spoken by the majority of its citizens. Therefore, the aim of our study was to cross-culturally adapt and validate the Malay Kidney Disease Quality of Life-36 (KDQOL-36) among patients with chronic kidney disease.

**Methods:** The English version of the KDQOL-36 was translated according to international guidelines to Malay. Content validity was verified by an expert panel and piloted in five patients. Our instrument was then administered to patients with chronic kidney disease stage 1-3A and patients on hemodialysis at baseline and 4 weeks later.

**Results:** A total of 181/232 patients agreed to participate (response rate = 78.0%). The majority were male (69.6%) with a median age of 51.0 years. Exploratory factor analysis found that the KDQOL-36 had three domains. All three domains showed low to moderate correlation (Spearman's Rho = 0.297–0.610) with the Europe Quality of Life Five Dimension questionnaire. Patients on hemodialysis (physical component summary = 39.8; mental component summary = 53.1; burden of disease = 37.5; symptoms/burden list = 75.0; effects of kidney disease on daily life = 68.8) had significantly worse quality of life than patients with chronic kidney disease stage 1-3A (physical component summary = 49.9; mental component summary = 52.9; burden of disease = 75.0; symptoms/burden list = 85.4; effects of kidney disease on daily life = 93.8,  $p < 0.001$ ) except for the mental component summary. This indicates that the Malay KDQOL-36 has achieved adequate known-groups validity. Cronbach alpha ranged from 0.872–0.901, indicating adequate internal consistency. At retest, intraclass correlation coefficient ranged from 0.584–0.902, indicating moderate to good correlation.

**Conclusion:** The Malay Kidney Disease Quality of Life-36 was found to be a valid and reliable tool to assess the quality of life in patients with chronic kidney disease. This tool can now be used to assess the health-related quality of life (HRQOL) in patients with chronic kidney disease, as HRQOL is an important independent predictor of patient outcome.

**Keywords:** Malay, Hemodialysis, Kidney disease quality of life, Validity, Reliability; health related quality of life

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## Background

Globally, chronic kidney disease (CKD) is one of the important causes of mortality and morbidity [1]. More than ten million people worldwide have CKD which may progress to end stage renal disease (ESRD) [2]. In 2014, the prevalence of CKD in the United States was 13.6%. A 2016 review showed that the prevalence of CKD was higher in developed countries (such as the United States, Europe and Canada) than in economically developing countries (such as sub Saharan Africa and India) [3]. This may be due to the prevalence of higher dietary risks, body mass index (BMI), systolic blood pressure and co-morbid conditions in developing countries [3]. In Malaysia, the prevalence of CKD was 9.1% in 2011 [4]. In 2015, there were 37,183 patients receiving dialysis in Malaysia with 7597 new patients for dialysis [5].

Health-related quality of life (HRQOL) is a marker for burden of disease which can be used to assess the effectiveness of a treatment and predict the risk of adverse outcomes [1]. HRQOL is the patient's subjective perception of their illness and treatment with regards to their physical, psychological and social-well-being [6]. Patients on dialysis have significant symptom burden and impaired quality of life, as they have a high number of comorbidities [7, 8]. In a study conducted in Hong Kong, patients on dialysis had a symptom burden of at least 9 symptoms (mean =  $9.3 \pm 4.7$ ) with fatigue (75.4%), cold aversion (68.7%), pruritus (65.7%), lower torso weakness (59.7%) and difficulty in sleeping (61.9%) as the most prevalent symptoms [8]. Dialysis patients with sleep disturbance was associated with lower HRQOL [9]. Therefore, assessing HRQOL of patients with ESRD is important as it is an independent predictor for patient outcomes.

A generic quality of life (QOL) tool (e.g. SF-12) is designed to assess the function and well-being of individuals regardless of their specific condition [10]; whilst a "disease targeted" HRQOL instrument assesses QOL in specific disease conditions [10]. The most comprehensive method for assessing QOL would be to include both generic and disease targeted content in the instrument [10]. Several tools such as Kidney Disease Questionnaire (KDQ) [11], Kidney Transplant Questionnaire (KTQ) [12] and Netherlands Cooperative Study on Adequacy of Dialysis (NECOSAD) [13] have been developed for assessing HRQOL in patients with CKD [14]. Among these tools, we selected the Kidney Disease Quality of Life (KDQOL) as it was developed for individuals with kidney disease who may or may not be on dialysis [15]. The KDQOL also has adequate to excellent internal consistency [16]. The Kidney Disease Quality of Life-36 (KDQOL-36) is an instrument that consists of both a generic core (SF12) and disease specific components [10]. However, the KDQOL-36 has not been validated in

Malaysia. When adapting questionnaire, the cultural, idiomatic, linguistic and contextual aspects concerning its translation should be considered [17]. Therefore, the cross-cultural adaptation of a health status self-administered questionnaire in a different language requires a unique method to reach equivalence between the source and target version of the questionnaire through the process of translation, adaptation and assessment of validity and reliability of the targeted questionnaire [17]. It was important for us to validate the KDQOL-36 in Malay as Malay is the national language of Malaysia and spoken by the majority of its citizens. In addition, the prevalence of CKD in Malaysia was 9.1% [4].

Therefore, the aim of this study was to cross-culturally adapt and validate the Malay Kidney Disease Quality of Life among patients with chronic kidney disease.

## Methods

### Translation of the English kidney disease quality of life (KDQOL-36™) to Malay

Permission to use the KDQOL-36 was obtained from the original developer (via email on 25 June 2016). Translation of the English KDQOL-36 to Malay was performed according to international guidelines (Additional file 1) [18].

### Face and content validity

Face validity is defined as "the degree to which (the items of) an health-related-patient-reported outcome (HR-PRO) instrument indeed looks as though they are an adequate reflection of the construct to be measured" [19]. Content validity is defined as "the degree to which content of an HR-PRO instrument is an adequate reflection of the construct to be measured" [19] Face and content validity of the Malay KDQOL-36 was assessed by an expert panel (consisting of a nephrologist, an academician experienced in the validation of instruments and a pharmacist). A pilot study was then conducted on five patients with CKD stage 1-3A. Two participants were confused with item no. 3 ("climbing several flights of stairs") as they were unsure whether the item meant "climbing several flights of stairs" or just "several steps". In Malay, "climbing several flights of stairs" or just "several steps" are expressed in the same way. Hence, for this item, the researcher had to explain to each participant that this item meant "climbing several flights of stairs".

### Validation of the Malay kidney disease quality of Life-36

This validation study was conducted at the Nephrology clinic in a tertiary hospital and its affiliated dialysis centers located in Kuala Lumpur from July 2016 to July 2017.

### Participants

Known-groups validity is demonstrated when a test or questionnaire can discriminate between two groups known to differ on the variable of interest [20]. Previous studies showed that HRQOL progressively declined across the stages of CKD [21–23]. Hence, two groups of participants were recruited so that known-groups validity could be assessed. We hypothesized that the HRQOL of patients on hemodialysis would be worse than patients with CKD stage 1-3A.

### Patients on hemodialysis (patient group)

Patients  $\geq 21$  years of age, who could understand Malay and were on hemodialysis for at least 3 months were recruited. Patients with mental disabilities were excluded.

### Patients with chronic kidney disease stage 1-3A (control group)

Patients  $\geq 21$  years of age, who could understand Malay and with CKD stage 1-3A (defined as glomerular filtration rate (eGFR) value of 45 to  $\geq 90$  mL/min/1.73 m<sup>2</sup> with evidence of kidney damage) were recruited. Patients who were diagnosed with rheumatoid arthritis, active cancer and mental disabilities were excluded.

### Sample size

Sample size was calculated based on the number of items to participant ratio of 1:5 to perform factor analysis [24]. There are 36 items in the KDQOL-36. Therefore, the minimum number of participants required was  $36 \times 5 = 180$ .

### Baseline demographic form

A baseline demographic form was used to collect participants' baseline demographic data and other relevant information.

### The Malay kidney disease quality of life 36

The KDQOL-36 is a self-administered tool which measures kidney disease-related HRQOL. The original tool consists of 134 items, and was too lengthy to administer in clinical practice [25]. Thus, a shorter version – the KDQOL-SF™ version 1.3 was developed. It consists of 36 items, and two cores: the SF-12 (i.e. generic QOL) and the disease-specific core. The generic core consists of two domains: the physical component summary (PCS) [6 items] and the Mental Component Summary (MCS) [6 items]. The disease-specific core consists of 24 items with 3 domains: symptoms and problems (12 items), burden of kidney disease (4 items) and effects of kidney disease (8 items). The raw scores were transformed according to the scoring manual [26] ranging from 0 to 100, where a higher score indicates better QOL. Patients that were not on

hemodialysis were not required to answer item 28a “problems with your access point”.

### The Malay EuroQol 5 dimensions questionnaire (EQ-5D-5L)

Convergent validity is the extent of different instruments to measure the same construct and that correlates with each other [27]. The Malay EQ-5D-5L was used to assess the convergent validity of the KDQOL-36. The EQ-5D-5L consists of 5 items (which assesses five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression) and a visual analog scale (EQ-VAS) [28]. The response for the five items was a 5-point Likert scale where 1 indicated better QOL, whilst 5 indicated poorer QOL. Scores were converted to 0 to 100%. The EQ-VAS requires patients to rate their own health using a scale which ranged from 0 (worst imaginable health) to 100 (best imaginable health).

### Data collection

Convenience sampling was used to recruit participants. Potential participants were approached, and the purpose of the study was explained to them. For those who agreed to participate, written informed consent was obtained. At baseline, participants were asked to fill the baseline demographic form, the Malay KDQOL-36 and the EQ-5D-5L. One month later, participants were asked to answer the Malay KDQOL-36 again.

### Data analysis

Data was analyzed using the Statistical Package for Social Science (SPSS) version 20.0 software (Chicago, Illinois, USA). Normality was assessed using the Kolmogorov Smirnov test. Non-parametric tests were used as data was not normally distributed. Descriptive statistics were used to describe the demographic data of participants. Categorical variables were presented using percentages and frequencies, whilst continuous variables were presented using median and interquartile ranges.

### Validity

Validity is defined as “the degree to which HR-PRO instrument measures the construct(s) it purports to measure” [19].

### Factor analysis

The dimensionality of the Malay KDQOL-36 was analyzed using exploratory factor analysis (EFA). Principal factor analysis and promax oblique rotation was used as the domains were correlated [29]. The cut-off point for the factor loadings was 0.4. [30].

**Convergent validity**

Convergent validity is defined as “the degree to which scores of a measure associate with scores on other measures that are intended to assess similar construct” [17]. The score for the three domains of the KDQOL-36 were compared with the scores of the EQ 5D5L and VAS. Correlations were calculated using Spearman’s rho coefficient: < 0.20 shows a very weak correlation, 0.20–0.40 shows weak correlation, 0.40–0.70 shows moderate correlation, 0.70–0.90 shows strong correlation and > 0.90 shows very strong correlation [31].

**Known-groups validity**

The Mann-Whitney-*U*-test was used to determine whether the Malay KDQOL-36 was able to discriminate between patients with stage 1-3A CKD (eGFR  $\geq$  90–45 ml/min/1.73m<sup>2</sup>) and patients undergoing dialysis.

**Reliability**

Reliability is defined as “the degree to which the measurement is free from measurement error” [19] In the reliability section, we analyzed the data of both patients with stage 1-3A and patients on hemodialysis as a whole.

**Internal consistency**

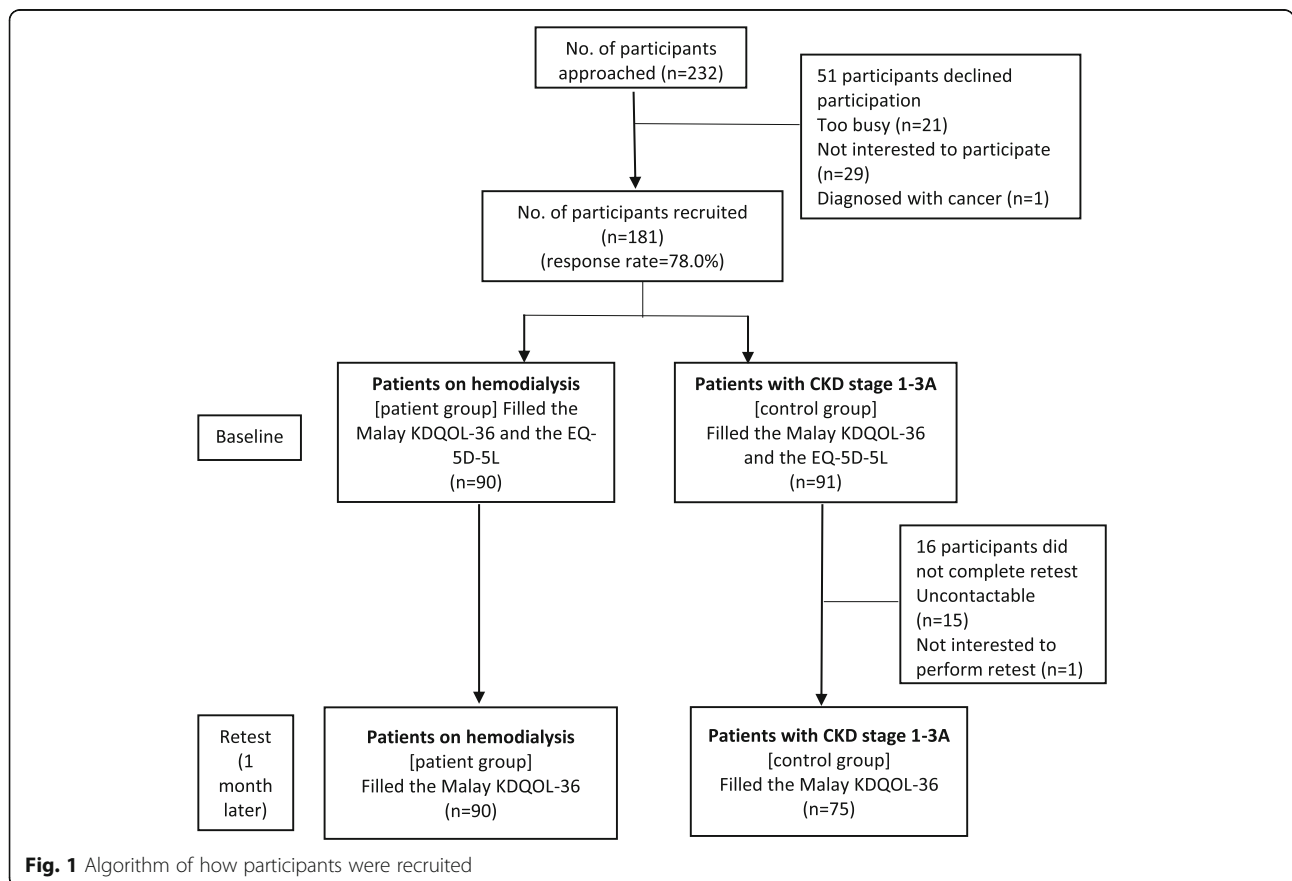
Internal consistency is defined as “the degree of inter-relatedness among the items” [19]. Internal consistency was assessed using Cronbach’s alpha coefficient to determine the extent that all items in a test measures the same concept [32]. This was done for the entire instrument, and for the different domains. Cronbach’s alpha < 0.70 have inadequate consistency; 0.70–0.90 suggests adequate internal consistency [32]. Corrected item-total correlation was also performed. Corrected item-total correlation > 0.4 is considered acceptable [33]. The effect of removing an item on Cronbach’s alpha was also determined.

**Test-retest**

The intra-class correlation coefficient (ICC) was used to analyze responses obtained at test and retest. Values > 0.9 indicate excellent reliability, 0.75–0.90 indicate good reliability; 0.5–0.75 indicate moderate reliability and < 0.5 indicate poor reliability [34].

**Results**

A total number of 181/232 agreed to participate (response rate = 78.0%) [Fig. 1]. The demographic characteristics of participants are shown in Table 1. The



**Fig. 1** Algorithm of how participants were recruited

**Table 1** Demographic characteristics of participants

	Total (n = 181) N (%)	Patients with CKD (Control group (n = 91) N (%)	Patients on hemodialysis [Patient group] (n = 90) N (%)	Chi square / z-value	p-value
Gender					
Male	126 (69.6)	70 (76.9)	56 (62.2)	4.623	0.032*
female	55 (30.4)	21 (23.1)	34 (37.8)		
Median age in years (IQR) [range]					
< 30 years	7 (3.9)	6 (6.6)	1 (1.1)	19.374	0.002*
31–40 years	36 (19.9)	19 (20.9)	17 (18.9)		
41–50 years	44 (24.3)	17 (18.7)	27 (30.0)		
51–60 years	39 (21.5)	12 (13.2)	27 (30.0)		
61–70 years	48 (26.5)	31 (34.1)	17 (18.9)		
> 70 years	7 (3.9)	6 (6.6)	1 (1.1)		
Median BMI in kg/m <sup>2</sup> (IQR) [range]*	25.5 (22.4–28.7)	26.6 (24.1–31.3)	23.9 (20.6–27.9)	–3.205	0.010*
Ethnicity					
Malay	82 (45.3)	52 (57.1)	33.3 (30)	14.897	0.02*
Chinese	69 (38.1)	23 (25.3)	51.1 (46)		
Indian	24 (13.3)	14 (15.4)	11.1 (10)		
Others	6 (3.3)	2 (2.2)	4.4 (4)		
Level of education					
Primary school (6 years of education)	7 (3.9)	3 (3.3)	4 (4.4)	19.227	> 0.001*
Secondary school (11 years of education)	71 (39.2)	26 (28.6)	45 (50)		
Diploma/ (12 years of education)	48 (26.5)	21 (23.1)	27 (30)		
Tertiary (> 12 years of education)	55 (30.4)	41 (45.1)	14 (15.6)		
Presently Working					
Working	83 (45.9)	51 (56)	32 (35.6)	7.650	0.006*
Income (calculate USD equivalent as your manuscript will be read internationally)					
< 238.41 USD\$	61 (33.7)	21 (23.1)	40 (44.4)	29.865	> 0.001*
238.41 USD\$–476.82 USD\$	42 (23.2)	14 (15.4)	28 (31.1)		
476.82 USD\$–715.23 USD\$	24 (13.3)	17 (18.7)	7 (7.8)		
715.23 USD\$–953.64 USD\$	14 (7.7)	8 (8.8)	6 (6.7)		
953.64 USD\$–1192.05 USD\$	13 (7.2)	12 (13.2)	1.1 (1)		
> 1192.05 USD\$	26 (14.4)	19 (20.9)	7 (7.8)		
Duration patient has been diagnosed with CKD in years; median [IQR]					
= < 10 years	5.0 (2.0–10.3)	4.0 (2.0–10.0)	7.0 (3.0–11.3)	–2.129	0.033*
11–20 years	134 (74.0)	69 (75.8)	65 (72.2)		
21–30 years	34 (18.8)	13 (14.3)	21 (23.3)		
31–40 years	7 (3.9)	3 (3.3)	4 (4.4)		
> 40 years	2 (1.1)	2 (2.2)			
Duration on dialysis in months; median [IQR]	1 (0.6)	1 (1.1)	36 (24–84)		

BMI Body Mass Index, CKD Chronic Kidney Disease, ESRD End Stage Renal Disease, IQR Interquartile range, USD United States Dollars

**Table 2** Exploratory factor analysis of the Malay kidney disease Quality of Life-36

Item no.	Description of items	Subscale	Factor loadings			KMO	AVE	CR	
			1	2	3				
How true or false is each of the following statements for you?									
13	Kidney disease interferes too much with my life	Burden of kidney disease	0.892			0.785	0.698	0.902	
14	Too much time is spent dealing with my kidney disease		0.888						
15	I feel frustrated dealing with my kidney disease		0.765						
16	I feel like a burden on my family		0.791						
During the past 4 weeks, to what extent were you bothered by each of the following?									
22	Shortness of breath	Symptom/burden list		0.691		0.875	0.427	0.890	
25	Washed out or drained			0.744					
27	Nausea or upset stomach			0.633					
23	Faintness or dizziness			0.700					
26	Numbness in hands or feet			0.683					
17	Soreness of muscle			0.690					
18	Chest pain			0.635					
20	Itchy skin			0.673					
21	Dry skin			0.659					
19	Cramps			0.587					
24	Lack of appetite			0.448					
Some people are bothered by the effects of kidney disease on their daily life, while others are not. How much does kidney disease bother you in each of the following areas?									
32	Your ability to travel		Effects of kidney disease on daily life			0.766	0.892	0.502	0.889
34	Stress or worries caused by kidney disease					0.746			
30	Dietary restriction					0.727			
36	Your personal appearance					0.719			
29	Fluid restriction				0.717				
31	Your ability to do work around the house				0.717				
33	Being dependent on doctors and other medical staff				0.670				
35	Your sex life				0.593				

KMO Kaiser-Meyer-Olkin test, AVE average variance extracted, CR composite reliability

majority were male (69.6%) with median age of 51 years (Table 1).

### Construct validity

#### Factor analysis

EFA found that the Malay KDQOL-36 was a 3-factor model (Table 2). The scree plot for each domain is provided in Additional file 2.

#### Convergent validity

The scores for the three domains in the KDQOL-36 were found to be significantly correlated to the EQ-5D-5L. However, the association between the KDQOL-36 and EQ-5D-5L was weak to moderate. The association between the domains “burden of disease”, “signs/symptoms list”, “effects of kidney disease on daily life” with

the EQ-5D-5L was  $-0.456$ ,  $-0.610$  and  $-0.588$  while the association these domains with the EQ VAS was  $0.297$ ,  $0.434$  and  $0.361$ , respectively.

#### Known-groups validity

Patients on hemodialysis (physical component summary = 39.8; mental component summary = 53.1; burden of disease = 37.5; symptoms/burden list = 75.0; effects of kidney disease on daily life = 68.8) had significantly worse quality of life than patients with chronic kidney disease stage 1-3A (physical component summary = 49.9; mental component summary = 52.9; burden of disease = 75.0; symptoms/burden list = 85.4; effects of kidney disease on daily life = 93.8,  $p < 0.001$ ) except for the mental component summary, indicating that the Malay

**Table 3** Known-groups validity of the Kidney Disease Quality of Life –36

Domain	Patients on hemodialysis (patient group) median (IQR)	Patients with CKD stage 1-3A (control group) median (IQR)	Mann Whitney-U test	
			z-score	p-value
Physical component summary (PCS)	39.8 (33.4–46.4)	49.9 (37.0–54.0)	−4.456	< 0.001*
Mental component summary (MCS)	53.1 (43.5–57.9)	52.9 (47.0–58.2)	−0.437	0.662
Burden of disease	37.5 (25.0–6.3)	75.0 (62.5–87.5)	−8.015	< 0.001*
Symptoms/burden list	75.0 (66.7–83.3)	85.4 (75.0–89.6)	−4.719	< 0.001*
Effects of kidney disease on daily life	68.8 (53.1–81.3)	93.8 (84.4–100.0)	−8.542	< 0.001*

IQR Interquartile range

KDQOL-36 has achieved adequate known-groups validity (Table 3).

KDQOL-36 showed moderate to good correlation (ICC = 0.584–0.902) (Table 4).

### Reliability

The overall Cronbach alpha of the Malay KDQOL-36 was 0.715. Cronbach's alpha values for the domain ranged from 0.872–0.901. At test-retest, the ICC of the

### Discussion

The Malay KDQOL-36 was found to be a valid and reliable tool to assess the HRQOL of patients with CKD in Malaysia.

**Table 4** Psychometrics of the Malay Kidney Disease Quality of Life-36

Domain	No.	Item	Cronbach alpha	Corrected item-total correlation	Intra-class correlation
Burden of kidney disease	13	Kidney disease interferes too much with my life	0.901	0.826	0.808
	14	Too much time is spent dealing with my kidney disease		0.821	0.841
	15	I feel frustrated with my kidney disease		0.725	0.824
	16	I feel like a burden on my family		0.746	0.885
Symptoms/ burden list	17	Soreness of muscle	0.872	0.607	0.753
	18	Chest pain		0.553	0.584
	19	Cramps		0.506	0.790
	20	Itchy skin		0.533	0.732
	21	Dry skin		0.534	0.802
	22	Shortness of breath		0.680	0.819
	23	Faintness or dizziness		0.657	0.806
	24	Lack of appetite		0.428	0.635
	25	Washed out or drained		0.678	0.674
	26	Numbness in hands or feet		0.608	0.777
	27	Nausea or upset stomach		0.660	0.779
Effects of kidney disease on daily life	28a	Problems with your access site (HD patients only)	0.884	0.347	0.825
	29	Fluid restriction		0.666	0.864
	30	Dietary restriction		0.677	0.761
	31	Your ability to do work around the house		0.674	0.786
	32	Your ability to travel		0.716	0.883
	33	Being dependent on doctors and other medical staff		0.624	0.707
	34	Stress or worries caused by kidney disease		0.693	0.861
	35	Your sex life		0.553	0.902
	36	Your personal appearance		0.683	0.782

EFA found that the Malay KDQOL-36 was a 3-factor model: “burden of kidney disease”, “symptoms/burden list” and “effects of kidney disease on daily life”. Our findings were similar to a Singaporean study which reported that the KDQOL-36 was a three-factor model [35]. However, the authors of this study used confirmatory factor analysis to confirm the number of factors, whereas we used EFA. We were not able to analyze our data using CFA, as the minimum sample size required to conduct CFA was 315 [36].

The Malay KDQOL-36 was able to discriminate between patients who were on hemodialysis and early stage (CKD stage 1-3A) in all domains except for the mental component summary. In a previous study, the HRQOL of patients were discriminated based on subgroups of demographic data of patients of the study [37]. The study showed that being female, unemployed, having history of hospitalization during the past 6 months, and being on a longer duration of hemodialysis had worse HRQOL [37]. At present, no other study has assessed the discriminative validity of the KDQOL-36 using patients at different stages of CKD. [23].

The scores from the three domains of the Malay KDQOL-36 were significantly correlated to the EQ-5D-5L and EQ VAS score, which was similar to a previous study [38]. The correlation in our study was negative because for the KDQOL-36, as a higher KDQOL-36 score indicates a better QOL, whilst a higher score in EQ5D5L indicates a worse QOL.

The overall Cronbach alpha of the Malay KDQOL-36 was 0.715, whilst the Cronbach alpha of the individual domains ranged from 0.872–0.901, which was similar to a previous study [38]. At test-retest, ICC values ranged from 0.584–0.902, which was lower compared to previous studies [37, 38]. This was due to item no. 18 (“in the past 4 weeks, to what extent were you bothered by chest pain?”) where two participants selected the answer “not at all bothered” at test (Likert scale = 1), whilst at retest they answered, “extremely bothered” (Likert scale = 5). These patients may have experienced chest pain during the period between test and retest.

One of the limitations of our study was that we were unable to perform CFA as the minimum sample size required to perform this analysis was 315. Another limitation was that our patients were recruited using convenience sampling, and may not be representative of the general population [39].

## Conclusion

The Malay KDQOL-36 was found to be a valid and reliable tool to assess the HRQOL in patients with CKD. This tool can now be used to assess the HRQOL in patients with chronic kidney disease, as HRQOL is an important independent predictor of patient outcome.

## Additional files

**Additional file 1:** Translation of the English Kidney Disease Quality of life (KDQOL-36) to Malay. (DOCX 39 kb)

**Additional file 2:** Scree plot for exploratory factor analysis of burden of disease, symptoms/burden list and effects of kidney disease on daily life for the Malay KDQOL-36. (DOCX 42 kb)

## Abbreviations

CFA: Confirmatory factor analysis; CKD: Chronic kidney disease; EFA: Exploratory factor analysis; eGFR: Glomerular filtration rate; EQ-5D-5L: Europe quality of life-5-dimension-5-level; EQ-VAS: Europe quality of life-visual analog scale; ESRD: End stage renal disease; HR-PRO: Health-related-patient-reported outcome; HRQOL: Health-related quality of life; MCS: Mental component summary; PCS: Physical component summary; QOL: Quality of life

## Acknowledgements

We would like to thank Associate Professor Dr. Karuthan Chinna, Department of Social and Preventive Medicine, University of Malaya, for his assistance in our data analysis. We also would like to all the patients who participated in our study.

## Consent of publication

Not applicable

## Authors' contributions

KGKK was involved in the conception of the study design, collected and analyzed the data and wrote the manuscript. PLSM was involved in the conception of the study design, analyzed the data and wrote the manuscript. LSK was involved in the conception of the study design, assisted in the recruitment of participants, and wrote the manuscript. All authors have read and approved the final manuscript.

## Funding

This research was funded by the University Malaya Research Grant (UMRG) (RP048B-17HTM). Funding was used to pay the forward and backwards translators of the Malay KDQOL-36, and to pay participants an honorarium for their participation.

## Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Ethics approval and consent to participate

This study was approved by the Medical Research Ethics Committee of University Malaya Medical Centre prior to the commencement of the study (approval number: MECID No. 20165–2493). Written informed consent was obtained from all participants who agreed to participate.

## Competing interests

The authors declare that they have no competing interests.

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Received: 24 January 2019 Accepted: 24 May 2019

Published online: 20 June 2019

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