# The relationship between laboratory values and quality of life of dialysis patients in the United Arab Emirates

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## Abstract

**Background:** Several factors can determine the quality of life (QOL) of haemodialysis patients. One of these factors is laboratory values as proxy to dialysis adequacy. The relationship between laboratory values and QOL of dialysis patients is debated in the literature. As part of a larger study on the QOL of dialysis patients in the United Arab Emirates (UAE), the impact of laboratory values on QOL were examined using two QOL tools.

**Method:** The relationship between laboratory values and SF-36 and the QOL Index was examined using data from a sample of 130 dialysis patients over the age of 18 years.

**Results:** Overall, findings from the study did not yield a significant relationship between laboratory values and either the SF-36 or QOL Index scores. The only significant finding was a positive correlation between pre-dialysis serum creatinine level and SF-36 total scores (r=0.274, p=0.002).

**Conclusion:** Based on this study, we did not find compelling evidence of the relationship between laboratory values as a proxy to dialysis adequacy and QOL scores. Future work should incorporate larger sample sizes and patient recruitment from multiples dialysis centres to truly capture the variability in patient characteristics and treatment modalities.

## Keywords

Quality of life, dialysis, United Arab Emirates, laboratory values, SF-36, Quality of Life Index.

Advancement in medical technology has extended the average life expectancy of patients with chronic illnesses (Goyen & Debatin, 2009). In response to these advances, there has been a greater focus on the quality of life (QOL) of dialysis patients instead of simply focusing on survival (Steele *et al.*, 1996). Longer life expectancy for people with chronic health conditions can lead to poor QOL (Graham *et al.*, 2009). Usually, laboratory values are used in medical practice to guide medical interventions in treating patients with chronic illnesses such as kidney failure (Santos & Kerr, 2008). In dialysis units, blood tests are performed regularly to measure the adequacy of treatment. Common blood tests include haemoglobin, albumin, and pre- and post- blood tests for urea and creatinine to measure dialysis adequacy.

Anaemia has a well-documented negative effect on QOL. Partial correction of anaemia to maintain haemoglobin (Hb) levels in the target range of 11 to 12 g/dL is recommended by the National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (National Kidney Foundation, 2006). A haemoglobin concentration of 11 g/dL is a suitable therapeutic target (CARI Guidelines, 2013). Correction of anaemia positively correlates with significant improvements in both physical and mental health-related QOL in dialysis patients (NKF-K/DOQI). The correction of anaemia is usually done by administering erythropoietin (EPO), a naturally occurring hormone, produced by the kidneys, which stimulates the bone marrow to produce red blood cells (Valderrabano, 1996). Failed kidneys produce less EPO resulting in patients with kidney failure developing anaemia (Speigel, 2006). Breiterman-White

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(2005) reported that anaemia negatively affects a broad range of parameters that can considerably decrease functional ability in patients on dialysis, such as diminished energy and physical activity levels, poor sleep and eating habits, decline in general health status, reduction in the ability to perform exercise, decreased strength, increased muscle weakness, intermittent leg cramps and increased shortness of breath, therefore reducing the QOL overall.

A person's albumin level has been linked to morbidity and mortality in dialysis patients (Mapes *et al.*, 2004). Markers of Malnutrition-Inflammation Complex Syndrome (MICS) are reported to predict mortality and hospitalisation in haemodialysis patients. However, it is not clear which marker is more sensitive and predictive of outcome. Kalantar-Zadeh, Kopple, Humphreys and Block (2004) examined the utility of 10 markers of MICS as predictors of mortality and hospitalisation, malnutrition-inflammation score, a subjective global assessment score, and serum levels of C-reactive protein, interleukin-6, tumour necrosis factor-alpha, albumin, pre-albumin, total iron binding capacity, creatinine, total cholesterol and normalised protein nitrogen appearance. The study by Kalantar-Zadeh *et al.* of a cohort of 378 dialysis patients (average 55 years; 53% men; 47% Hispanics, 30% African-Americans; 55% diabetic patients), who were randomly selected from dialysis facilities in Los Angeles, found that C-reactive protein, malnutrition-inflammation score and the Charlson Comorbidity Index were the only consistent predictors of mortality and hospitalisation, and their outcome predictabilities were superior to serum albumin. In contrast, other studies suggested that anaemia control and normal albumin levels were associated with improved survival and QOL (Lopes *et al.*, 2007; Sanaka, 2003).

The impact of dialysis adequacy on the QOL for dialysis patients is debated in the literature. Cleary and Drennan (2005) studied the dialysis adequacy and QOL of 97 patients undergoing haemodialysis treatment at a hospital in the Republic of Ireland using the SF-36. They identified low scores in vitality, physical functioning, role physical and mental health subscale scores in patients who were less dialysed compared with patients who were well dialysed. In contrast, the study by Morton *et al.* (1996) on the impact of dialysis adequacy on the QOL of 55 haemodialysis and 60 peritoneal dialysis patients using the SF-36 tool found no significant association between Kt/V and any of the dimensions (physical functioning; role limitations [physical]; role limitations [emotional]; social functioning; emotional wellbeing; pain; energy; and general health perceptions) of QOL. These findings were supported by Eknoyan, Beck, Cheung and Daugirdas (2002) who noted that patients undergoing haemodialysis thrice-weekly had no major benefit from a higher dialysis dose than that recommended by the current USA guidelines or from the use of a high-flux membrane.

The purpose of this study is to examine the relationship between laboratory values — as a proxy to dialysis adequacy, anaemia and nutritional status — and QOL of a sample of haemodialysis patients from Sheikh Khalifa Medical City (SKMC). The study utilises data from a major research study aimed at comparing QOL between haemodialysis patients and well persons living in the community in the United Arab Emirates (UAE) (Ayoub & Hijjazi, 2012).

Ethics approvals for the research were obtained from the Human Ethics Committee at Victoria University of Wellington and SKMC Ethics Committee.

## Method

### Sample and recruitment of participants

All haemodialysis patients at SKMC who met the following criteria were invited to participate: i) On regular haemodialysis therapy for more than three months (to exclude the influence of metabolic factors in the early stage of haemodialysis on consciousness level such as uremic encephalopathy; ii) No apparent cerebrovascular disease or serious intellectual impairment (to avoid potential misinterpretation of the questions); iii) Monthly blood tests taken during the data collection period; and iv) 18 years or over. One hundred and thirty patients were included in the study.

### Data collection and analysis

Data collection was done with the help of an independent registered nurse. The independent nurse approached potential dialysis participants and provided them with the invitation letter to participate in the study. Once they indicated their willingness to participate in the study, the patients were asked to sign a consent form, after which they were given the survey package. The survey package included three components: demographic data elements, health status indicators and quality of life measures. Laboratory test values were extracted from patients' records.

For QOL assessment, the researchers used two tools: the SF-36 and the QOL Index dialysis version. The rationale for choosing two QOL tools was an aim of the main study which included establishing whether one tool was more culturally acceptable than the other. The SF-36 is a general tool, developed to be used on all populations irrespective of health or illness. It is one of the most commonly used measures to study the QOL in dialysis patients (Liem, Bosch, Arends, Heijenbrok-Kal, & Hunink, 2007; Unruh & Hess, 2007). In addition to the English version developed for use in the United States, it is approved and available through the Boston-based International Quality of Life Assessment project (IQOLA) for other settings. The SF-36 version 2 is currently available in more than 120 translations (Quality Metric tools, 2011). This study has used the SF-36 tool version 1 because at the time of data collection in June

2007 only the SF-36 tool version 1 was available in the Arabic language.Version 1 had been used by several researchers in the Middle East (Khoudri, Ali Zeggwagh, Abidi, Madani, & Abouqal, 2006: Sabbah, Drouby, Sabbah, Retel-Rude, & Mercier, 2003). There were no normative values of the SF-36 for the UAE at the time of this research.

In contrast, the QOL Index is a disease-specific tool that measures satisfaction and importance of determinants of QOL. It was developed to be used for people on dialysis as it has specific questions related to kidney failure. Both tools have well-established reliability and validity studies (Ferrans & Powers, 1992; Lindsay *et al.*, 2006). The Arabic version of the QOL Index was translated by Halabi (2006). Participants could complete either the English or Arabic versions of the tools.

Data analysis was performed using the SPSS software for Windows version 18.0 (SPSS Inc, Chicago, IL, USA). Frequency distribution and mean ± standard deviation were used for descriptive analysis; independent sample *t*-test technique and one-way ANOVA were used for group comparisons, and multiple regression was used for multivariate analysis. Backward stepwise regression technique was used to remove variables with low F values and produce reduced models to include significant independent variables. Manual comparison of bivariate and multivariate results was performed to ensure that the automatic selection procedure did not remove variables that were significantly associated with the two dependent variables in the bivariate analysis.

## Results

### Demographic and clinical data findings

Tables 1 and 2 describe the sample. Most of the respondents were males (73.8%), married (76.2%), Muslims (82.3%), and living with family (55.4%). UAE nationals comprised 27.7% of the sample and Arab ex pats comprised 36.9%. Asian ex pats were the third ethnic group (23.1%). Only 21.5% of the respondents had education beyond secondary level and about one-third (36.2%) held full-time jobs. One-fifth of the respondents did not have any schooling. Beside chronic renal failure, about one-half of the respondents (52.3%) had other chronic illnesses; however, less than a third (29.2%) reported major life events in the past year. It is worth noting that the proportion of males in the UAE population of 5,012,384 persons at the time of data collection was over twice that of females; 70.5% and 29.5% respectively (UAE Statistics, 2013).

The average age of the respondents was 49.4 years with a range between 19 and 75 years and the average time the respondents lived in UAE was 27 years. In terms of last travel outside the UAE, the average was about four years. This may in part be related to the burden of securing holiday dialysis services in the region or the desired travel destination.

*Table 1: Frequency distribution of categorical socio-demographic and health variables*

| Variables | N | % |
|---|---|---|
| **Gender** | | |
| Female | 34 | 26.2 |
| Male | 96 | 73.8 |
| **Ethnicity** | | |
| UAE | 36 | 27.7 |
| Arab | 48 | 36.9 |
| Asian | 30 | 23.1 |
| Other | 16 | 12.3 |
| **Marital status** | | |
| Not married | 31 | 23.8 |
| Married | 99 | 76.2 |
| **Religious affiliation** | | |
| Muslim | 107 | 82.3 |
| Others | 23 | 17.7 |
| **Living arrangements** | | |
| Lives with family | 72 | 55.4 |
| Lives alone | 11 | 8.5 |
| Others | 47 | 36.2 |
| **Employment status** | | |
| Full-time employment | 47 | 36.2 |
| Part-time employment | 31 | 23.8 |
| Retired | 23 | 17.7 |
| Unemployment | 29 | 22.3 |
| **Educational level** | | |
| No schooling | 26 | 20.0 |
| Primary school | 50 | 38.5 |
| Secondary school | 26 | 20.0 |
| Tertiary education | 28 | 21.5 |
| **Chronic illnesses** | | |
| No | 62 | 47.7 |
| Yes | 68 | 52.3 |
| **Major life events** | | |
| No | 92 | 70.8 |
| Yes | 38 | 29.2 |
| **Awareness of disease cause** | | |
| No | 42 | 32.3 |
| Yes | 88 | 67.7 |

*Table 2: Descriptive analysis of continuous socio-demographic, health, and blood levels variables*

| Variables | N | Mean | SD | Range | Therapeutic range |
|---|---|---|---|---|---|
| Age (years) | 130 | 49.4 | 12.0 | 19–75 | |
| Duration living in UAE (months) | 129 | 324.8 | 209.7 | 0–900 | |
| Elapsed time since last travel outside UAE (Months) | 129 | 47.7 | 73.0 | 0–480 | |
| Time on dialysis (months) | 130 | 57.9 | 55.5 | 2–300 | |
| Haemoglobin (g/L) | 130 | 117.6 | 17.4 | 69–157 | |
| Haemoglobin — Male (g/L) | 96 | 117.2 | 15.6 | 69–157 | 113–118 |
| Haemoglobin — Female (g/L) | 34 | 118.6 | 18.0 | 74–143 | 112–116 |
| Serum albumin (g/L) | 130 | 33.3 | 4.9 | 18.2–55 | 35–48 |
| Pre-dialysis BUN (mmol/L) | 130 | 22.2 | 7.3 | 5.8–58.8 | 1.2–6.4 |
| Pre-dialysis creatinine (µmol/L) | 130 | 960.2 | 268.5 | 83–1982 | 62–115 |
| Urea reduction ratio (%) | 126 | 75.3 | 6.9 | 56.2–91 | Above 65% |
| Systolic BP (mm Hg) | 128 | 149.6 | 25.8 | 93–211 | 100–120 |
| Diastolic BP (mm Hg) | 128 | 77.7 | 16.1 | 22–115 | 70–80 |

*Source: Sheikh Khalifa Medical City Lab Manual for Reference Ranges for Blood Results

*Table 3: Descriptive analysis of quality of life scales and subscales*

| Variables | N | Mean | SD | Range |
|---|---|---|---|---|
| **SF-36 total score** | **129** | **59.0** | **19.4** | **17.4–95** |
| Physical function | 130 | 55.5 | 28.0 | 0–100 |
| Role — physical | 130 | 46.3 | 45.0 | 0–100 |
| Body pain | 130 | 69.0 | 26.2 | 0–100 |
| General health | 130 | 47.5 | 17.2 | 0–90 |
| Vitality | 129 | 54.8 | 21.2 | 0–100 |
| Social functioning | 130 | 68.4 | 26.1 | 0–100 |
| Role — emotional | 130 | 55.4 | 46.5 | 0–100 |
| Mental health | 130 | 74.1 | 20.6 | 4–100 |
| Dimension — physical health | 129 | 54.8 | 19.6 | 16–96 |
| Dimension — mental health | 129 | 60.2 | 18.2 | 19.5–93.6 |
| | | | | |
| **Quality of Life Index total score** | **130** | **23.2** | **5.2** | **9.6–30** |
| QOLI — Health and functioning subscale | 130 | 21.5 | 6.0 | 5.6–30 |
| QOLI — Social and economic subscale | 130 | 23.2 | 5.6 | 8–30 |
| QOLI — Psychological/Spiritual subscale | 130 | 24.2 | 6.3 | 0–30 |
| QOLI — Family subscale | 130 | 26.3 | 4.5 | 10.8–30 |

*Table 4: Correlation matrix of QOL scores and continuous level variables*

| | SF-36 score | QOLI score | Age | Months living in UAE | Last travel outside UAE | Time on dialysis | Haemoglobin | Serum albumin | Pre-dialysis BUN | Pre-dialysis creatinine | URR | Systolic BP | Diastolic BP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SF-36 score | 1 | | | | | | | | | | | | |
| QOLI score | 0.527** | 1 | | | | | | | | | | | |
| Age | -0.127 | 0.148 | 1 | | | | | | | | | | |
| Time living in UAE | -0.040 | 0.279** | .481** | 1 | | | | | | | | | |
| Last travel outside UAE | -0.060 | 0.037 | 0.034 | 0.123 | 1 | | | | | | | | |
| Time on dialysis | 0.009 | -0.151 | -0.040 | 0.026 | 0.054 | 1 | | | | | | | |
| Haemoglobin | 0.105 | -0.011 | -0.081 | 0.068 | -0.097 | 0.165 | 1 | | | | | | |
| Serum albumin | 0.109 | 0.041 | -0.148 | -0.052 | -0.040 | 0.039 | 0.265** | 1 | | | | | |
| Pre-dialysis BUN | 0.097 | 0.108 | 0.040 | -0.029 | -0.040 | -0.032 | 0.161 | 0.173* | 1 | | | | |
| Pre-dialysis creatinine | 0.274** | 0.163 | -0.161 | -0.078 | -0.015 | 0.106 | 0.217* | 0.266** | 0.423** | 1 | | | |
| Urea reduction ratio | -0.115 | -0.130 | -0.081 | 0.032 | 0.058 | 0.159 | -0.009 | -0.025 | -0.192* | -0.310** | 1 | | |
| Systolic BP | -0.020 | -0.035 | 0.228** | 0.149 | -0.064 | -0.008 | -0.054 | 0.080 | -0.017 | 0.004 | 0.111 | 1 | |
| Diastolic BP | 0.118 | -0.021 | -0.032 | -0.161 | -0.143 | 0.088 | -0.018 | 0.097 | -0.009 | 0.150 | 0.113 | 0.524** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

*Table 5: QOL scores by demographic and health variables*

| Variables | SF-36 scores | | | | QOL Index score | | | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | P | N | Mean | SD | P |
| **Gender** | | | | | | | | |
| Female | 34 | 53.80 | 18.11 | 0.067 | 34 | 22.70 | 4.86 | 0.562 |
| Male | 95 | 60.90 | 19.63 | | 96 | 23.31 | 5.36 | |
| **Ethnicity** | | | | | | | | |
| Expatriate | 93 | 60.55 | 19.42 | 0.155 | 94 | 22.35 | 5.35 | 0.002 |
| UAE | 36 | 55.11 | 19.17 | | 36 | 25.25 | 4.27 | |
| **Educational level** | | | | | | | | |
| Other | 102 | 58.89 | 20.23 | 0.866 | 102 | 23.36 | 5.14 | 0.397 |
| Has Tertiary education | 27 | 59.53 | 16.38 | | 28 | 22.41 | 5.55 | |
| **Marital status** | | | | | | | | |
| Not married | 31 | 55.31 | 18.31 | 0.223 | 31 | 22.23 | 5.16 | 0.259 |
| Married | 98 | 60.20 | 19.71 | | 99 | 23.44 | 5.24 | |
| **Living arrangements** | | | | | | | | |
| Alone | 58 | 60.05 | 21.41 | 0.598 | 58 | 21.93 | 5.48 | 0.016 |
| With family | 71 | 58.19 | 17.76 | | 72 | 24.14 | 4.82 | |
| **Employment status*** | | | | | | | | |
| Employed full-time | 46 | 64.13 | 20.86 | 0.014 | 47 | 22.90 | 5.57 | 0.622 |
| Employed part-time | 31 | 55.78 | 18.46 | | 31 | 23.11 | 5.19 | |
| Retired | 23 | 49.39 | 17.71 | | 23 | 24.42 | 5.56 | |
| Unemployed | 29 | 62.04 | 16.58 | | 29 | 22.61 | 4.45 | |
| **Religious affiliation** | | | | | | | | |
| Muslim | 107 | 58.44 | 19.65 | 0.463 | 107 | 23.38 | 5.10 | 0.295 |
| Other | 23 | 61.73 | 18.56 | | 23 | 22.11 | 5.76 | |
| **Chronic illness** | | | | | | | | |
| No | 61 | 67.66 | 17.59 | <0.001 | 62 | 23.92 | 4.82 | 0.109 |
| Yes | 68 | 51.28 | 17.76 | | 68 | 22.45 | 5.51 | |
| **Major life events** | | | | | | | | |
| No | 91 | 61.36 | 19.56 | 0.034 | 92 | 23.62 | 5.22 | 0.114 |
| Yes | 38 | 53.43 | 18.15 | | 38 | 22.03 | 5.13 | |
| **Knows cause of disease** | | | | | | | | |
| No | 42 | 54.68 | 16.04 | 0.055 | 42 | 22.66 | 5.21 | 0.457 |
| Yes | 87 | 61.12 | 20.63 | | 88 | 23.39 | 5.24 | |

*= One-way ANOVA

*Table 6: Regression analysis of SF-36 and QOL Index models*

| Variables | SF-36 | | | | | | | | QOL Index | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full model | | | | Reduced model | | | | Full model | | | | Reduced model | | | |
| | B | SE | t | P | B | SE | t | P | B | SE | t | P | B | SE | t | P |
| (Constant) | 62.23 | 30.39 | 2.05 | .043 | 58.30 | 4.53 | 12.87 | <.001 | 26.56 | 8.01 | 3.32 | .001 | 19.00 | 1.87 | 10.16 | <.001 |
| Male | .91 | 4.92 | .18 | .854 | | | | | -.28 | 1.30 | -.22 | .830 | | | | |
| UAE national | -3.42 | 5.48 | -.62 | .535 | | | | | 1.75 | 1.45 | 1.21 | .228 | | | | |
| Tertiary education | -3.68 | 4.75 | -.77 | .441 | | | | | -2.31 | 1.25 | -1.86 | .066 | | | | |
| Married | 2.31 | 5.86 | .40 | .694 | | | | | -.66 | 1.55 | -.43 | .671 | | | | |
| Lives with family | .78 | 4.47 | .18 | .861 | | | | | 2.32 | 1.18 | 1.97 | .051 | 2.03 | .89 | 2.28 | .024 |
| Full-time job | 6.53 | 4.20 | 1.56 | .123 | 8.07 | 3.44 | 2.35 | .021 | .80 | 1.11 | .72 | .475 | | | | |
| Muslim | -1.94 | 4.82 | -.40 | .689 | | | | | -.15 | 1.27 | -.12 | .907 | | | | |
| Chronic illness | -15.67 | 3.82 | -4.10 | <.001 | -16.21 | 3.25 | -4.99 | <.001 | -3.17 | 1.01 | -3.15 | .002 | -2.48 | .90 | -2.94 | .004 |
| Major life events | -7.35 | 3.79 | -1.94 | .055 | -6.86 | 3.43 | -2.00 | .048 | -1.42 | 1.00 | -1.42 | .160 | | | | |
| Knows cause of disease | 5.18 | 3.77 | 1.37 | .172 | 6.14 | 3.40 | 1.81 | .074 | 1.46 | 1.00 | 1.47 | .144 | | | | |
| Age | -.17 | .19 | -.87 | .385 | | | | | .03 | .05 | .50 | .616 | | | | |
| Months living in UAE | .02 | .01 | 1.80 | .075 | 0.01 | 0.01 | 1.80 | .074 | .01 | .00 | 1.78 | .079 | 0.01 | .01 | 3.63 | <.001 |
| Last travel outside UAE (months) | .02 | .02 | .69 | .490 | | | | | .00 | .01 | .33 | .746 | | | | |
| Time on dialysis (months) | -.02 | .03 | -.63 | .529 | | | | | -.02 | .01 | -2.09 | .040 | -0.01 | .01 | -2.23 | .027 |
| Haemoglobin | .08 | .12 | .66 | .512 | | | | | -.01 | .03 | -.45 | .656 | | | | |
| Serum albumin | .21 | .37 | .56 | .580 | | | | | .04 | .10 | .38 | .703 | | | | |
| Pre-dialysis BUN (g/L) | -.06 | .29 | -.20 | .843 | | | | | .01 | .08 | .08 | .937 | | | | |
| Pre-dialysis creatinine (g/L) | .01 | .01 | .70 | .489 | | | | | .001 | .00 | .96 | .337 | 0.00 | .00 | 1.97 | .052 |
| Urea reduction ratio | -.18 | .28 | -.67 | .506 | | | | | -.071 | .07 | -.99 | .325 | | | | |
| Systolic BP | -.02 | .07 | -.24 | .811 | | | | | -.011 | .02 | -.54 | .594 | | | | |
| Model fit | | | | | | | | | | | | | | | | |
| F statistic | 2.30 | | | .004 | 8.42 | | | <.0001 | 2.28 | | | .004 | 7.15 | | | <.001 |
| Adjusted R square | .177 | | | | .235 | | | | .173 | | | | .201 | | | |

## Blood results of the dialysis sample

The majority of dialysis patients at SKMC receive four hours of Hi Flux dialysis three times a week. The average time respondents had been on dialysis was 4.9±4.6 year range (0.16–25) years.

The average haemoglobin level was in the normal range for males and above the therapeutic level for females. This therapeutic level is for people without kidney failure. More than half of the dialysis male sample had a haemoglobin level above the range and around one-third were below the range, leaving 11.5% within the therapeutic level. One-quarter of the female dialysis respondents had a haemoglobin level below the therapeutic range and 61.2% had haemoglobin level above the range, leaving three respondents only within the normal range. More than half of the dialysis sample had a serum albumin level below the therapeutic range, with only two patients above the range. Nearly all patients had urea and creatinine levels above the therapeutic range except one respondent who had a therapeutic range of urea. Ten respondents (7.9%) had urea reduction ratio below 65%.

## Finding from quality of life tools

Table 3 contains total and subscale scores for both the SF-36 tool and the QOL Index Dialysis version. The average SF-36 score was 59 with a range of 17.4–95. The average QOL Index score was 23.2 with a range of 9.6–30. In the SF-36 subscales, higher scores than the overall average were noted in body pain, social functioning, and mental health subscales. And in the QOL Index subscales, higher score that the overall average were noted in the psychosocial/spiritual and family subscales.

Table 4 contains the correlation matrix. The pre-dialysis creatinine level was the only variable with significant correlation with the SF-36 score (r=0.275). None of the blood results had a significant correlation with the QOL Index score.

Table 5 presents *t*-test findings for SF-36 and QOL Index scores across categorical level variables. Significantly higher average total SF-36 scores (64.13 vs 62.04, p=0.14) were found among patients who either held full-time jobs, had no other chronic conditions and did not experience any major life events in the 12 months preceding the survey. Retired patients had the lowest SF-36 scores (49.39) compared to the other employment groups. On the other hand, UAE national patients and patients living with their families had significantly higher QOL Index scores than their counterparts.

Table 6 shows the results from two linear regression models including full and reduced models. The dependent variables are the SF-36 and QOL Index total scores. The independent variables included socio-demographic and health variables as dummy variables and laboratory values as continuous variables. The socio-demographic and health-related variables are included to control for their effects in the regression equation. All four models were significant. Controlling for socio-demographic and health factors, none of the laboratory values had a significant impact on either the SF-36 or QOL Index scores in the full models. In the reduced model, pre-dialysis creatinine level showed a very small positive impact on the QOL Index score. In all models, the presence of other chronic conditions had a significant negative impact on the QOL scores, while the length of time lived in the UAE had a significant but small positive on impact on QOL scores. Experiencing major life events in the past year had a significant negative impact on the SF-36 score, while time on dialysis had a similar impact on the QOL Index score. Having full-time employment and knowledge of the cause of disease also had a positive impact on the SF-36 scores.

## Discussion

The findings from the correlation tests between the total scores of the SF-36 and the collected laboratory values show that the only laboratory value that correlated significantly with better scores on the total scores of the SF-36 was the pre-dialysis creatinine level. Santos and Kerr (2008), found that the body pain subscale of 59 correlates positively with serum creatinine level (p=0.009). An elevated creatinine level before dialysis means remaining a long time without dialysis or having suboptimal dialysis due to the usage of small dialysers or poorly functioning vascular access (Cortez, Paulson, & Schwab, 2005; Locatelli *et al.,* 2002).

The finding that serum albumin did not correlated with SF-36 scores is consistent with Mingardi *et al.*'s (1999) multi-centre study findings. In contrast, Owen, Lew, Liu, Lowrie and Lazarus (1993) found that serum albumin concentration was highly correlated with better QOL scores among dialysis patients and found to be a strong predictor of mortality.

The finding that serum haemoglobin results did not correlate with the total scores of the SF-36 is also consistent with findings by Mingardi *et al.* (1999). The authors attributed their findings to the limited variability of haemoglobin levels in their patients due to the routine use of erythropoietin. Conversely, other studies suggest that anaemia control and high albumin levels were associated with improved survival and QOL (Bergström & Lindholm, 1998; Eknoyan *et al.*, 2002; Kimmel & Patel, 2006; Locatelli *et al.*, 2004; Lopes *et al.*, 2007).

The finding that dialysis adequacy, as measured by urea reduction ratio, did not have any statistical correlation with the SF-36 total scores differs from several other studies (Bergström & Lindholm, 1998; Eknoyan *et al.,* 2002; Kalantar-Zadeh *et al.*, 2001; Kimmel & Patel, 2006; Locatelli *et al.*, 2004; Lopes *et al.*, 2007; Mittal *et al.*, 2001). Unruh *et al.* (2004) and Dwyer *et al.* (2002) found that the effects of dialysis adequacy measures on the total scores of the SF-36 were very small. On the other

hand, Tsuji-Hayashi *et al.* (2001) compared the QOL of dialysis patients in Seattle (USA) with dialysis patients in Aichi (Japan). They attributed the better perception of QOL in Japanese patients to improved dialysis adequacy. Furthermore, Lockridge *et al.* (1999) suggested that the QOL changes experienced in association with changing from conventional haemodialysis to daily dialysis occur in a relatively short period of time.

Although the NKF-K/DOQI (2006) guidelines suggested a minimum acceptable target of URR with 65%, in this study, the mean URR was 75%. However, it did not have any statistically significant correlation with the total scores of both tools. This finding differs from those of Manns *et al.* (2002) who studied 128 patients who had been on haemodialysis for more than six months. Manns *et al.* found that patients with above average URR had higher SF-36 scores. The finding that higher URR did not have a significant effect on either QOL score might be attributed to the low variability in the URR values as well as the presence of other chronic conditions in over half of the study sample.

## Study limitations

This study is a first of its kind in the UAE. The relatively small sample size and the fact that the sample was drawn from a single hospital with well-defined care protocols provided a somewhat homogenous group with limited variability within the study variables. A larger or a multi-centre study may yield greater variability and subsequently more robust findings. The study, also, did not include other factors that could impact the adequacy of dialysis such as type of dialysers, frequency of dialysis treatments and blood and dialysate flow rates.

## Conclusion

A positive significant correlation was found between the SF-36 score and pre-dialysis creatinine level. However, while controlling for other socio-demographic and health factors, we found no significant impact of laboratory values — as proxy to dialysis treatment adequacy — on SF-36 or QOL Index scores. Further research is needed in this area to look for proxy measures to the adequacy of dialysis treatment through larger and more diverse samples and the addition of other factors with direct or indirect influence on dialysis treatment outcomes.

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