

## Exploring quality of life among renal and liver transplant recipients

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**BACKGROUND AND OBJECTIVES:** Despite the worldwide recognition of the importance of quality of life (QOL) assessment, research data on QOL for renal and liver transplant recipients are limited. The main objective of this study was to explore and compare QOL in renal and liver transplant patients.

**DESIGN AND SETTING:** This cross-sectional study was conducted at King Abdulaziz Medical City, Saudi Arabia.

**PATIENTS AND METHODS:** Saudis 16 years of age or more who received liver or renal transplantation at least three months before the study participated. QOL was evaluated using the World Health Organization QOL instrument (WHOQOL-BREF).

**RESULTS:** Renal and liver transplant patients were highly or moderately satisfied with most circumstances of life. Using data for subjects in all WHO centers, renal and liver transplant patients domain scores in this study were significantly higher in the psychological health domain, social relations and environmental domain ( $P < .0001$ ). The results also show that renal and liver transplant recipients who were male, or had higher education or who were employed had higher QOL scores.

**CONCLUSIONS:** This study found that both renal and liver transplant recipients achieved very high QOL domain scores as compared with international data. Lower QOL was significantly associated with social disadvantages, suggesting that these patients may require more focused attention and counselling following transplantation.

The World Health Organization defines Quality of Life (QOL) as an individual perception of their position in life in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns.<sup>1</sup> High QOL does not only reflect improvement in symptoms, but also indicates that an overall improvement in the self-perception of one's health has also occurred.<sup>1</sup>

The volume of QOL research has grown substantially during the last two decades, reflecting the appreciation of the fact that diseases not only impact mortality and other clinical outcomes, but also life style, well-being and perception of health.<sup>2</sup> The recognition of the value of QOL assessment as an important outcome in clinical trials and also in clinical practice

has led to a growing interest in QOL assessment and even in periodic national<sup>2</sup> and disease-related surveillance of QOL.<sup>3</sup> Despite the world wide recognition of the importance of QOL assessment, this has not been matched by similar general population and disease-specific QOL studies in the Middle East region as only a few QOL assessment studies from this region can be identified in the literature.

Even in developing countries, the survival rate for transplant recipients has increased dramatically<sup>4,5</sup> which has contributed to the increasing focus on the QOL of these patients.<sup>6</sup> Transplant recipients may experience various physical, social and psychological changes for many years following their surgery, therefore, periodic QOL assessment should be considered,<sup>6</sup> possibly on a yearly basis, and particularly during the

first few years after transplant. This periodic assessment can be a useful tool in the evaluation of treatment success and may help in making treatment decisions.

Kidney and liver transplantation operations are increasing in Saudi Arabia and in the Middle East. In 2011, there were 553 kidney and 164 liver transplantations in Saudi Arabia alone.<sup>7</sup> However, research data on QOL of renal or liver transplant recipients from the Middle East region are very limited.<sup>8</sup> On the other hand, we have identified only one international study that had directly investigated and compared QOL in renal and liver transplant patients.<sup>9</sup>

Compared to disease specific QOL instruments, generic QOL instruments assess overall health and functioning, are applicable across multiple populations, and can provide cross-disease comparisons. Therefore in the current study we used a generic QOL assessment to be able to compare renal and liver transplant patients and to be able to compare results with general international population data. We selected the WHOQOL-BREF<sup>1</sup> for use in this study as it measures several important domains of QOL including physical, social, psychological and environmental. WHOQOL-BREF was simultaneously developed in diverse cultures. According to the WHOQOL-BREF group because the instrument was developed cross-culturally, health care providers, administrators and legislators in countries where no validated QOL measures currently exist can be confident that data yielded by work involving the WHOQOL assessments will be genuinely sensitive to their setting.<sup>1</sup> Additionally, the WHOQOL-BREF Arabic version is valid and reliable.<sup>10,11</sup>

The specific objectives of this study were to explore and compare renal and liver transplant patients satisfaction with aspects of life circumstances as in the WHOQOL-BREF and to compare the QOL of these two groups with the general international population. In addition, the study investigated the correlation of QOL domain scores with sociodemographic variables.

We hypothesized that renal and liver transplant patients would in general be satisfied with their circumstances of living and that the QOL domain scores of these two groups would be comparable and would be similar to the general international population.<sup>12</sup>

## PATIENTS AND METHODS

### *Study design and setting*

This cross-sectional study was conducted at the liver and kidney transplants centers at King Fahad Hospital, King Abdulaziz Medical City (KAMC), Riyadh, Saudi Arabia. The KAMC hospital in Riyadh

(KAMC-Riyadh) is a 1200-bed tertiary teaching hospital that commenced operations in 1983. It is one of five medical cities of the National Guard Health Affairs (NGHA) that are spread across regions of Saudi Arabia. The health system has been fully accredited by the Joint Commission International (JCI) since 2006. The study was approved by the Institutional Review Board of King Abdullah International Medical Research Center at KAMC, and all persons gave their informed consent prior to their inclusion in the study.

### *Study subjects*

The study was conducted between January 2013 and January 2014. Patients who were residents of Saudi Arabia, 16 years of age or more and received liver or renal transplantation at least three months before the study were asked to participate.

### *Quality of life assessment: WHOQOL-BREF*

QOL was evaluated using the Arabic version of the World Health Organization QOL instrument (WHOQOL-BREF).<sup>10,11</sup> The WHOQOL-BREF contains two general items and 24 specific items measuring the following domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environment domain (8 items).<sup>1</sup> The domain scores reflect the individual perception of QOL in each specific domain. The mean score of items within each domain was used to calculate each domain score which was then multiplied by 4 to make domain scores comparable with the scores used in the WHOQOL-100.<sup>1</sup> Since the instrument is a scale from 1 to 5, the mean scores for each domain range from 4-20 (after multiplying by 4). The WHOQOL-BREF recommends that the scores are then transformed to a scale from 0 to 100 to provide percentage scale maximum (% SM).<sup>1</sup> The value of this transformation is for comparison with other scales.<sup>13</sup> Domain scores are scaled in a positive direction (i.e. higher scores indicate higher QOL). The internal consistency (Cronbach-alpha) value for all domains in this study was >0.70. Instructions were discussed with patients before the instrument was administered through interview.

Subjects categorized as having high QOL were those who had domain scores greater than the mean plus 1 SD. Subjects with normal QOL were those with domain scores within the range of mean plus or minus 1 SD; while poor QOL categorization was for subjects with scores less than the mean minus 1 SD.<sup>2,14</sup>

### *Operational definitions*

We adopted the WHO definition of QOL as an indi-

viduals' perception of life in the context of the culture and value system in which they live and in relation to their goals, expectations, standards and concerns.<sup>12</sup> Patient satisfaction was defined as the degree of positive appreciation for each item of the WHOQOL-BREF. We evaluated satisfaction with each item depending on the % of patients rating the item as good/very good; dissatisfaction (if <50%); bare satisfaction (if 50-65%); moderate satisfaction (if 66-74%); and high satisfaction (if >75%).<sup>2,15</sup>

*Data collection*

Demographic and clinical variables including age, gender, level of education, employment status, economic status, marital status, liver function tests (LFT), and

serum creatinine (SCr) were collected through patient interviews and by reviewing patient charts. Graft function for renal transplant patients was judged as acceptable if SCr was 0.5 to 1.0 mg/dL (45-90 µmol/L) for women and 0.7 to 1.2 mg/dL (60-110 µmol/L) for men (local hospital reference range). Graft function for liver transplant patients was judged as acceptable if the liver function test was within normal range.

Before the study start, research assistants, who were two clinical pharmacists at the study site, were trained on the use of the study's questionnaires and the items on the questionnaires were explained to them.

*Data analysis*

Data entry and analysis were carried out using the Statistical Package for Social Sciences (SPSS v.21, IBM, USA). Categorical variables were expressed as frequency (percentage) and continuous variables were expressed as means and standard deviation. Renal and liver transplant patients were compared in terms of demographic and clinical characteristics. Categorical variables were analyzed using the chi-square test. For continuous variables a *t*-test or Mann-Whitney U were used for comparisons as appropriate.

QOL domain scores (range, 4-10 and 0-100%) were calculated for the four domains and adjusted for sociodemographic variables using one-way analysis of covariance (ANCOVA) as recommended by the WHOQOL group.<sup>1</sup> The association between sociodemographic factors and QOL domains was examined using one-way analysis of variance (ANOVA), Pearson correlation, chi-square test, *t*-test or Mann-Whitney U as appropriate. Statistical significance was considered at *P*<.05.

**RESULTS**

*Demographic characteristics*

During the study period, 357 renal transplant recipients and 461 liver transplant recipients fulfilled the inclusion criteria and 151 renal transplant recipients and 154 liver transplants recipients agreed to participate in the study. The demographic characteristics of the study sample are shown in **Table 1**. Renal transplant patients were significantly younger than liver transplant patients (*P*<.001). Most liver and renal transplant patients were males (80.5% vs 55.6% respectively, *P*<.001). There were also significant differences between renal and liver transplant patients in marital status, number of medications and level of education. Most transplant patients were unemployed and were married.

**Table 1.** Demographic and clinical characteristics.

Variable	Renal transplant (n=151)	Liver transplant (n=154)	P
Age (years)	46.9 (16.5)	57.4 (13.1)	<.001
Mean (SD)			
Range	14-91	19-80	
10-19	6 (4.0)	2 (1.3)	
20-29	22 (14.6)	5 (3.2)	
30-39	23 (15.2)	11 (7.1)	<.001
40-49	29 (19.2)	14 (9.1)	
≥50	71 (47.0)	122 (79.2)	
<b>Gender</b>			
Male	84 (55.6)	124 (80.5)	<.001
Female	67 (44.4)	30 (19.5)	
<b>Level of education</b>			
Illiterate	40 (26.5)	36 (23.4)	.037
Primary school	31 (20.5)	46 (29.9)	
High school	24 (15.9)	17 (11.0)	
University degree or above	56 (37.1)	55 (35.7)	
<b>Employment status</b>			
Yes	33 (21.9)	39 (25.3)	.48
No	118 (78.1)	115 (74.7)	
<b>Economic status</b>			
Low (≤5000)	68 (45.0)	69 (44.8)	.85
Medium (500-1000)	47 (31.1)	48 (31.2)	
High (>10000)	31 (20.5)	37 (24.0)	
Missing	5 (3.3)	0 (0.0)	

Data presented as frequency (percentage) unless otherwise stated.

*Satisfaction with circumstances of life*

Employing the operational definition for satisfaction with QOL items, interestingly, we found that renal and liver transplant patients were highly or moderately satisfied with most of the circumstances of life (Table 2). However, most of the subjects were unsatisfied with the availability of money (income) for their needs. Both liver and renal transplant patients were barely satisfied or unsatisfied with sexual life, ability to concentrate, availability of money and available information for life. Renal transplant patients dissatisfaction or bare satisfaction was also observed in several items related to physical aspects such as enough energy, capacity to work and ability to get around.

*Quality of life domain scores*

Tables 3 and 4 show QOL domain scores by transplant type and QOL category.

Average scores for each of the domains in both renal and liver transplant recipients were more than 70%. For each domain, in both patient groups, less than 20% of patients were classified in the poor QOL category. Renal transplant recipients had significantly higher scores than liver transplant recipients in both social and environmental domains whereas liver transplant recipients had higher scores in the psychological domain (Table 3).

*Association of QOL domain scores with sociodemographic variables*

Factors associated with QOL domains are shown in Table 5 (renal transplant patients) and in Table 6 (liver transplant patients).

In renal transplant patients, age was correlated with the physical domain only, where younger patients reported significantly higher satisfaction. On the other hand male patients had higher QOL scores in all domains and the differences were statistically significant in the physical and environmental domains. Employment status, education level, and marital status also had a significant impact on both the physical and the environmental domains. The social relations domain was only related to employment status, where employed patients reported significantly higher scores. Environmental domain was also significantly influenced by economic status.

For liver transplant patients, males reported higher QOL scores in all domains and all were statistically significant except in the environmental domain. Age was not associated with any of the QOL domain scores in the liver transplant patients. Similar to renal transplant patients, employment status, education

**Table 1. cont.** Demographic and clinical characteristics.

Variable	Renal transplant (n=151)	Liver transplant (n=154)	p
<b>Marital status</b>			
Single	26 (17.2)	6 (3.9)	
Married	88 (58.3)	137 (89.0)	
Divorced	5 (3.3)	3 (1.9)	<.001
Widow	15 (9.9)	8 (5.2)	
Missing	17 (11.3)	0 (0.0)	
<b>Medication administration</b>			
Self	131 (86.8)	135 (87.7)	
Caregiver	15 (9.9)	19 (12.3)	.57
Missing	5 (3.3)	0 (0.0)	
<b>Graft function</b>			
Acceptable	102 (67.5)	149 (96.8)	
No acceptable	48 (31.8)	5 (3.2)	<.001
Missing	1 (0.7)	0 (0.0)	
<b>Number of medications</b>			.004
Mean (SD)	11.0 (4.3)	9.4 (5.2)	

Data presented as frequency (percentage) unless otherwise stated.

level and economic status had a significant effect on the environmental domain while social domain scores were significantly associated with economics, marital status and employment status. Economic status was significantly associated with all domains except the physical domain. The number of patients who weren't married was too small to draw a valid conclusion on the impact of marital status on QOL.

**DISCUSSION**

Renal and liver transplantation are becoming very common in Saudi Arabia and the Middle East.<sup>7</sup> However, there are very limited data from the Middle East on this important group of patients<sup>4,5,16</sup> and only a few studies have investigated QOL in transplant recipients.<sup>8</sup>

*Satisfaction with circumstances of life*

The generally high level of satisfaction with items of life circumstances (Table 2) and the high domain scores (see below pattern of QOL domain scores were rather surprising for both groups of patients. This could be attributed to the generally high socioeco-

**Table 2.** Level of satisfaction on WHOQOL-BREF Items.

	Renal transplant (n=151)		Liver transplant (n=154)	
	Item	%	Item	%
Highly satisfied	Self-satisfaction	80.8	Capacity for work	76.5
	Life meaningful	77.5	Self-satisfaction	85.7
	Leisure activities	76.5	Conditions of living place	97.4
	Need for treatment	86.0	No physical pain	87.0
	Healthy Physical environment	80.8	Leisure activities	79.2
	Personal relationships	88.0	Need for treatment	81.1
	Access health services	82.2	Enjoyment of life	94.8
	Conditions of living place	84.8	Safety	91.5
	Transport	80.2	Healthy physical environment	86.8
			Personal relationships	93.5
Moderate satisfaction	Sleep	73.5	Sleep	68.2
	Enjoyment of life	66.9	Enough energy	66.2
	Safety	68.9	Activities of daily living	69.0
	No physical pain	69.4	No negative feeling	68.2
Bare satisfaction	Bodily appearance	52.3	Transport	60.4
	Enough energy	52.3	Ability to concentrate	61.7
	Available information for life	62.2		
	Friends' support	61.5		
	Activities of daily living	59.6		
	Sexual life	59.0		
	Capacity for work	57.0		
	Ability to get around	54.3		
	Ability to concentrate	64.9		
Unsatisfied	Money	43.7	Sexual life	30.5
	No negative feeling	41.0	Money	42.8
			Available information for life	30.5

conomic indices and strong religious belief of the Saudi population and may also reflect the close-knit family relations and structure in the Saudi society. This high level of satisfaction was not even achieved in a nationwide study of Kuwaiti subjects who generally have similar socioeconomic indices as Saudi Arabia where only average levels of satisfaction based on the same questionnaire were reported.<sup>2</sup> Another possible explanation for these high satisfaction levels could be a general relief after successful transplantations and may indicate happiness with life after suffering for many years from illness. The completely free of charge medical service these patients are receiving could have also contributed to the high level of satisfaction. In concordance with our results, Moralis et al reported that most liver and renal transplant patients had no problems in the five QOL dimensions explored using EQ-5D.<sup>9</sup>

Liver and renal transplant patients' poor satisfaction with sexual life, ability to concentrate, availability of money and available information for life was expected, as it might be related to their older age and high unemployment status. On the other hand, more than 50% of renal transplant patients were less than 50 years of age compared with around 20% of liver transplant patients. This age difference may have caused higher physical expectations among renal transplant patients and was reflected in their greater dissatisfaction with the physical aspects.

#### Pattern of QOL domain scores

The domain scores (Table 3) and the prevalence of normal/high QOL categories (Table 4) were very high in both renal and liver transplant patients. Applying Cummins' recommendation of a 70% - 80% threshold for psychosocial well-being<sup>13</sup> we found that renal and liver transplant recipients had achieved the psychosocial well-being threshold score of 70% for all domains.

Renal transplant recipients' satisfaction with their sexual life was approximately twice that for liver transplant recipients and this was reflected in the significantly higher social domain scores in the renal transplant patients (Table 3). The younger age of renal patients could also have contributed to their higher scores in the environmental domain and also to the better satisfaction with sexual life and hence higher social domain scores. On the other hand liver transplant recipients had significantly higher scores in the psychological domain, which could have been due to the much higher percentage of male subjects compared to renal transplant recipients. In support of this argument, Table 6 shows that male patients scored

**Table 3.** Quality of life domain scores.

Domain	Renal transplant (n=151)			Liver transplant (n=154)		
	4-20 scale <sup>a</sup>	0-100 scale %SM <sup>b</sup>	Adjusted values <sup>c</sup>	4-20 scale <sup>a</sup>	0-100 scale %SM <sup>b</sup>	Adjusted values <sup>c</sup>
Physical health	16.1 (3.1)	76.1 (19.2)	76.6 (16.0)	16.1 (3.0)	76.0 (18.7)	76.4 (19.9)
Psychological** health	16.2 (2.5)	76.4 (15.3)	76.0 (16.0)	17.6 (2.0)	85.0 (12.3)	84.9 (12.4)
Social relations**	16.7 (3.2)	79.1 (20.3)	79.3 (20.9)	15.6 (2.8)	72.5 (17.8)	72.3 (19.9)
Environmental*	17.0 (2.5)	81.3 (15.4)	80.8 (16.0)	16.4 (2.1)	77.6 (13.0)	78.2 (13.7)

Data are expressed as mean (standard deviation); <sup>a</sup>Transformed scores on 4-20 scale based on WHO User Manual <sup>b</sup>A % SM = % of scale maximum using transformed 0-100. Figures calculated using guidelines from WHO User Manual; <sup>c</sup>Adjusted for age, sex, education, occupation, marital status and perception of being currently ill based on WHO User Manual.

\*\*P value less than .001 for renal vs liver.

\*P value less than .05 for renal vs liver.

**Table 4.** Categorization of QOL of subjects.

QOL Domains	Renal transplant (n=151)			Liver transplant (n=154)		
	High	Normal	Poor	High	Normal	Poor
Physical health	26 (17.2)	99 (65.6)	26 (17.2)	15 (9.7)	116 (75.3)	23 (14.9)
Psychological health	31 (20.5)	102 (67.5)	18 (11.9)	18 (11.7)	109 (70.8)	27 (17.5)
Social relations	33 (21.9)	89 (58.9)	29 (19.2)	35 (22.7)	117 (76.0)	2 (1.3)
Environmental	18 (11.9)	110 (72.8)	23 (15.2)	31 (20.0)	96 (62.3)	27 (17.5)

Data are expressed as mean (standard deviation); <sup>a</sup>High QOL: i.e., subjects with domain scores > group mean score plus 1 SD; <sup>b</sup>Average QOL: subjects with domain scores within the range of group mean score plus/minus 1 SD; <sup>c</sup>Poor QOL: subjects with domain scores < group mean score minus 1 SD.

higher in the psychological domain as compared to female patients.

Using data for subjects in all WHO centers,<sup>12</sup> renal and liver transplant patients domain scores in this study were similar to the total WHO subjects in the physical domain ( $P > .05$ ) and they scored significantly higher in the psychological health domain, social relations and environmental domain ( $t > 5$  for all comparisons,  $df = 11979$  (renal) and  $11982$  (liver),  $P < .0001$  for all comparisons). These high scores in the renal and liver transplant patients may also be related to the high socioeconomic indices of the Saudi population and other related factors listed in the satisfaction with QOL items section above.

Our results were also similar to those of Lekarskist

**Table 5.** Factors associated with QOL in renal transplant patients.

Variable		N	Physical	Psychological	Social	Environmental
Graft function	Good	102	78.6 (17.6) <sup>a</sup>	77.3 (14.0)	78.8 (19.3)	82.5 (14.1)
	Unsatisfactory	48	70.9 (21.8)	74.4 (17.9)	79.6 (22.4)	78.4 (17.7)
Age	r value	151	-0.313 <sup>c</sup>	0.071	-0.105	-0.143
Age category	10-19	6	93.8 (6.9) <sup>b</sup>	82.3 (8.4)	86.5 (17.5)	95.0 (4.5)
	20-29	22	84.5 (14.4)	72.6 (17.3)	75.3 (25.5)	81.5 (15.0)
	30-39	23	73.5 (20.6)	71.3 (15.9)	81.8 (22.2)	81.6 (17.8)
	40-49	29	76.5 (18.0)	78.7 (11.0)	84.1 (19.1)	80.3 (15.4)
	>50	71	72.9 (20.1)	77.7 (16.2)	76.9 (18.4)	80.2 (15.1)
Gender	Male	84	80.9 (17.4) <sup>c</sup>	78.0 (15.8)	81.1 (17.8)	83.5 (13.8) <sup>a</sup>
	Female	67	69.9 (19.8)	74.4 (14.6)	76.6 (22.9)	78.6 (16.9)
Duration	<1 year	28	83.6 (17.5) <sup>a</sup>	77.9 (14.7)	79.6 (19.6)	82.8 (16.3)
	>1 year	123	75.7 (19.4)	75.8 (15.8)	80.9 (19.4)	79.9 (15.6)
Type of transplant	Cadaveric	39	76.4 (18.4)	77.4 (16.5)	80.4 (21.9)	81.1 (15.6)
	LRRT	50	78.8 (18.6)	75.9 (14.1)	81.4 (16.7)	79.4 (14.2)
	LNRRT	42	74.9 (21.2)	75.9 (16.3)	79.6 (20.1)	81.3 (17.8)
Economic	<5000	68	75.4 (19.7)	75.4 (15.6)	76.8 (22.1)	75.8 (15.7) <sup>c</sup>
	5001-10000	47	77.3 (20.1)	77.7 (17.6)	83.9 (16.8)	83.9 (13.5)
	>10001	31	75.5 (17.9)	77.3 (11.9)	78.3 (20.6)	89.5 (11.7)
Level of education	Illiterate	40	68.7 (20.9) <sup>c</sup>	77.1 (14.7)	75.5 (18.5)	73.7 (17.3) <sup>c</sup>
	Primary school	30	71.2 (18.1)	75.9 (13.4)	79.8 (24.9)	79.6 (13.6)
	High school	24	82.2 (18.8)	80.7 (14.9)	83.6 (14.3)	85.5 (14.9)
	University degree or above	55	82.1 (16.2)	74.7 (17.1)	79.6 (20.9)	85.6 (13.1)
Employment	Yes	33	83.1 (16.8) <sup>a</sup>	77.0 (11.6)	86.1 (14.4) <sup>a</sup>	85.9 (13.2) <sup>a</sup>
	No	118	74.1 (19.5)	76.3 (16.3)	77.2 (21.2)	80.0 (15.8)
Marital status	Single	26	86.5 (13.2) <sup>b</sup>	75.1 (16.5) <sup>a</sup>	78.4 (21.1)	85.3 (14.6) <sup>b</sup>
	Married	88	76.3 (15.8)	77.9 (13.8)	82.4 (19.0)	81.8 (13.6)
	Widow	15	69.9 (18.4)	75.1 (16.9)	74.9 (15.9)	70.9 (20.5)
	Divorced	5	62.6 (22.8)	56.4 (24.9)	67.6 (22.9)	64.0 (20.8)

Data are expressed as mean (standard deviation); <sup>a</sup>P<.05; <sup>b</sup>P<.01; <sup>c</sup>P<.001; LRRT: Living-related renal transplant; LNRRT: Living non-related renal transplant

**Table 6.** Factors associated with QOL in liver transplant patients.

Variable		N	Physical	Psychological	Social	Environmental
Graft function	Good	149	75.8 (18.9)	84.9 (12.4)	72.9 (17.2)	77.4 (12.9)
	Unsatisfactory	5	82.6 (12.7)	87.4 (9.0)	58.6 (29.6)	85.2 (12.9)
Age	r value	154	-0.143	0.059	-0.034	0.023
Age category	10-19	2	87.5 (9.2)	91.0 (4.2)	47.0 (4.2)	75.0 (0.0)
	20-29	5	75.0 (15.3)	82.8 (13.5)	67.4 (20.5)	81.4 (6.5)
	30-39	11	80.3 (19.0)	83.7 (13.6)	76.7 (19.5)	79.0 (12.9)
	40-49	14	82.3 (12.8)	85.0 (10.0)	77.2 (16.5)	77.4 (15.2)
	≥50	122	74.8 (19.4)	85.1 (12.6)	72.2 (17.5)	77.4 (13.1)
Gender	Male	124	78.3 (17.1) <sup>b</sup>	85.9 (11.7) <sup>a</sup>	74.9 (17.6) <sup>c</sup>	78.4 (13.3)
	Female	30	66.6 (22.3)	80.9 (14.1)	62.1 (14.6)	74.5 (11.3)
Type of transplant	LRLT	28	74.9 (24.3)	85.8 (14.1)	73.9 (15.6)	80.5 (11.8)
	DDLT	126	76.3 (17.4)	84.8 (11.9)	72.2 (18.3)	76.9 (13.1)
Economic	<5000	69	73.8 (19.3)	82.4 (13.2) <sup>a</sup>	70.7 (17.6) <sup>a</sup>	72.1 (10.8) <sup>c</sup>
	5001-10 000	48	77.5 (15.9)	85.6 (12.6)	70.5 (18.1)	77.0 (12.3)
	>10001	37	78.2 (20.9)	88.8 (9.0)	78.4 (16.8)	88.7 (10.4)
Level of Education	Illiterate	36	68.9 (21.6)	84.4 (10.9)	66.3 (16.9)	73.3 (10.4) <sup>c</sup>
	Primary school	46	78.8 (12.9)	84.5 (11.7)	73.4 (16.9)	75.3 (13.3)
	High school	17	71.9 (23.4)	83.7 (16.0)	73.6 (15.1)	72.2 (15.3)
	University degree or above	55	78.5 (19.2)	85.4 (12.9)	75.7 (19.6)	82.9 (11.6)
Employment	Yes	39	79.9 (15.6)	86.0 (10.4)	78.4 (14.8) <sup>a</sup>	81.4 (11.8) <sup>a</sup>
	No	115	74.7 (19.6)	84.6 (12.9)	70.5 (18.3)	76.3 (13.1)
Marital status	Single	6	88.7 (6.4)	89.8 (6.5)	52.0 (4.9) <sup>a</sup>	77.2 (8.4)
	Married	137	76.0 (18.7)	85.4 (12.2)	74.8 (17.2)	77.6 (13.2)
	Widow	3	81.3 (18.5)	77.3 (18.5)	60.3 (7.5)	85.3 (7.5)
	Divorced	8	64.3 (20.3)	77.5 (13.9)	52.1 (8.8)	75.1 (12.6)

Data are expressed as mean (standard deviation); <sup>a</sup> $P < .05$ ; <sup>b</sup> $P < .01$ ; <sup>c</sup> $P < .001$ ; LRLT: Living related liver transplant; DDLT: Deceased donor liver transplant.

al, where they found that renal transplant patients domain scores (WHOQOL-BREF) were similar to normal subjects in most aspects,<sup>17</sup> however, patients in the current study scored significantly higher. Another study reported that the QOL of Chinese renal transplant patients using the WHOQOL-BREF was moderate.<sup>18</sup> However, this study was conducted in 1999, when renal transplantation and immunosuppression therapy may not have been as advanced as today. Compared with the Kuwaiti general population,<sup>2</sup> renal and liver transplant patients scored significantly higher in all domains ( $df=3352$  and  $3355$  in renal and liver respectively,  $P < .0001$  for all domains).

#### Factors associated with QOL

Factors associated with QOL in the current study were similar to those in published reports.<sup>2,12,19,20</sup> Reduced QOL was associated with female gender and older age. The lack of association of QOL with age in liver patients was due to the narrow age distribution in this group, in which about 80% of patients were more than 50 years old.

The results also show that renal and liver transplant recipients who were males, or single or married, or had higher education or who were employed had consistently higher QOL domain scores. This important finding was similar to that in other re-

ports<sup>2,9,20</sup> where there was consistent evidence of poorer QOL with social disadvantage as indicated by the significant impact of gender, employment status, economic status, education level and marital status on most QOL domain scores. The clinical implication for this is that focused attention and counseling should be provided for these groups of patients.

#### *Limitations and strengths*

A major limitation of this study is its cross-sectional nature rather than longitudinal, controlled or before/after design; hence the results do not support causality. Also the study was conducted at a single center, which may limit its generalizability. Another limitation was that the WHOQOL-BREF has not been previously used on the Saudi population,

which precluded more useful comparisons and further investigation of the study results.

On the other hand, this study provides important data on QOL for renal and liver transplant recipients thus establishing benchmarks for future comparisons with other patients groups and other diseases in the Middle East.

## CONCLUSION

This study found that both renal and liver transplant recipients achieved very high QOL domain scores as compared to the international data and were highly satisfied with their QOL aspects as measured by the WHOQOL-BREF. Lower QOL was significantly associated with social disadvantage, suggesting that these patients may require more focused attention and counselling following transplantation.

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