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Differences in quality of life between Jewish and Arab patients on hemodialysis

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Abstract
Purpose Higher health-related quality of life (HRQOL) in dialysis patients has been associated with fewer hospitalizations and lower mortality. Since Arab patients on dialysis have better survival rates than Jewish patients, we hypothesized that they would have higher HRQOL. We also studied the impact of several risk factors on HRQOL in each population.
Methods Based on a national dialysis registry, patients from 64 hemodialysis units were recruited to participate. Patients who consented were interviewed face-to-face, using the Kidney Disease Quality of Life Short Form (KDQOL-SF36) questionnaire.
Results Five hundred and fifty-eight (50.6%) Jewish and 544 (49.4%) Arab patients participated in the study. For Arab patients mean crude scores for the "mental component summary" and KDQOL scores were significantly lower than for Jewish patients [31.6 (95% Cl 30.0–33.3) vs. 38.0 (95% Cl 36.1–39.9), $p < 0.0001$ and 55.6 (95% Cl 54.5–56.7) vs. 59.8 (95% Cl 58.6–60.9), $p < 0.0001$, respectively]. Much lower scores were observed for Arabs in the "emotional role" and "work status" subscales. The two populations had similar general health assessments and albumin level. For both, HRQOL was positively associated with higher educational level, higher albumin level, and dialysis connection by fistula or graft; and negatively associated with low income and diabetes. HRQOL was negatively associated with previous cerebrovascular accident among Arabs and with female gender among Jews.
Conclusions Differences between Jews and Arabs in subscales related to psychosocial factors suggest that cultural differences in the perceptions of sickness and health may be relevant here. Future studies should explore such possibility and focus on the large gap in the "work status" subscale.

Keywords Health-related quality of life (HRQOL) · KDQOL-SF36 · Hemodialysis · End-stage renal disease · Quality of life · Jews · Arabs

Introduction

Survival of hemodialysis patients has improved remarkably in recent years [1, 2]. However, the quality of life (HRQOL) of these patients remains significantly lower than that of the general population [1–8]. Patients on dialysis often have several comorbid conditions, and require close medical management and follow-up, frequently resulting in severe stress and poor HRQOL [9].

Several factors have been reported to be associated with higher HRQOL among dialysis patients, including younger age [7, 10–12]; male gender [1, 10, 13]; higher levels of albumin, hemoglobin and creatinine [7, 13]; higher education and income [3, 6, 10, 11, 14]; and religious adherence [12, 15, 16]. Race, cultural diversity, and ethnicity

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have also been suggested to play a role in HRQOL among dialysis patients, partly due to different perceptions and/or expressions of sickness and suffering [17, 18]. Higher HRQOL among dialysis patients has been associated with better compliance with treatment, fewer hospitalizations, and improved survival [7, 14, 19].

Since survival rates of Israeli Arab dialysis patients have been found to be higher than those of Jewish patients [20, 21], we hypothesized that HRQOL scores might be higher among Arab patients. The current study examined HRQOL of hemodialysis patients among the two major population groups in Israel—Jews and Arabs, whose differences with respect to culture, socioeconomic factors, and health behaviors may affect their HRQOL [22–24]. We also studied correlates of HRQOL in these population groups.

Methods

Study design

A cross-sectional study was conducted between January 2014 and February 2015 based on the national Israeli dialysis registry.

Sample size and patient recruitment

Israel has a national dialysis registry since 1980, managed by the Israel Center for Disease Control. Every new patient is reported to the registry by the hemodialysis (HD) unit where he/she is treated. There are 73 HD units distributed throughout seven geographic districts in Israel. Sample size was calculated to enable the detection of a 3-point difference in HRQOL mean scores between Jews and Arabs, with statistical power of 80% at a 5% level of significance. To obtain a geographic representative sample, the number of patients recruited from each district was proportional to the number of HD patients treated in that district. The number of patients sampled per HD unit was proportional to the size of the unit; and within the unit, the numbers of Jews and Arabs sampled were equal. In most of the hemodialysis units (48 of 64), Jewish and Arab patients were treated in the same unit. Nine small units were not included in the study due to technical problems. These units comprised 359 patients, which equaled 6.6% percent of the total number of patients in the survey year.

Inclusion and exclusion criteria

The inclusion criteria for sample selection were age over 18 years and treatment by hemodialysis in one of the 64 dialysis units sampled, native language of Hebrew or Arabic, and the capability of responding to the questionnaire independently. Patients with deafness, severe speech impairments, or cognitively disabled were excluded.

Patients who consented to participate in the study were scheduled an interview on one of their regular visits to the dialysis unit. After receiving a detailed explanation about the study and signing an informed consent, the participants were interviewed face-to-face, in their native language (Hebrew or Arabic). The interviewers were nursing students in the final year of study, who received comprehensive training for interviewing by the principal investigator.

The interview took place at the patient's bedside during dialysis treatment, with closed curtain to assure maximum confidentiality. The interviewers were asked to follow the questionnaire exactly.

The study protocol was approved by the Institutional Review Board of the Israel Ministry of Health.

Assessment of quality of life

Quality of life was assessed using the Kidney Disease Quality of Life Short Form (KDQOL-SF36 questionnaire) [25]. We used the translated versions provided by RAND Health on their official website [26]. These translations were prepared following the specifications provided by RAND Health. The Arabic version was validated by ElHafeez et al. [27] and the Hebrew version was validated by Lewin-Epstein N.et al. [28].

The KDQOL-SF36 includes general measures and additional questions designed to assess the particular health-related concerns of individuals with kidney disease, including those on dialysis. The SF-36 items are compressed into eight multi-item scales, which are summarized in two dimensions. Physical functioning, physical role, bodily pain, general health, and vitality scales are aggregated into the "physical component summary" (PCS); and social functioning, emotional role, mental health, vitality, and general health scales are aggregated into the "mental component summary" (MCS) (General health and vitality scales are included in both the PCS and MCS dimensions). The scores of the two dimensions (PCS, MCS) are based on mathematical averaging of the scale components [25, 29].

The kidney disease quality of life component score (KDQOL) was derived from 11 subscales: symptoms/problems, effect of kidney disease on daily life, burden of kidney disease, work status, cognitive function, quality of social interaction, sexual function, sleep, social support, support of dialysis staff, and patient satisfaction. The questionnaires were scored according to the manual of Hays et al. [30]. Higher scores indicated better quality of life. The participants were also asked to rate their general health assessment on a scale from 0 to 100.

Socio-demographic and clinical data

Socio-demographic and clinical data of patients were collected at the time of the interview and included patient's age, number of children, country of birth, marital status, years of schooling, monthly household income, employment, smoking habits, whether the patient was a candidate for kidney transplant, and residual renal function (as reported by the patients).

Information on dialysis access and on comorbidities, including congestive heart failure, angina pectoris, other cardiac conditions, peripheral vascular disease, stroke, diabetes, hypertension, lung disease, and cancer was extracted from the patient medical records. This was also the source of information for most recent laboratory values of albumin (g/dl), hemoglobin (g/dl), cholesterol (mg/dl), transferrin (mg/dl), parathyroid hormone (PTH) (pg/ml), and C-reactive protein (CRP) (mg/l).

Statistical analysis

For continuous variables, differences in means between Jews and Arabs were assessed by T test, and the χ^2 test was applied for categorical variables. A p value of less than 0.05 was considered statistically significant.

The associations between independent variables and summary scores (PCS, MCS, and KDQOL) were analyzed using simple linear regression models. Variables indicating statistically significant associations with the various summary scores ($p < 0.05$) were included in the multiple linear regression models. In addition, the variables of age, gender, and duration of treatment were included in all models regardless of their statistical significance, because of the relevance of these factors to the HRQOL of patients.

We compared the adjusted scores of Jews and Arabs by analysis of covariance (ANCOVA) using the generalized linear regression model (GLM procedure). All statistical analyses were performed using the SAS package (version 9.1, SAS, Cary, NC).

Results

Of 743 Jewish patients sampled, 558 (75.1%) were interviewed. Of 701 Arab patients, 544 (77.8%) were interviewed. The characteristics of the study participants by population group are presented in Table 1. Jews were significantly older than Arabs, with more years of schooling and higher monthly income. Jews were more likely to be current or past smokers, with a higher rate of cancer, and more likely to have catheter access to the dialysis machine. Arab patients were more likely to be married, with more children, and with a higher rate of diabetes. There were no statistically significant differences in the mean number of years on dialysis, in the rates of the other comorbidities, in any of the laboratory parameters and in the male to female ratio.

Table 2 presents crude and adjusted scores of Jewish and Arab patients for each of the subscales that comprise the PCS and the MCS, and the mean SF-36 score. It also presents the scores on eleven subscales of the KDQOL, and the KDQOL mean score. Arabs had significantly lower adjusted scores on the MCS (32.4 vs. 36.7; $p = 0.003$), mainly due to low scores on the "emotional role." There was no difference between Arabs and Jews in the adjusted PCS scores. Arabs scored significantly lower than Jews in the "physical role" subscale (adjusted scores: 10.1 vs. 18.4, respectively, $p = 0.002$) but significantly higher on the general health component.

The KDQOL summary score was significantly higher among Jews (adjusted scores: 58.6 vs. 56.2; $p = 0.03$). A most striking difference between the populations was in the "work status" subscale (adjusted scores: 8.9 vs. 25.2, respectively, $p < 0.0001$). Arabs scored significantly higher on "social support" but lower on "quality of social interaction" and "staff encouragement" (Table 2).

General health assessment

The crude means of the general health assessment were 42.0 (95% CI 40.1–43.8) in Jews and 42.3 (95% CI 40.4–44.1) in Arabs, $p = 0.37$. The adjusted means were 41.7 (95% CI 39.4–45.0) in Jews and 43.2 (95% CI 40.6–45.0), $p = 0.47$, respectively.

The univariate regression

PCS scores PCS scores were positively associated with male gender, higher education, higher monthly income, dialysis connection by fistula/graft compared to catheter, and higher albumin level among both Jews and Arabs. In Arabs, PCS scores were also positively associated with higher transferrin level. PCS scores were negatively associated with older age, no residual renal function, and the following comorbidities: diabetes, congestive cardiac failure, heart disease (other than angina pectoris or congestive cardiac failure), and chronic pulmonary disease, in both Jews and Arabs. In Arabs, PCS scores were also negatively associated with the number of children, past CVA, angina pectoris, and peripheral vascular disease.

MCS scores MCS scores were positively associated with male gender, higher education, higher monthly income, dialysis connection by fistula/graft compared to catheter, having residual renal function, and higher albumin levels, among both Jews and Arabs. MCS scores were negatively

Table 1 Demographic, clinical characteristics, and laboratory findings of Jewish and Arab dialysis patients

	Jewish patients $N = 558$ N (%) or mean ± SD	Arab patients $N = 544$ N (%) or mean ± SD	p
Age	69.5 ± 13.1	61.4 ± 14.1	<0.0001
Gender (male)	287 (51.4)	277 (50.9)	0.9
Marital status			
Married	348 (62.4)	393 (72.2)	<0.0001
Divorced	68 (12.2)	24 (4.4)	
Widowed	116 (20.8)	79 (14.5)	
Unmarried	26 (4.7)	48 (8.8)	
No. of children	3.0 ± 2.0	5.3 ± 3.4	<0.0001
Education (years)	9.6 ± 3.7	6.5 ± 4.5	<0.0001
Monthly income (US$)			
≤1000	164 (37.2)	293 (64.7)	<0.0001
1001–2000	178 (40.4)	139 (30.7)	
≥2001	99 (22.5)	21 (4.6)	
No. of years on dialysis	5.7 ± 4.3	6.0 ± 4.0	0.3
Having residual renal function			
No	102 (18.3)	81 (14.9)	0.3
Yes	456 (81.7)	463 (85.1)	
Dialysis connection			
Catheter	133 (23.1)	115 (21.1)	0.0006
Fistula	383 (66.6)	405 (74.3)	
Graft	59 (10.3)	25 (4.6)	
Ever smoked	212 (44.0)	146 (33.3)	0.0009
Hypertension	476 (85.3)	462 (84.9)	0.9
Diabetes	293 (52.5)	327 (60.1)	0.01
Past cerebrovascular accident	83 (14.9)	76 (14.0)	0.6
Congestive cardiac failure	129 (23.1)	137 (25.2)	0.4
Angina pectoris	184 (33.0)	193 (35.5)	0.4
Other heart disease	283 (50.7)	282 (51.8)	0.7
Peripheral vascular disease	73 (13.1)	70 (12.9)	0.9
Chronic pulmonary disease	119 (20.4)	110 (20.2)	0.9
Cancer	118 (21.2)	44 (8.1)	>0.0001
Albumin (g/dl)	3.8 ± 0.36	3.8 ± 0.4	0.6
Hemoglobin (g/dl)	11.2 ± 1.2	11.2 ± 1.2	0.9
CRP (mg/l)	2.9 ± 2.7	3.4 ± 3.5	0.1
Cholesterol (mg/dl)	154.4 ± 39.1	151.9 ± 36.9	0.3
PTH (pg/ml)	415.3 ± 387.8	407.6 ± 401.8	0.7
Transferrin (mg/dl)	160.8 ± 50.9	167.2 ± 42.3	0.03

associated with older age, number of children and diabetes, in both Jews and Arabs. Additionally, in Arabs, MCS scores were negatively associated with other comorbidities: congestive cardiac failure, angina pectoris, other heart disease, chronic pulmonary disease, past CVA, and peripheral vascular disease.

KDQOL scores KDQOL scores were positively associated with higher monthly income and dialysis connection by fistula/graft compared to catheter, among both Jews and Arabs. In addition, in Jews, KDQOL scores were positively associated with higher education and higher albumin level; and in Arabs, with male gender. KDQOL scores were negatively associated with diabetes in both Jews and Arabs. Among Arabs, KDQOL scores were negatively associated with other comorbidities, namely: congestive cardiac failure, angina pectoris, past CVA, and peripheral vascular disease.

Table 2 Crude and adjusted KDQOL-SF36 scores for Jewish and Arab dialysis patients

	Jews $N = 558$ mean (95% CI)		Arabs $N = 544$ mean (95% CI)	
	Crude	Adjusted*	Crude	Adjusted*
SF 36 subscores				
Physical functioning	26.0	26.4	22.8	22.8
	(23.7–28.4)	(24.0–28.9)	(20.4–25.1)	(20.4–25.3)
Physical role	19.4**	18.4**	9.9	10.1
	(16.5–22.4)	(15.3–21.6)	(7.6–12.3)	(7.0–13.3)
Body pain	40.9	39.2	38.3	39.8
	(37.9–43.8)	(35.7–42.5)	(35.5–41.1)	(36.9–43.1)
General Health	30.0	27.5**	32.5	34.2
	(28.1–32.0)	(25.2–29.8)	(30.5–34.5)	(31.9–36.4)
Vitality	53.7**	52.2**	45.3	47.3
	(51.7–55.8)	(48.8–54.5)	(43.6–47.0)	(45.0–49.6)
Emotional role	33.5**	33.5**(29.2–37.7)	15.6	15.4
	(29.7–37.4)		(12.6–18.6)	(11.3–19.6)
Social functioning	43.7**	42.3	38.7	39.5
	(40.7–46.7)	(38.9–45.7)	(35.7–41.6)	(36.1–42.8)
Mental health	29.1**	27.1	26.2	27.3
	(27.2–31.1)	(24.5–29.3)	(24.4–27.9)	(25.2–29.5)
Physical component summary (PCS)	29.1**	28.0	25.9	26.6
	(27.2–30.9)	(26.1-29.8)	24.3-27.6))	(24.7-28.4)
Mental component summary (MCS)	38.0**	36.7**	31.6	32.4
	(36.1–39.9)	(34.7–38.9)	(30.0–33.3)	(30.4–34.5)
KDQOL subscores				
Symptoms	61.1**	60.1	58.2	58.8
	(59.3–62.7)	(57.9–62.2)	(56.3–60.3)	(56.6–60.8)
Effects	51.2**	48.9	47.3	47.6
	(49.2–53.1)	(46.5–51.3)	(45.4–49.3)	(45.3–49.9)
Burden	28.6	27.2	27.8	27.9
	(26.5–30.6)	(24.9–25.6)	(26.0–29.7)	(25.6–30.3)
Work status	27.5**	25.2**	6.7	8.9
	(24.7–30.3)	(22.3–28.0)	(5.0–8.5)	(6.2–11.7)
Cognitive function	75.4**	72.6	67.9	69.9
	(73.3–77.4)	(70.1–75.1)	(65.8–69.9)	(67.5–72.4)
Quality of social interaction	74.0**	72.1**	64.9	66.6
	(72.2–75.9)	(69.8–74.4)	(63.1–66.8)	(64.4–68.8)
Sexual functioning	75.8	72.4	72.5	71.3
	(72.4–79.3)	(68.2–76.7)	(68.9–76.0)	(67.2–75.4)
Sleep	48.5	47.8	48.8	49.4
	(46.5–50.4)	(45.6–50.0)	(47.1–50.5)	(47.4–51.6)
Social support	69.6	68.6**	74.5	75.7
	(67.3–72.0)	(65.8–71.4)	(72.3–76.8)	(72.9–78.5)
Staff encouragement	77.2**	78.1**	73.5	72.7
	(75.1–79.4)	(75.2–81.0)	(71.1–75.9)	(69.8–75.5)

Table 2 continued

	Jews $N = 558$ mean (95% CI)		Arabs $N = 544$ mean (95% CI)	
	Crude	Adjusted*	Crude	Adjusted*
Satisfaction	78.2	78.2	77.9	77.4
	(76.3–80.1)	(75.9–80.6)	(76.1–79.7)	(75.1–79.7)
KDQOL average	59.8**	58.6**	55.6	56.2
	(58.6–60.9)	(57.2–60.0)	(54.5–56.7)	(54.9–57.5)

* Adjusted for: age, gender, education, income, albumin level, comorbidities, dialysis access, residual kidney function

** $p < 0.05$ for comparison between Jews and Arabs

The multiple linear regression analysis

The results of the multiple linear regression analysis are presented in Table 3, for the Jewish and Arab populations. Higher PCS scores were significantly associated, in both Jews and Arabs, with higher education, higher monthly income, dialysis connection by fistula/graft compared to catheter, and higher albumin level. Male gender was significantly associated with higher PCS scores in Jews and was of borderline significance in Arabs ($p = 0.06$). Lower PCS scores were significantly associated with diabetes in both Jews and Arabs, and with past CVA among Arabs.

Table 3 Multivariate Linear regression models in Jewish and Arab hemodialysis patients

	Jews						Arabs					
	PCS		MCS		KDQL		PCS		MCS		KDQL	
	β	*p*	*β*	*p*	*β*	*p*	*β*	*p*	*β*	*p*	*β*	*p*
Gender (Male)	6.2	**<0.001**	**4.5**	**0.02**	−0.02	1.0	3.2	0.06	2.5	0.2	−1.8	0.1
Age (≥65)	0.3	0.9	2.7	0.2	2.3	0.07	−0.5	0.8	−0.2	0.9	2.6	**0.04**
Number of children	–	–	−0.6	0.5			−0.28	0.3	−0.4	0.1	−0.4	**0.02**
Years of schooling	0.9	**<0.001**	1.1	**<0.001**	0.4	**0.01**	0.9	**<0.001**	0.6	**0.007**	–	–
Monthly income (US$)												
>2001	Reference		Reference		Reference		Reference		Reference		Reference	
<1000	−4.2	**0.05**	−2.5	0.3	−3.0	0.03	−5.7	0.004	−5.6	0.006	−3.2	0.02
1001–2000	−4.1	**0.04**	−5.3	0.02	−4.0	0.003	−7.9	<0.001	−7.2	0.003	−2.7	0.1
Dialysis duration (years)	−0.3	0.1	−0.3	0.1	−0.2	0.1	−0.3	0.1	−0.05	0.8	−0.3	0.1
Dialysis connection by fistula or graft compared to catheter	4.2	**0.04**	7.2	**0.001**	3.5	**0.009**	3.5	**0.05**	4.5	**0.02**	2.2	0.1
No residual renal function	−1.2	0.5	−0.3	0.7	–	–	−1.7	0.3	−1.8	0.3	–	–
Albumin (mg/dl)	10.7	**<0.001**	8.7	**<0.001**	4.2	**0.007**	10.0	**<0.001**	5.2	**0.009**	–	–
Transferrin (mg/dl)	–	–	–	–	–	–	−0.05	0.8	–	–	–	–
Comorbidities												
Diabetes	−5.1	**0.004**	−4.7	**0.01**	−3.2	**0.02**	−4.4	**0.01**	−0.95	0.6	−2.1	0.1
Past CVA	–	–	–	–	–	–	−5.7	**0.01**	−6.4	**0.007**	−3.4	**0.03**
Congestive cardiac failure	−1.7	0.4	–	–	–	–	−0.9	0.6	−1.7	0.4	−1.9	0.2
Angina pectoris	2.1	0.4	–	–	–	–	0.2	1.0	−1.6	0.5	−0.7	0.6
Other heart diseases	−3.4	0.1	–	–	–	–	−3.6	0.06	−1.8	0.4	–	–
Peripheral vascular disease	−0.2	0.9	–	–	–	–	−1.0	0.7	−2.5	0.3	−2.0	0.2
Chronic pulmonary disease	−3.8	0.08	–	–	–	–	−1.6	0.4	–	–	–	–

The significant variables in the multivariate regression are highlighted in bold

CVA cerebrovascular accident

For both Jews and Arabs, higher MCS scores were significantly associated, with higher education, higher monthly income, dialysis connection by fistula/graft compared to catheter, and higher albumin level; while lower MCS scores were significantly associated with diabetes in Jews and with past CVA in Arabs.

Among both Jews and Arabs, higher KDQOL scores were significantly associated with higher monthly income. Among Jews, higher education, dialysis connection by fistula/graft compared to catheter, and higher albumin level were significantly associated with higher scores of KDQOL; while lower KDQOL scores were significantly associated with diabetes. Among Arabs, older age was significantly associated with higher KDQOL scores, and past CVA was significantly associated with lower KDQOL scores.

Discussion

Based on reports of a survival advantage of Arab over Jewish patients on dialysis, we hypothesized that Arab patients would score higher on HRQOL. One study reported survival of 85% of Arab patients one year after initiating dialysis, compared to 79% of Jewish patients [20, 21]. Several studies [7, 19, 31–33] described a positive association between HRQOL scores and survival in dialysis. The results of the present study do not support our hypothesis. Jews generally scored higher than Arabs on the MCS and KDQOL. The MCS adjusted score was 4.3 points higher among Jews and the KDQOL adjusted score was 2.4 points higher. Regarding the MCS score a large portion of the difference is attributed to a much lower score in the "emotional role" subscale among Arab. This might be due to different perceptions regarding sickness and suffering. The expression of suffering and externalizing is different among religions [18] in a manner that comes to the forefront regarding the MSC scores.

The lowest scores for Jews and Arabs were on the "physical role" and "work status" subscales. These findings are in agreement with several studies that examined HRQOL with similar tools, among HD patients in different populations. The score in the "physical role" subscale was the lowest among Greek (47.5) [6], Iranian (25.6) [17], Saudi Arabian (35) [14], Brazilian (40.6) [1], European (34.4) [2], and American patients (31.7) [2].

Of the 11 subscales from which the KDQOL is derived, the score on the "work status" subscale was the lowest, among both the Jews and Arabs. Similar findings were reported from Brazil (25.1) [1], among Europeans (25.2) and among Americans (20.0) [2], in Saudi Arabia (24.5) [14], and in Iran (22.3) [17].

According to "work status" the findings were largely attributed to the patients' ages and poor medical status. In the present study, the extremely low scores for "work status" among Arabs can be partially attributed to the lower rate of labor force participation of Arabs compared with Jews (42.0 vs. 59.0%, respectively, in 2010) [34]. Arab patients scored significantly higher on the 'social support' subscale of the KDQOL dimensions. This may be attributed to the larger size of Arab families and the fact that the extended family often lives in close proximity.

For both Jews and Arabs, MCS scores were significantly higher than PCS scores, concurring with findings in other populations [1–3, 6, 12, 35, 36] including studies conducted among Arabs in Saudi Arabia and Iran [14, 17]. Although dialysis treatment carries a significant emotional burden, the physical burden seems to have a greater effect.

For both Jewish and Arab patients, KDQOL scores were higher than PCS and MCS scores. In both populations, the highest scores ($\geq$70), were all subscores of the KDQOL dimensions. These scores were observed for 'patient satisfaction,' 'dialysis staff encouragement,' and 'sexual function' subscales in both populations; for the 'social support' subscale among Arabs; and for the 'quality of social interaction' and 'cognitive function' subscales among Jews.

The lower KDQOL scores among Arabs resulted mainly from differences in the subscales of quality of social interaction, work status, and staff encouragement. Arabs scored similarly as Jews on subscales that related directly to kidney disease (symptoms, effects, burden, cognitive function, sexual function, and sleep). This implies that the disparity in HRQOL between the populations may be due to cultural differences between the populations rather than to differences in coping with the disease. This proposition is supported by the fact that no differences between Jews and Arabs were observed in albumin levels, which is recognized as the most important predictor of HRQOL in patients with end-stage renal disease [19].

In both population groups we found positive associations of HRQOL scores with male gender, higher educational level, higher income, higher albumin level, and connection to dialysis by graft/fistula rather than by catheter. In Arabs, older age was associated with higher KDQOL scores, and having more children was negatively associated with KDQOL scores. A negative association was found with respect to comorbidity (diabetes in Jews and Arabs, and past CVA in Arabs).

We found positive associations of PCS and of MCS scores with male gender in Jewish patients; and of PCS scores with male gender in Arab patients (of borderline significance, $p = 0.06$). Several studies found a poor HRQOL in females compared to males [1, 10, 13]. A study conducted in Pakistan using the WHOQOL-BREF

questionnaire [10] found that males had a better HRQOL in the social relationship domain than did women. A significantly lower score on the PCS among females than males was reported in a Brazilian study that used the KDQOL-SF [1], and in Iran. A study that evaluated HRQOL by the EQ-5D questionnaire also found a significantly lower HRQOL in females [13].

Possible explanations for lower HRQOL in women include the difficulty of coping with kidney disease, higher susceptibility to anemia (in our study, 53.7% of women had hemoglobin levels under 10.5 g/dl, compared with 46.3% in men; $p < 0.001$), and higher rates of anxiety and depressive symptoms in women [1]. In addition, women on hemodialysis usually continue to perform their traditional home and childcare roles, with concomitant high levels of physical and mental stress, and subsequent lower HRQOL [1].

Another possible explanation is that a tendency of women to more frequently report pain and to seek help [37] could result in lower HRQOL scores. The scores relating to bodily pain were higher among men than women (where higher scores indicate better HRQOL), for both Jews and Arabs.

We found positive associations between higher educational level and PCS, MCS, and KDQOL scores among Jews; and between higher education and PCS and MCS scores among Arabs (a finding similar to others [9, 10]); and negative associations between low income and PCS, MCS, and KDQOL among Jews and Arabs, similar to the findings of others [3, 6, 10, 14]. Not surprisingly, financial difficulty has a negative impact on HRQOL, since patients with higher incomes are likely to experience less financial stress related to health expenses, and may enjoy better living conditions and more social activities. Higher educational levels may be associated with a better understanding of the disease, and heightened awareness regarding treatment options [11].

Older age is known to be an important predictor of HRQOL [7, 10–12]. However, in the current study, we found no association between age and HRQOL (PCS, MCS, KDQOL) among Jews. Among Arabs we found a positive association only between older age and KDQOL scores, but not with PCS and MCS. Similarly, an expected relationship between age and HRQOL components (PCS, MCS, KDQOL) was not found in a large cohort of hemodialysis patients [38]. Elsewhere, a positive association between MCS and age was reported; higher MCS scores (but with no statistical significance) were reported in older patients [7]. This finding may be explained by different life expectations and different degrees of acceptance of the illness in the elderly; a more recent study conducted by Cruz et al. among Saudi patients [15] also identified advanced age as a significant factor that positively influenced HRQOL. These finding are in accordance with our findings in the Arab population.

Another study [6] found no differences between the MCS in different age groups.

The presence of other chronic diseases is known to strongly affect HRQOL of patients on dialysis [1, 11, 38, 39]. Accordingly, we found a negative association between diabetes and PCS, MCS, and KDQOL scores in Jews; and between diabetes and PCS scores in Arabs. Past CVA was negatively associated with PCS, MCS, and KDQOL scores among Arabs. Two additional clinical indices, namely, serum albumin and the type of connection to the dialysis machine, were found to be associated with reported HRQOL, in both Arab and Jewish dialysis patients. Concurring with other studies [7, 13], we found that serum albumin was strongly and positively associated with PCS, MCS, and KDQOL scores in Jews, and with SF-36 and PCS scores in Arabs.

Connection to dialysis by fistula or graft (rather than catheter) was positively associated with higher scores of HRQOL in Jews and Arabs. These techniques, which are associated with lower rates of infections and complications, are usually employed in less complex cases, which may explain at least in part the higher HRQOL scores of these patients [20].

Arab patients had lower scores in MCS and in KDQOL subscales that are related to social parameters and not directly to the diseases symptomatology. It is possible that factors related to cultural differences in the perception of sickness and health contribute to the observed differences in HRQOL. Improving patients' HRQOL is one of the most Important and challenging goals in renal replacement therapy. The very low scores found with respect to the "physical role" subscale, particularly among Arab patients, underline the importance of improving physical functioning and promoting independence of dialysis patients. This is an important perspective that could change the perception of the disease and lessen its incapacitating role [39]. In addition, every effort should be exerted to reduce the effect of modifiable factors, such as the adequate management of comorbidities, in the quest towards improving the quality of life of patients on dialysis.

A limitation of the current study is that the questionnaires were filled out by face-to-face interviewing of patients; this means of information collection could potentially bias the study outcomes.

Future studies should focus on possible differences in the perception of sickness and health among the two population groups that might be related to HRQOL. A special attention should be given to further explore the large difference in "work status" subscale.

References

1. Braga, S. F., Peixoto, S. V., Gomes, I. C., Acúrcio Fde, A., Andrade, E. I., & Cherchiglia, M. L. (2011). Factors associated with health-related quality of life in elderly patients on hemodialysis. *Revista de Saude Publica, 45*(6), 1127–1136.
2. Fukuhara, S., Lopes, A. A., Bragg-Gresham, J. L., Kurokawa, K., Mapes, D. L., Akizawa, T., et al. (2003). Worldwide dialysis outcomes and practice patterns study. Health-related quality of life among dialysis patients on three continents: The dialysis outcomes and practice patterns study. *Kidney International, 64*(5), 1903–1910.
3. Cruz, M. C., Andrade, C., Urrutia, M., Draibe, S., Nogueira-Martins, L. A., & Sesso, Rde C. (2011). Quality of life in patients with chronic kidney disease. *Clinics, 66*(6), 991–995.
4. Cruz, L. N., Fleck, M. P., Oliveira, M. R., Camey, S. A., Hoffmann, J. F., Bagattini, A. M., et al. (2013). Health-related quality of life in Brazil: Normative data for the SF-36 in a general population sample in the south of the country. *Cien Saude Colet, 18*(7), 1911–1921.
5. Bagheri, Z., Jafari, P., Faghih, M., Allahyari, E., & Dehesh, T. (2015). Testing measurement equivalence of the SF-36 questionnaire across patients on hemodialysis and healthy people. *International Urology and Nephrology, 47*(12), 2013–2021.
6. Ikonomou, M., Skapinakis, P., Balafa, O., Eleftheroudi, M., Damigos, D., & Siamopoulos, K. C. (2015). The impact of socioeconomic factors on quality of life of patients with chronic kidney disease in Greece. *Journal of Renal Care, 41*(4), 239–246.
7. Broers, N. J., Usvyat, L. A., Kooman, J. P., van der Sande, F. M., Lacson, E., Jr., Kotanko, P., et al. (2015). Quality of life in dialysis patients: A Retrospective cohort study. *Nephron, 130*(2), 105–112.
8. Stephens, C., Alpass, F., Baars, M., Towers, A., & Stevenson, B. (2010). SF-36v2 norms for New Zealanders aged 55–69 years. *Journal of the New Zealand Medical Association NZMJ, 123*(1327), 47–57.
9. Saad, M. M., El Douaihy, Y., Boumitri, C., Rondla, C., Moussaly, E., Daoud, M., et al. (2015). Predictors of quality of life in patients with end-stage renal disease on hemodialysis. *International Journal of Nephrology and Renovascular Disease, 3*(8), 119–123.
10. Anees, M., Malik, M. R., Abbasi, T., Nasir, Z., Hussain, Y., & Ibrahim, M. (2014). Demographic factors affecting quality of life of hemodialysis patients—Lahore, Pakistan. *Pakistan Journal of Medical Sciences, 30*(5), 1123–1127.
11. Mozes, B., Shabtai, E., & Zucker, D. (1997). Differences in quality of life among patients receiving dialysis replacement therapy at seven medical centers. *Journal of Clinical Epidemiology, 50*(9), 1035–1043.
12. Fructuoso, M., Castro, R., Oliveira, L., Prata, C., & Morgado, T. (2011). Quality of life in chronic kidney disease. *Nefrologia, 31*(1), 91–96.
13. Saffari, M., Pakpour, A. H., Naderi, M. K., Koenig, H. G., Baldacchino, D. R., & Piper, C. N. (2013). Spiritual coping, religiosity and quality of life: A study on Muslim patients undergoing hemodialysis. *Nephrology, 18*(4), 269–275.
14. AL-Jumaih, A., Al-Onazi, K., Binsalih, S., Hejaili, F., & Al-Sayyari, A. (2011). A study of quality of life and its determinants among hemodialysis patients using the KDQOL-SF instrument in one center in Saudi Arabia. *Arab Journal of Nephrology and Transplantation, 4*(3), 125–130.
15. Cruz, J. P., Colet, P. C., Alquwez, N., Inocian, E. P., Al-Otaibi, R. S., & Islam, S. M. (2017). Influence of religiosity and spiritual coping on health-related quality of life in Saudi haemodialysis patients. *Hemodialysis International, 21*(1), 125–132.
16. Cruz, J. P., Colet, P. C., Qubeilat, H., Al-Otaibi, J., & Suminta, R. C. (2016). Religiosity and health-related quality of life A Cross-sectional study on Filipino christian hemodialysis patients. *Journal of Religion and Health, 55*(3), 895–908.
17. Rostami, Z., Einollahi, B., Lessan-Pezeshki, M., Soleimani Najaf Abadi, A., Mohammadi Kebar, S., Shahbazian, H., et al. (2013). Health-related quality of life in hemodialysis patients: An Iranian multi-center study. *Nephro-urology Monthly, 5*(4), 901–912.
18. Badarna, K. (2008). Principles of Islam in health, disease and death. *Oncology Nursing in Israel, 2,* 74.
19. Mapes, D. L., Lopes, A. A., Satayathum, S., McCullough, K. P., Goodkin, D. A., Locatelli, F., et al. (2003). Health-related quality of life as a predictor of mortality and hospitalization: The dialysis outcomes and practice patterns study (DOPPS). *Kidney International, 64*(1), 339–349.
20. Renal replacement therapy in Israel 1990–2010. (2013). *Israel Ministry of Health and the Israel Society for Nephrology and Hypertension*. Jerusalem: ICDC publication.
21. Kalantar-Zadeh, K., Golan, E., Shohat, T., Streja, E., Norris, K. C., & Kopple, J. D. (2010). Survival disparities within American and Israeli dialysis populations: learning from similarities and distinctions across race and ethnicity. *Seminars in Dialysis, 23*(6), 586–594.
22. Statistical Abstract of Israel 2013 No.64. Central Bureau of Statistics. The State of Israel, Jerusalem.
23. Baron-Epel, O., Haviv Messika, A., Green, M. S., & Kalutzki, D. N. (2004). Ethnic differences in reported smoking behaviors in face to face and telephone interviews. *European Journal of Epidemiology, 19*(7), 679–686.
24. Israel Center for Disease Control. (2011). *Health Status in Israel 2010*. Hebrew: ICDC Publication 333.
25. Ware, J. E., & Kosinski, M. (2001). *SF-36 Physical & Mental Health Summary Scales: A Manual for Users of Version 1* (2nd ed.). Lincoln: Quality Metric Incorporated.
26. RAND health official website http://www.rand.org/health/surveys_tools/kdqol/faq.html.
27. ElHafeez, S., Sallam, S. A., Gad, Z. M., Zoccali, C., Torino, C., Tripepi, G., et al. (2012). Cultural adaptation and validation of the Kidney Disease and Quality of Life-Short Form (KDQOL-SF^{TM}) version 1.3 questionnaire in Egypt. *BMC Nephrology, 13,* 170.
28. Lewin-Epstein, N., Sagiv-Schifter, T., Shabtai, E., & Shmueli, A. (1998). Validation of the SF 36-Item Short-Form Health Survey (Hebrew Version) in the adult population of Israel. *Medical Care, 36,* 1361–1370.
29. Kalantar-Zadeh, K., Kopple, J. D., Block, G., & Humphreys, M. H. (2001). Association among SF36 quality of life measures and nutrition, hospitalization, and mortality in hemodialysis. *Journal of the American Society of Nephrology, 12,* 2797–2806.
30. Hays, R. D., Kallich, J. D., Mapes, D. L., Coons, J. S., Amin, N., Carter, W. B., et al. (1997). *Kidney disease quality of life short form (KDQOL-SF), version 1.3 a manual for use and scoring*. Santa Monica: RAND.
31. Perl, J., Karaboyas, A., Morgenstern, H., Sen, A., Rayner, H. C., Vanholder, R. C., et al. (2016). Association between changes in quality of life and mortality in hemodialysis patients: results from the DOPPS. *Nephrology Dialysis Transplantation, 32,* 521–527.
32. DeOreo, P. B. (1997). Hemodialysis patient-assessed functional health status predicts continued survival, hospitalization, and dialysis-attendance compliance. *American Journal of Kidney Diseases, 30*(2), 204–212.
33. Lopes, A. A., Bragg-Gresham, J. L., Satayathum, S., McCullough, K., Pifer, T., Goodkin, D. A., et al. (2003). Worldwide Dialysis Outcomes and Practice Patterns Study Committee. Health-related quality of life and associated outcomes among hemodialysis patients of different ethnicities in the United States:

the Dialysis Outcomes and Practice Patterns Study (DOPPS). *American Journal of Kidney Diseases, 41*(3), 605–615.
34. Jabareen, Y. (2010). *Employment of Arabs in Israel-economic challenge*. Jerusalem: The Israel Democracy Institute.
35. Wu, A. W., Fink, N. E., Marsh-Manzi, J. V. R., Meyer, K. B., Finkelstein, F. O., Chapman, M. M., et al. (2004). Changes in quality of life during hemodialysis and peritoneal dialysis treatment: Generic and disease specific measures. *Journal of the American Society of Nephrology, 15*(3), 743–753.
36. Ramos, E. C., Santos, I. D., Zanini, R. V., & Ramos, J. M. (2015). Quality of life of chronic renal patients in peritoneal dialysis and hemodialysis. *Journal Brasileiro de Nefrologia, 37*(3), 297–305.
37. Ayoub, A. M., & Hijjazi, K. H. (2013). Quality of life in dialysis patients from the United Arab Emirates. *Journal of Family and Community Medicine, 20*(2), 106–112.
38. Unruh, M. L., Newman, A. B., Larive, B., Dew, M. A., Miskulin, D. C., Greene, T., et al. (2008). The influence of age on changes in health-related quality of life over three years in a cohort undergoing hemodialysis. *Journal of the American Geriatrics Society, 56*(9), 1608–1617.
39. Avramovic, M., & Stefanovic, V. (2012). Health-related quality of life in different stages of renal failure. *Artificial Organs, 36*(7), 581–589.