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# Evaluation of health-related quality of life among Libyan patients undergoing haemodialysis in two different centres: a cross-sectional study

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**Abstract:** Dialysis patients typically experience significantly poorer health-related quality of life (HRQOL) compared to the general population. In Libya, hemodialysis (HD) patients face additional burdens, including limited medical care and the disruptive effects of political instability. Cities such as Derna and Benghazi remain understudied despite the value such data would offer for improving care. This study aimed to assess HRQOL among Libyan HD patients and identify its predictors. Using a cross-sectional design, we recruited participants from two HD facilities, the Derna Kidney Centre and Al-Hawari Kidney Services, from January to June 2020. Overall, HD patients showed diminished HRQOL, with mean scores of 46.59 for the physical component summary (PCS), 47.87 for the mental component summary (MCS), and 54.68 for the kidney disease component summary (KDCS); gender emerged as a meaningful predictor, with female patients consistently scoring lower than males across all domains, including PCS (41.03±17.25, p=0.01), MCS (39.17±18.23, p=0.001), and KDCS (43.79±16.51, p=0.001). At the same time, comorbid conditions also mattered, with diabetes mellitus associated with the poorest outcomes across every subscale of PCS (32.44±16.20, p=0.013), MCS (29.55±8.69, p=0.043), and KDCS (46.52±13.68, p=0.031). Libyan patients with end-stage renal disease experience reduced HRQOL, with physical functioning affected more severely than mental well-being or kidney-disease-specific quality of life, and gender and comorbidity, particularly diabetes, were identified as key predictors of HRQOL outcomes among this population.

## Introduction

End-stage renal disease (ESRD), also known as kidney failure, and death are two potential outcomes and prognoses associated with chronic kidney disease (CKD) [1]. The prevalence of ESRD varied across Middle Eastern countries. Lebanon had 818 per million population (pmp) cases, compared with 55 in Iraq. Turkey and Qatar had prevalences of 756 and 624 cases/pmp, respectively. Iran had a prevalence of 49.9 cases/pmp, and Egypt reported 330 cases/pmp for ESRD [2]. Libya, like many other countries, is seeing a growing incidence of CKD, resulting in an escalating need for dialysis among individuals. According to a comprehensive study published in 2012 on the epidemiology and aetiology of dialysis-treated ESRD in Libya, 2417 adult patients were undergoing maintenance dialysis for ESRD [3]. Haemodialysis (HD) is the most

common treatment for patients who have kidney failure all over the world [4]. Aljemhoria Hospital in Benghazi City established the first HD service in Libya in 1973. The majority of dialysis units are situated in the northern quarter of the nation, that is, the coastal, western, and eastern mountainous areas that are home to 88.5% of the population. Evidence indicates that dialysis units located in different Libyan sites have suffered remarkable damage or destruction. Furthermore, all units are highly likely to encounter challenges in acquiring supplies due to the ongoing conflict [5]. A significant proportion of non-Libyan medical professionals have emigrated from the country, resulting in serious personnel shortages in certain health institutions. The conflict has clearly had a significant negative impact on the provision of dialysis in Libya, and a great number of patients possibly have perished as a consequence of this conflict, thereby increasing the burden of disease on patients undergoing HD and impairing HRQOL [6-8]. HRQOL refers to the extent to which an individual's typical or expected physical or emotional well-being is affected by a health condition and its treatment. HRQOL includes aspects of one's physical health, social life, mental health, and treatments [9]. The HRQOL of patients receiving HD can be affected by the disease's clinical manifestations and the treatment's side effects [10]. The HRQOL of patients receiving HD is also influenced by their medical condition, socioeconomic challenges, and the level of performance of the national health system [11]. Patients on HD who have worse HRQOL have a higher chance of death and being hospitalised [12]. This study aimed to evaluate the HRQOL of Libyan patients undergoing HD, focusing on important areas like physical health, mental well-being, and kidney disease effects. It also aimed to identify the factors that impact this particular demographic's HRQOL to provide information for healthcare policies and practices that could improve patient treatment and outcomes in the Libyan setting.

## Materials and methods

*Study design:* This cross-sectional study was carried out on patients undergoing HD at two HD facilities, namely, the Derna Kidney Centre in Derna City and the Al-Hawari Kidney Services facility in Benghazi City, between January 1, 2020, and June 30, 2020.

*Study setting and population:* The Derna Kidney Center is equipped with 34 kidney dialysis machines and 60 beds. The second facility has a capacity of 100 beds and 99 kidney dialysis machines [13]. The inclusion criteria were: All adult patients aged 18 years and above and patients undergoing HD for a duration exceeding one month. The exclusion criteria comprised the following: All patients with central nervous system diseases and individuals with acute illnesses.

*Variables:* The dependent variables were HRQOL scores, including PCS, MCS, and KDCS. Independent variables included gender, age, marital status, educational level, comorbidities (e.g., diabetes, hypertension), and duration of dialysis.

*Data collection:* The Kidney Disease and Quality of Life Short Form (KDQOL-SF) Arabic version 1.3 was used [14] with permission from the author. KDQOL-SF is available in English and has been translated into Arabic. KDQOL-SF is a disease-specific measure that was validated in numerous Arabic countries to address the health-related issues of people. KDQOL-SF contains three parts. The researcher or nephrology personnel distributed the KDQOL-SF questionnaires to patients, and they were available for any questions or clarifications via face-to-face interviews. Patients provided informed written consent. The patients self-administered the surveys, but they had the option to seek clarification from the researcher, if necessary, regarding the interpretation of the questions. The participants completed the questionnaires at the hospital during HD sessions or at their residences, and the researcher gathered the data during their next dialysis session. The term of data collection period extended from January 1$^{st}$, 2020, until June 30$^{th}$, 2020. The first section comprises sociodemographic information, including age, gender, marital status, educational attainment, comorbidities, and duration of HD. The second part contains SF-36 questions. The third part contains kidney disease-focused questions.

KDQOL-SF consisted of 80 questions aimed at assessing quality of life across three specific domains: MCS, KDCS, and PCS. The quality of life in the PCS domain was evaluated using a total of 21 questions, including 10 questions pertaining to physical function, four questions pertaining to role function, two questions pertaining to pain, and five questions pertaining to general health-related concerns. 14 questions were utilised to evaluate quality of life in the MCS domain, including five questions pertaining to physical role, three questions pertaining to emotional role, two questions about social function, and four questions pertaining to energy and fatigue-related concerns. In addition to a single indicator of whether people feel their health has changed over time, a total of 43 questions were asked in the KDCS domain, including 12 questions about symptoms, eight questions about effects, four questions about the burden of kidney disease, two questions about work status, three questions about cognitive function, three questions about the quality of social interactions, two questions about sexual function, four questions about sleep, two questions about social support, two questions about dialysis staff encouragement, and one question related to patient satisfaction. Participants' sociodemographic and clinical data included gender, age, marital status, educational attainment, chronic diseases, and length of dialysis. All items were scored, with a higher score signifying a more advantageous health condition. Each item was scored on a scale of 0 to 100, with 0 being the minimum score and 100 the maximum score. A lower number indicates a greater impairment; for instance, a score of zero signifies maximum disability.

*Sample size:* Alashek et al. [3] reported 2417 patients receiving HD in Libya out of a population of 3,873,000. The prevalence (P) value was obtained using Daniel's formula to establish the appropriate sample size [14]. The key parameters are the sample size (n), the z statistic (which represents a confidence level), the expected prevalence or percentage (p), and the precision (d=0.05 if precision is 5.0%). The calculated sample size for this investigation was 90.

*Ethical considerations:* This study received approval from Al-Hawari Kidney Services Ethics Committee (reference number 19-139 BAM) in Benghazi, Libya, and the local ethics committee of the Derna Dialysis Centre (reference number MKD-120) in Derna city, Libya. Patients also provided informed written consent.

*Statistical analysis:* SPSS software (version 26) was used to conduct all statistical data analyses. Initially, descriptive analysis was used to show categorical variables as frequencies and percentages. Continuous data were presented as median, interquartile range, mean, and standard deviation depending on the normality of the observations. Inferential analysis techniques like independent-samples t-test and one-way ANOVA were used, and Sociodemographic and clinical data were assessed using the KDQOL-SF™ (version 1.3). Higher scores indicated better quality of life across domains. Statistical analysis examined associations between independent variables and HRQOL scores. Pearson correlation was used to examine the differences in means between the independent variables and the outcomes. A level of $<0.05$ was selected as the threshold for significance.

## Results

*Socio-demographic analysis:* Amongst the 108 patients who received the questionnaires, 106 responded to the survey, indicating a response rate of 98.0%. Of the total number of participants, 40.4% were between the ages of 51 and 70 years, 54.7% were male, 65.7% were married, and 35.0% had completed at least high school (**Table 1**).

*Clinical characteristics:* Hypertension was the most prevalent comorbid disease overall, affecting 41.0% of the participants. Diabetes mellitus and hypertension were the most common combination, affecting 25.7% of the participants. The length of time a patient is on dialysis can range anywhere from one year to more than ten years; however, the average length of time was five years or less in 62.1% of the patients, as shown in **Table 2**.

**Table 1**: Sociodemographic characteristics of patients undergoing HD at Derna Kidney Centre and Al-Hawari Kidney Services

| Demographic variables | Frequency (%) |
|---|---|
| **Age groups** | **104** |
| ≤ 30 | 18 (17.3) |
| 31 - 50 | 38 (36.5) |
| 51 - 70 | 42 (40.4) |
| > 70 | 06 (5.8) |
| **Gender** | **106** |
| Male | 58 (54.7) |
| Female | 48 (45.3) |
| **Marital status** | **105** |
| Married | 69 (65.7) |
| Single | 19 (18.1) |
| Widowed | 10 (9.5) |
| Divorced | 07 (6.7) |
| **Educational Level** | **103** |
| Uneducated | 06 (5.8) |
| Primary /middle school | 31 (30.1) |
| High school | 36 (35.0) |
| High institute/University | 30 (29.1) |

**Table 2**: Clinical characteristics of patients undergoing haemodialysis at Derna Kidney Centre and Al-Hawari Kidney Services

| Comorbidities | Frequency (%) |
|---|---|
| No disease | 25 (23.8) |
| Diabetes mellitus (DM) | 4 (3.8) |
| Hypertension (HTN) | 43 (41.0) |
| DM and HTN | 27 (25.7) |
| Other diseases | 6 (5.7) |
| **Duration of dialysis** | **103** |
| < 5 years | 64 (62.1) |
| 6 - 10 years | 24 (23.3) |
| > 10 years | 15 (14.6) |

*Internal consistency of KDQOL-SF:* The internal consistency 'reliability' metric most often used is Cronbach's α, which is a straightforward reliability coefficient that researchers can use to assess a group of variables. When evaluating the overall reliability of a metric, the α coefficient that is produced can be anything from 0 to 1. The greater the α coefficient, the more items share correlation and likely measure the same concept. The results of this study demonstrate that Cronbach's α coefficient for the KDQOL-SF scales was 0.75 or more for all items, apart from social functioning and general health, which had Cronbach's α coefficients of 0.55 and 0.60, respectively. KDCS exhibited Cronbach's α values that ranged from 0.51 to 0.86, with the exception of three dimensions: social support, quality of social interaction, and work status. These dimensions displayed very low Cronbach's α values of 0.33, 0.30, and 0.01, respectively (**Table 3**).

*Quality of life scores:* MCS had a better score of internal consistency than PCS, as indicated by the Cronbach's alpha of 0.67. The mean scores on MCS were higher than those on PCS (47.87±2.04 versus 46.59±2.11, respectively). Even though the overall scores on PCS were lower than 50 (46.59±2.11), the scores on physical functioning and body pain were found to be higher than 50. Meanwhile, the overall score on MCS was 47.87±2.04, with the exception of the scores for role limitations due to emotional problems (19.75±21.56) and energy/fatigue (48.09±26.91), which were above 50. The patients had higher quality-of-life scores in the areas of social functioning (62.61±30.00) and emotional well-being (58.02±26.08), whereas they had the lowest quality-of-life scores in the areas of role Limitations due to physical functioning (16.58±17.83) and role limitations due to emotional problems (19.75±21.56). The KDCS scales demonstrated that all scores surpassed the threshold of 50.

**Table 3**: Description and reliability of Arabic HRQOL-SF version amongst patients undergoing HD at Derna Kidney Centre and Al-Hawari Kidney Services

| Scale | Items | Cronbach's α | Mean | SD | Measurement score |
|---|---|---|---|---|---|
| Physical functioning | 10 | 0.88 | 53.86 | 30.19 | 53.86% |
| Role limitations due to physical functioning | 4 | 0.75 | 16.58 | 17.83 | 16.58% |
| Body pain | 2 | 0.86 | 57.31 | 30.71 | 57.31% |
| General health | 5 | 0.60 | 47.05 | 20.92 | 47.05% |
| **Physical Component Summary** | **4** | **0.38** | **46.59** | **2.11*** | **46.59%** |
| Social functioning | 2 | 0.55 | 62.61 | 30.00 | 62.61% |
| Role limitations due to emotional problems | 3 | 0.85 | 19.75 | 21.56 | 19.75% |
| Energy/Fatigue | 4 | 0.80 | 48.09 | 26.91 | 48.09% |
| Emotional well-being | 5 | 0.79 | 58.02 | 26.08 | 58.02% |
| **Mental Component Summary** | **4** | **0.67** | **47.87** | **2.04*** | **47.87%** |
| Symptoms/Problems | 11 | 0.86 | 68.31 | 23.25 | 68.31% |
| Effects of kidney disease | 8 | 0.73 | 65.06 | 22.46 | 65.06% |
| Burden of kidney disease | 4 | 0.82 | 42.17 | 32.77 | 42.17% |
| Work status | 2 | 0.01 | 43.27 | 34.88 | 43.27% |
| Cognitive function | 3 | 0.72 | 68.53 | 25.58 | 68.53% |
| Quality of social interaction | 3 | 0.30 | 75.47 | 21.56 | 75.47% |
| Sexual function | 2 | 0.51 | 70.54 | 27.05 | 70.54% |
| Sleep | 4 | 0.51 | 56.09 | 21.55 | 56.09% |
| Social support | 2 | 0.33 | 84.30 | 21.37 | 84.30% |
| Patient satisfaction | 1 | NA | 75.28 | 26.84 | 75.28% |
| **Kidney Disease Component Summary** | **40** | **0.67** | **54.68** | **19.89** | **54.68%** |

**Table 4:** Association of sociodemographic and clinical data with HRQOL among patients undergoing HD at Derna Kidney Centre and Al-Hawari Kidney Services

| Variables | PCS Mean ± SD | Test | p-value | MCS Mean ± SD | Test | p-value | KDCS Mean ± SD | Test | p-value |
|---|---|---|---|---|---|---|---|---|---|
| **Age group** | | | | | | | | | |
| ≤ 30 | 47.71±16.15 | Pearson's | | 41.02±21.04 | Pearson's | 0.414 | 49.22±18.21 | Pearson's | 0.341 |
| 31-50 | 49.52±16.96 | correlation* | 0.389 | 52.03±18.61 | correlation | | 55.79±21.20 | correlation | |
| 51-70 | 43.55±22.18 | r = -0.098 | | 45.80±19.38 | r= 0.089 | | 54.91±19.02 | r= 0.094 | |
| > 70 | 44.96±20.86 | | | 57.14±12.37 | | | 58.51±26.51 | | |
| **Gender** | | | | | | | | | |
| Male | 51.04±19.38 | t-test** | **0.018**** | 55.47±16.71 | t-test | **≤ 0.000**** | 63.68±17.95 | t-test | ** |
| Female | 41.03±17.25 | | | 39.17±18.23 | | | 43.78±16.50 | | |
| **Marital status** | | | | | | | | | |
| Married | 46.07±20.41 | Pearson's | | 51.48±19.99 | Pearson's | 0.120 | 57.41±20.73 | Pearson's | 0.236 |
| Single | 52.50±13.18 | correlation | 0.885 | 40.73±17.88 | correlation | | 47.78±19.84 | correlation | |
| Widowed | 35.35±20.42 | r= -0.016 | | 35.35±13.87 | r= -0.168 | | 43.83±14.27 | r = -0.117 | |
| Divorced | 49.69±14.15 | | | 52.44±10.35 | | | 60.36±8.92 | | |
| **Educational level** | | | | | | | | | |
| Uneducated | 43.25±19.90 | | | 40.35±12.48 | Pearson's | 0.924 | 43.22 ± 16.62 | Pearson's | 0.783 |
| Primary/middle | 46.25±25.05 | Pearson's | 0.875 | 49.58±22.98 | correlation | | 57.40 ± 21.70 | correlation | |
| High school | 50.86±15.75 | correlation | | 49.92±18.71 | r= -0.011 | | 53.63 ± 22.03 | r= -0.027 | |
| High institute/University | 42.04±12.67 | r= -0.018 | | 45.27±16.31 | | | 54.67±15.08 | | |
| **Comorbidities** | | | | | | | | | |
| No diseases | 59.31±15.86 | | | 57.51±17.88 | Pearson's | **0.043*** | 61.54 24.09 | Pearson's | **0.031*** |
| Diabetes mellitus | 32.44±16.20 | Pearson's | **0.013*** | 29.55±8.69 | correlation | | 46.52±13.68 | correlation | |
| Hypertension | 45.61±18.20 | correlation | | 45.16±17.86 | r= -0.216 | | 55.20±18.01 | r= -0.24 | |
| DM and HTN | 40.75±18.19 | r= -0.276 | | 50.73±17.94 | | | 53.74±17.38 | | |
| Other diseases | 45.83±22.85 | | | 34.46±24.22 | | | 38.83±13.20 | | |
| **Duration of dialysis** | 47.37±18.22 | ANOVA*** | 0.854 | 47.41±19.99 | ANOVA*** | 0.722 | 56.81±18.99 | ANOVA*** | 0.354*** |
| < 5 years | 45.96±19.72 | | | 46.18±19.88 | | | 51.37±22.43 | | |
| 6-10 years | 43.98±23.07 | | | 51.56±16.57 | | | 50.26±20.58 | | |
| > 10 years | | | | | | | | | |

* Correlation is significant at the 0.05 level (two-tailed). Pearson's correlation; ** Independent-samples t-test is significant at the 0.05 level (two-tailed); and *** One-way ANOVA is significant at the 0.05 level

Notably, the social support domain exhibited the highest mean and standard deviation (84.30±21.37). This domain encompassed factors such as the amount of time spent with family and friends and the support received from them. Conversely, the burden of kidney disease domain demonstrated the lowest score (42.17±32.77). This domain encompassed the extent to which kidney disease disrupts daily life, consumes time, induces frustration, or generates feelings of being a burden to one's family (**Table 3**).

*Factors associated with HRQOL:* The mean scores of the respondents' mental, physical, and kidney disease components on the basis of clinical and sociodemographic factors. Pearson's correlation, one-way ANOVA, and independent-samples t-test were used to ascertain the existence of a relationship between the variables under investigation and quality of life. No significant link was found between any components and the demographic parameters of age, level of education, marital status, or duration of dialysis in the research population. Meanwhile, a significant correlation was identified between gender and comorbidity factors and HRQOL ($p<0.05$). The independent-samples t-test findings indicated a statistically significant mean difference between gender and PCS, MCS, and KDCS, with p-values of 0.018, ≤0.001, and ≤0.001, respectively. The results of Pearson's correlation indicated that these comorbid diseases had a substantial negative association with PCS, MCS, and KDCS ($r= -0.276$, -0.216, and -0.24), with p-values of 0.013, 0.043, and 0.031, respectively (**Table 4**).

## Discussion

This study sought to examine HRQOL of individuals with ESRD undergoing HD and to identify several clinical and socioeconomic variables that significantly influence these patients' HRQOL. This study was the first to look at a group of patients with ESRD who live in the eastern part of Libya. The findings indicated that the participants' scores on the PCS of the HRQOL measure were 46.59%, which was lower than their scores on MCS (47.80%). These findings are consistent with those of previous research [15-18]. The findings of many different kinds of studies consistently indicated that the KDCS value exceeds the MCS and PCS values. This trend was further supported by the present study, which indicated that the KDCS value was the highest and the PCS value was the lowest. These results align with comparable findings reported in previous studies [19-21]. This implies that as the physical health of individuals with HD deteriorates, their mental health remains intact [22]. Individuals diagnosed with HD frequently exhibit suboptimal sleep patterns, characterised by poor sleep habits. Consequently, they commonly experience symptoms, such as exhaustion and general fatigue, which can have a detrimental impact on their overall physical well-being [23]. Additionally, individuals diagnosed with HD may undergo a process of adaptation to their chronic condition over time, perhaps resulting in a reduction of their psychological response [24-27]. Healthcare professionals, including doctors and nurses, typically provide individualised psychological support to patients with ESRD during their dialysis treatments within specialised healthcare facilities [28, 29].

In this study, the KDCS scale was utilised to assess several dimensions of support amongst patients receiving HD in Libya. The findings revealed that the highest score was observed in the sub-scale of social support, followed by the sub-scales pertaining to the quality of social interaction. These findings may indicate that Libyan family and acquaintances have a strong propensity to offer assistance to individuals who are afflicted by HD. By contrast, the lower scores observed in the burden of kidney disease, followed by work status, are in line with findings from a study conducted in Egypt [20] and Malawi [21]. This can be exemplified by the fact that the burden of kidney disease sub-scale evaluates patients' perceptions of the extent to which the disease interferes with their daily lives [30]. Considering the impact of HD on individuals' daily lives is important, particularly in relation to their employment obligations and especially considering that the majority of the patient population in the present study were within the range of 51 - 70 years. In terms of the variables that are linked to HRQOL in patients who are undergoing HD, this study demonstrated that gender, as a sociodemographic variable, was substantially correlated with all categories of HRQOL, with females

exhibiting lower scores than males. This finding is in accordance with the results of previous research [18, 30-32]. In contrast to previous research findings, males exhibited poorer ratings of HRQOL than females [33]. The depiction of gender disparities in the context of depression amongst patients on HD is noteworthy [34]. A study revealed that females exhibited more pronounced depressive behaviours than males, particularly regarding HRQOL [35]. The epidemiology of CKD reveals considerable disparities between sexes. CKD is more common in women, particularly in the earlier stages. However, strangely, a greater number of men advance to kidney replacement therapy. These disparities may occur as a result of biological or physiological distinctions related to sex and the socially and culturally produced characteristics of women and men. Research showed that women regularly reported lower HRQOL than men in the general population and in different populations with chronic diseases. Patients with CKD exhibit sex disparities in patient-reported outcomes [36]. Another factor that showed significant association with HRQOL amongst patients undergoing HD in this study was comorbidity, namely, diabetes mellitus (DM). The results showed that DM scored worse than hypertension or the combination of the two. This conclusion is consistent with those of previous studies [37, 38]. DM has been identified as a risk factor associated with the decline in physical function [39]. Patients with DM undergoing HD exhibited lower HRQOL than individuals without diabetes [40]. The HRQOL of individuals with DM and CKD consistently exhibited faster deterioration than that of patients with CKD alone [41]. The reduction in HRQOL could be significantly accelerated, particularly in cases where an individual with DM also presents with hypertension [42]. A notable detail is that DM is regarded as a risk factor for depression in patients receiving HD [43]. The limitations of this research include a small sample size, which limits the statistical power to conclude. Additionally, self-administered surveys were used, potentially introducing bias due to respondents' lack of discipline. Moreover, the absence of biochemical and haematological data makes it challenging to assess the impact of these factors on MCS and PCS scores.

***Conclusion:*** This study found that patients undergoing HD in Libya have decreased HRQOL, especially in terms of comparing PCS scores with MCS and KDCS scores. Gender and comorbidity were identified as substantial determinants of HRQOL amongst Libyan patients undergoing HD.

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