Quality of Life in Patients With End-Stage Renal Disease on Hemodialysis: A Cross-Sectional Study in Sudan

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Research Article

Keywords: end-stage renal disease, hemodialysis, kidney disease, quality of life

DOI: https://doi.org/10.21203/rs.3.rs-108172/v1

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Abstract

**Background:** End-stage renal disease (ESRD) is the last stage of chronic kidney disease (CKD) when renal replacement therapy (RRT) is necessary for sustaining life. Assessment of QoL of ESRD patients has become an essential tool to measure how the disease affects patients’ lives, and to develop better plans of care. Little is known about QoL in patients with CKD before RRT. This study aims to examine the various socio-demographic and other factors that affect the daily QoL of ESRD patients on haemodialysis (HD).

**Methods:** A cross-sectional study was conducted at Dr Selma Dialysis Center, Khartoum, Sudan from September to December 2018. A total of 138 adult patients on chronic dialysis were recruited in this observational study. The QoL was assessed using the Kidney Disease Quality of Life-Short Form questionnaire (KDQoL-SF™).

**Results:** Out of 138 enrolled patients, there were 105 patients (76.1%) had a good QoL and 33 patients (23.9%) had a poor QoL.

Patients with a poor QoL had an average age of 42.8 ± 12.9 years. The good-QoL group had an average age of 46.9 ± 14.9 years. The total score of KDQoL-SF was 61.6%, while the scores for the physical and mental components were 39.3 ± 9.6 and 50.0 ± 10.6 respectively.

**Conclusion:** This study indicated that the main factors that have a significant impact on the QoL were social status, origin, employment status, duration of the CKD, family history of kidney disease, time on HD, and Hypertension.

**Background**

Quality of life (QoL) is defined by the World Health Organization (WHO) as “individuals’ 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”. It is a very large definition, influenced by the individual’s complex physical health, psychological well-being, level of autonomy, social relationships, individual beliefs as well as their relationship to basic components of their current circumstance [1,2].

Thus, the main components of QoL are physical well-being, mental well-being, social well-being, spiritual well-being, each component can be expressed in various manners depending on the patient's perceptions, resulting in a different assessment of QoL [3], many studies suggest that patients perceptions might be more important than objective clinical assessments in determining QoL in patients with End-Stage Renal Disease (ESRD) [4].

ESRD is the last stage of chronic kidney disease (CKD), this means that the kidneys permanently fail to work and can no longer support a person day to day life, so renal replacement therapy (RRT), dialysis &
transplant, is necessary for sustaining life [5]. It is a public health problem worldwide [6], with multiple medical, social, and psychological problems [5].

The total number of patients with ESRD has increased notably over the last several years [7]. It is one of the chronic diseases that can have serious effects on patients' QoL, and cause major alternation in lifestyle and high level of disability in different domains of patient lives [5,8] results in significant limitations in activities of patients and causes several complications such as depression, inflammations, malnutrition and negatively affecting patients’ QoL [7].

The availability of various RRT, such as peritoneal dialysis, HD, or renal transplant, only partially reduced the severity of the symptoms that the patient suffers from and resulted in longer survival of ESRD patients [3,8]. QoL in patients with ESRD is affected by the sorts of RRT, patients who undergo kidney transplant revealed better QoL compared to patients who undergo dialysis, and patients on HD revealed more improvement than patients on peritoneal dialysis [6]. With improved drugs, clinical therapy, medical services, and medical technology, patients might be living for many years but the question is, "are they living a better life"?

The effect of the HD is not only measured in terms of survival but also in terms of well-being [1]. HD treatment is one of the most effective therapeutic techniques for patients with ESRD second to renal transplantation [7], but also it has many side effects resulting in low QoL among HD patients [6]. HD treatment is time-intensive, expensive, and requires fluid and dietary restrictions, the physical, psychological, socioeconomic, and environmental aspects of life are negatively affected, leading to impaired QoL [8].

Several studies indicated that ESRD patients on HD have poor QoL compared with healthy individuals of the general population [8–10] and they have a significant lower QoL scores compared with other chronic diseases [7,11]. Poor QoL is associated with increased morbidity and mortality in patients with ESRD, and better QoL is associated with better performance status, and less morbidity and mortality [1,3,10,12]. Among HD patients, psychological and physical status is strongly associated with morbidity and mortality.

There are several important factors influence QoL among HD patient such as nutritional status, cholesterol level, serum albumin, haemoglobin, dietary intakes, and body mass index (BMI). Other factors affecting QoL of HD patients are age of the patient, ethnicity, and duration of dialysis, [6].

The evaluation of QoL among ESRD patients (physical, mental, and social well-being) has become a fundamental tool to measure how the disease affects patients’ lives, and it is important to improve communication between patients and their doctors, then providing a better planes of care. Moreover, the QoL assessment can inform the medical personnel of the effectiveness of treatment interventions, it also plays an important role in assessing patient's need, setting treatment goals and monitoring progression of the disease.
Assessment of QoL may include the physical status and psychological status, some of these are dependent on the patient such as age and gender of the patient. Others depend on the presence of co-morbidity, social factors (household income, educational level, occupation), duration and type of treatment (Hemodialysis, peritoneal dialysis, renal transplantation) are also affect the patient’s perception of QoL.

This study aims to examine the various socio-demographic and other factors that affect the daily QoL of adult ESRD patients at Dr Salma Dialysis Center, Khartoum, Sudan.

**Methods**

**Patients and study design**

This was a descriptive, cross-sectional hospital-based study. It was conducted at Dr Salma dialysis center in Khartoum state among ESRD patients who received HD, the study was conducted over three months during the period from September to December 2018. A total of One hundred thirty-eight patients on chronic HD were recruited in this study.

**Sampling**

This study covered all adult ESRD patients on HD at Dr Salma dialysis center. At the time of the study, there were 199 Hemodialysis patients served on 26 HD machines. However, those with co-morbidities with hepatitis infection were excluded.

**Respondents**

A total of 153 respondents meeting the inclusion criteria were recruited into the study. 138 patients were agreed to participate in the study, 11 patients were refused to participate, and 4 respondents withdrew from the study.

**Inclusion criteria**

It included all adult patients aged 18 years and above, suffering from ESRD of either sex and had received regular HD for at least three months at the dialysis center mentioned above, during the study period.

**Exclusion criteria**

Those with co-morbidities with hepatitis infection, rejection episodes, or any major surgical interventions in the previous three months were excluded.

**Study area**
The study was conducted at Dr Salma dialysis center in Khartoum state, Sudan. It is the first main HD center in Sudan.

Research methods and data collection procedure

Assessment

Many components of QoL cannot be observed directly, they are evaluated indirectly, according to the item-measurement theory [3]. This theory proposes that there is a true QoL value that can be measured indirectly by asking the patient a series of questions known as “items,” each of which measures the same true concept or construct [3]. The answers are converted into numerical scores that are combined to yield domains and summary scores [3]. Using this theory, the instrument most frequently used for QoL evaluation is the health profile measurement, presented as a questionnaire that requests a viewpoint, usually that of the patient.

QoL instruments

QoL instruments measure an individual’s own views of his wellbeing, and some of these instruments provide a standard assessment of health. These instruments include questionnaires designed to be applicable for the general population such as the Sickness Impact Profile (SIP), the SF-12, SF-36 [1]. The most used instrument for measuring QoL in ESRD patients is the Short Form health survey questionnaire (SF-36) [2,6,9,10].

The instruments used for data collection in this study included two sections, a general socio-demographic section, as well as a validated Arabic version of QoL section. The socio-demographic section, developed by the researcher. The patients were asked to complete the socio-demographic survey as well as the KDQoL-SF questionnaire. Socioeconomic and demographic information were age, gender, origin, educational level, current employment status (occupation), and current estimated household income (monthly), dialysis vintage (length of time on dialysis treatment), the average duration of the dialysis session, duration of the disease, family history of kidney disease, satisfaction, and the total number of chronic diseases or any co-morbidity.

KDQoL-SF

The QoL was measured using Kidney Disease Quality of Life- Short Form (KDQoL-SF™) version 1.3. It is a standard self-report QoL measure developed for individuals with kidney disease on dialysis [10]. It is reliable and recommended by the National Kidney Foundation [9]. The KDQoL-SF 1.3 included 43 kidney disease targeted items (kidney disease-specific module), as well as 36 items that provide a generic core (SF-36), and overall health rating item [3].

The disease-specific part of the test focus on particular health-related concerns of individuals with kidney disease on dialysis, it includes 43 items: symptoms/ problems (12 items), effects of kidney disease on daily life (8 items), the burden of kidney disease (4 items), cognitive function (3 items), work status (2
items), sexual function (2 items), quality of social interaction (3 items) and sleep (4 items). Also included are three additional quality of life scales: social support (2 items), dialysis staff encouragement (2 items), and patient satisfaction (1 item) [3].

The Short-Form Health Survey 36-items (SF-36) instrument consists of 36 items describing the perception of health state during the last 4 weeks, these items representing eight different dimensions of functioning and well-being. These eight dimensions can be summarized in a Physical Component Scale (PCS) and a Mental Component Scale (MCS).

The PCS comprises physical functioning (10 items), role limitations caused by physical health problems (4 items), physical pain (2 items), general health perceptions (5 items), and the four scales of MCS were role limitations caused by emotional problems (3 items), Vitality/energy level (4 items), social functioning (2 items), and emotional well-being (5 items). The final item, the overall health rating item, asks respondents to rate their health on 0-10 response scale rating from worst possible to best possible health [6], this item asks respondents to rate their health on a response scale of 0 to 10 ranging from “worst possible” to “perfect health.” Each question is pre-coded numerically, and then transformed into a scale of 0 to 100; the higher numerical score reflects better QoL or less impairment.

The overall score could potentially total to 100, so I classified the results into two groups: Scores <50/100 as poor QoL and those with ≥ 50/100 as good QoL, that is, the higher the score, the better the QoL.

**Statistical Analysis**

All Statistical analyses were carried out using the Statistical Package for the Social Science (SPSS) software version 23 as well as Microsoft Excel 2016.

Continuous variables were reported using mean ± SD, median, and interquartile range (IQR). For categorical variables, absolute numbers and percentage were calculated. When comparing the categorical variables, Chi-square test/ Fisher's exact test was used. P-value <0.05 was considered statistically significant.

**Ethical considerations**

The research followed the tenets of the Declaration of Helsinki. All methods were carried in accordance with relevant guidelines and regulations. The study was approved by Local Ethics Committee and Institutional Review Board of Faculty of Medicine of University of Khartoum, and administrative permission from the national center for kidney disease and surgery, and Dr Salma dialysis center administration for data collection.

Participation in this study was voluntary; all patients were fully informed of their rights to decline or withdraw from participation in the study if desired. Informed consent has been obtained from the patients before data collection. Confidentiality was maintained on all data collection forms by using codes to identify each participant.
Results

One hundred and thirty-eight patients have participated in the current study giving a response rate of 90%.

Socio-demographic factors

The socio-demographic of the study participants are summarized and displayed in (Table 1).

Age & Gender

A total of 138 ESRD patients with a mean (± standard deviation) age of 45.9 (±14.5) years on HD were included. There were 66 (47.8%) males with an average age of 48.7± 16.5 years (range: 23–84 years) and 72 (52.2%) were females with an average age of 43.4± 12 years (range: 23–70 years). Of the 138 patients, patients with a poor QoL had an average age of 42.8 ± 12.9 years, and there were 18 men and 15 women. The good-QoL group had an average age of 46.9 ± 14.9 years, and there were 48 men and 57 women.

Origin

Regarding ESRD patients originated from the northern areas of Sudan, there were 75% of the patient had a good QoL, and only 25% had a poor QoL. All patients originated from the eastern areas had a good QoL. The majority (82%) of the patients who were originated from the west areas of Sudan had a good QoL, and only 18% had a poor QoL. Half of the southern areas had good QoL. Regarding the middle area of Sudan, there were 57% had a good QoL, 43% had a poor QoL, and all people originated from outside Sudan had a good QoL.

Social status

UN-married patients represent 30.4% of the participants in this study, and 69.6% were married. The mean KDQoL scores of married patients were 62.6±15, and the mean scores of unmarried patients were 59.2±15.6.

Education

The majority of the good QoL received their education up to tertiary level, and the majority of the poor QoL group received up to primary level.

Employment status & income

The majority of the respondents 96 (69.6%) were unemployed, homemaker, disabled, and retired and 42 (30.4%) were employees, workers, merchants, and others. only a small group had a household monthly income of more than 3000 SD (n = 30, 21.7%). (Figure 1) represents the effect of HD treatment on household monthly income.

Associated diseases
ESRD is associated with many co-morbid diseases, out of 138 patients participated in this study, 93 (67.4%) suffering from chronic diseases, 19.6% of ESRD patients had Diabetes, 60.9% had HTN and 4.3% had CVD (Figure 2).

**Kidney disease and HD duration**

39.1% of the patients were suffering from kidney disease for more than 10 years, and 28.3% of the patients were receiving dialysis for more than 10 years, 57 of the patients (41.3%) were on dialysis for less than three years. All respondents were receiving HD regularly twice/week for four hours per session, even those with a monthly income of 3000 SD or less.

**Family history of kidney disease**

Approximately one-third of the patients have a family history of kidney disease.

**Overall KDQoL-SF score**

The overall score could potentially total to 100, the higher score, the better the QoL, so to simplify the results, I classified the results into two groups: Scores <50/100 as poor QoL and those with ≥ 50/100 as good QoL. The reported QoL as measured by mean KDQoL-SF scale score was 61.6%, while the mean for PCS and MCS were 39.3 ± 9.6 and 50.0 ± 10.6, respectively. Of the 138 patients on chronic dialysis, there were 105 (76.1%) had a good QoL and 33 (23.9%) had a poor QoL. The overall scores of the KDQoL-SF are presented in (Table 2).

**Satisfaction**

The majority of the patients (89.2%) at Dr Salma dialysis center show a good impression of the healthcare provided to them (Figure 3).

**Table 1.** Socio-demographic and clinical characteristics of the 138 participants at Dr Salma dialysis center during the period of Sep-Dec 2018.
| P-value | KDQoL-SF score | Frequency N (%) | Variable | SD | Mean ± SD | Variable | SD | Mean ± SD |
|---------|----------------|-----------------|----------|----|-----------|----------|----|-----------|
| 0.689   | 63.4±13.0      | 27(19.6)        | < 30     |    | 63.4 ± 13.0 | Age Category | (Years) |          |
|         | 60.4±15.9      | 93(67.4)        | 30–60    |    | 60.4 ± 15.9 |          |       |          |
|         | 65.1±14.1      | 18(13.0)        | > 60     |    | 65.1 ± 14.1 |          |       |          |
| 0.376   | 63.47±14.7     | 66(47.8)        | Male     |    | 63.47 ± 14.7 | Gender |          |          |
|         | 59.8±15.5      | 72(52.2)        | Female   |    | 59.8 ± 15.5 |          |       |          |
| 0.082   | 61.8           | 3(2.2)          | Not formal |    | 61.8 | Educational Level |          |
|         | 56.9±18.6      | 39(28.3)        | Primary  |    | 56.9 ± 18.6 |          |       |          |
|         | 61.2±13.1      | 39(28.3)        | Secondary |    | 61.2 ± 13.1 |          |       |          |
|         | 65±13.6        | 57(41.3)        | Tertiary |    | 65 ± 13.6 |          |       |          |
| 0.018   | 62.4±13.5      | 60(43.5)        | North    |    | 62.4 ± 13.5 | Origin |          |          |
|         | 73.6±9.1       | 15(10.9)        | East     |    | 73.6 ± 9.1 |          |       |          |
|         | 61.1±18.0      | 33(23.9)        | West     |    | 61.1 ± 18.0 |          |       |          |
|         | 49.5±0.9       | 6(4.3)          | South    |    | 49.5 ± 0.9 |          |       |          |
|         | 52.7±14.3      | 21(15.2)        | Middle   |    | 52.7 ± 14.3 |          |       |          |
|         | 75.1           | 3(2.2)          | Other    |    | 75.1 |          |          |          |
| 0.140   | 52.3±0.1       | 3(2.2)          | High(more than 10,000 SD) |    | 52.3 ± 0.1 | Household income (month) |          |
|         | 67.4±12.2      | 27(19.6)        | Moderate(4,000–10,000) |    | 67.4 ± 12.2 |          |       |          |
| SD) | 60.4±15.7 | 108(78.3) | Low (less than 4,000 SD) |
|---|---|---|---|
| Social status | 62.2±15.1 | 30(21.7) | Single |
| 52.1±17.1 | 9(6.5) | Divorced |
| 50.3 | 3(2.2) | Widowed |
| 62.6±15 | 96(69.6) | Married |
| 0.012 | 62.2±15.1 | 30(21.7) | Single |
| 52.1±17.1 | 9(6.5) | Divorced |
| 50.3 | 3(2.2) | Widowed |
| 62.6±15 | 96(69.6) | Married |
| Current employment status | 63±16.4 | 42(30.4) | Employed |
| 61±14.7 | 96(69.6) | Unemployed |
| 0.032 | 63±16.4 | 42(30.4) | Employed |
| 61±14.7 | 96(69.6) | Unemployed |
| Duration of the disease (Years) | 48.6±0.1 | 3(2.2) | < 1 |
| 65.7±13.6 | 69(50.0) | 1-5 |
| ±15.9 57.9 | 66 (47.8) | >5 |
| 0.006 | 48.6±0.1 | 3(2.2) | < 1 |
| 65.7±13.6 | 69(50.0) | 1-5 |
| ±15.9 57.9 | 66 (47.8) | >5 |
| Total chronic co-morbid diseases | 59.2±18.2 | 45(32.6) | None |
| 61.1±14.1 | 66(47.8) | 1 |
| 66.6±12.4 | 21(15.2) | 2 |
| 66.8±5.9 | 6(4.4) | ≥ 3 |
| 0.151 | 59.2±18.2 | 45(32.6) | None |
| 61.1±14.1 | 66(47.8) | 1 |
| 66.6±12.4 | 21(15.2) | 2 |
| 66.8±5.9 | 6(4.4) | ≥ 3 |
| Total chronic co-morbid diseases | 62.9±13.8 | 84(60.9) | Hypertension |
| 0.038 | 62.9±13.8 | 84(60.9) | Hypertension |
| 0.082 | 68.1±9.5 | 27(19.6) | Diabetes |
| 0.148 | 61.7±13.8 | 6(4.4) | Cardiovascular disease |

SD, Standard Deviation, KDQoL-SF, Kidney Disease Quality of Life-Short Form. The bold value indicates statistically significant.

**Table 2.** Different components of QoL as evaluated by KDQoL-SF of hemodialysis respondents (n=138).
| Scale (number of items in scale) | Mean | Median | Stan. Dev. |
|---------------------------------|------|--------|------------|
| Symptom/problem list            | 76.5 | 81.3   | 18         |
| Effects of kidney disease       | 77.9 | 79.7   | 17.3       |
| The burden of kidney disease    | 51.2 | 50     | 31.8       |
| Work status                     | 38   | 50     | 38         |
| Cognitive function              | 87.1 | 93.3   | 17.6       |
| Quality of social interaction   | 82.2 | 93.3   | 17         |
| Sleep                           | 71.6 | 72.5   | 23.4       |
| Social support                  | 87.7 | 100    | 22.2       |
| Overall health                  | 63.9 | 60     | 24.1       |
| Patient satisfaction            | 72.5 | 83.3   | 24         |
| Physical functioning            | 56.7 | 60     | 24.9       |
| Role limitations–physical       | 33.7 | 25     | 35.2       |
| Pain                            | 71.3 | 70     | 26.6       |
| General health                  | 57.4 | 60     | 26.6       |
| Scale                             | Score | Mean | Standard Deviation |
|----------------------------------|-------|------|-------------------|
| Emotional well-being             | 75.8  | 80   | 18.8              |
| Role limitations–emotional       | 64.5  | 100  | 43.2              |
| Social function                  | 63    | 62.5 | 34.2              |
| Energy/fatigue                   | 48.2  | 50   | 21.6              |
| SF-12 PCS                        | 39.3  | 40.4 | 9.6               |
| SF-12 MCS                        | 50    | 51.2 | 10.7              |

For each scale, the score range from 0-100, a higher score indicates a better quality of life. MCS, mental components summary, PCS, physical component summary; SF-12, short form12.

**Discussion**

QoL is an important clinical outcome for HD patients; it provides information about the impact of disease and the treatment on the daily life of a patient. More attention to the QoL instrument (e.g., KDQoL-SF) may help to determine the factors that affect the QoL and aimed to improve the QoL of a specific patient. Previous studies, give strong support to the use of the KDQoL-SF and the SF-36 as research instruments to assess the QoL [12]. QoL measurement is obtained from the answers given by patients to the standardized questionnaires. These answers reflect their perception of their health status, in addition to their satisfaction regarding the medical health care provided. In this study, QoL was measured using the KDQoL-SF, is an important tool to assess CKD patients on HD. The KDQoL-SF instrument was completed by 138 of 153 patients (90%) enrolled in this study.

**Socio-demographic factors**

**Age & Gender**

The results of this study showed that patients older than 60 years had a higher KDQoL-SF score than those younger than 30 years. In this study, there were more females than males (52.2% VS 47.8%), female gender was associated with lower mean KDQoL score compared to male, although this was not statistically significant, one possible explanation is that poor social life and physical inactivity of females in developing countries might contribute to lower QoL. Scores In this study, the good QoL patients were more than the poor QoL patients (76.1% VS 23.9%). The good QoL group was older than the
poor QoL group. In a study included 69 patients from the Republic of Guinea with ESRD, the average age of ESRD men was 51 ± 3 year and for women, it was 48 ± 3.1 years), 32 (46.3%) had good QoL and 37 (53.7%) had poor QoL. Those with a poor QoL had an average age of 54 ± 4 years, and the good QoL group had an average age of 47.6 ± 4 years, good QoL was associated with younger age [2].

**Education**

From the results, it is obvious that the majority of the patients received education up to the tertiary level (41.3%). Also, the tertiary level of education was associated with the highest KDQoL scores. This could be because educated patients may have a better understanding of the disease, its effects, and management [7]. In a study by Rachel L. Perlman in the Renal Research Institute found that education was associated with higher QoL scores in the Physical Functioning, Physical Role, Mental Health, Social Functioning, and PCS scales [10].

**Occupation & income**

This study showed that being unemployed was significantly related to lower KDQoL scores, and the association between the employment status and the QoL is statistically significant (P-value = 0.032). Unemployment was also confirmed in many studies as an important factor related to impaired QoL in HD patients [7].

**Origin**

The majority of the patients originated from the north of Sudan, followed by west, east, middle, and south respectively. In this study, I found that there was a significant association between the origin of the patient and the QoL (P-value =0.018).

**Co-morbidities**

Co-morbidities that were associated with the kidney disease may have been responsible for the impairment of the QoL and require close medical care and follow-up [9]. Several studies have hypothesized that co-morbidities, physical function, and mental well-being affect QoL [9]. Besides, this study has shown that the presence of co-morbid diseases can result in greater impairment of patient’s general health, social function, and mean KDQoL scores. Co-morbidities were more frequent in older QoL patients.

Chronic illnesses, mainly HTN, were strongly associated with impaired QoL in ESRD patients on dialysis. The results in this study showed that the majority of the patients (60.87%) have HTN, and the association between the QoL and HTN is statistically significant (P-value = 0.038). Patients who had HTN had worse scores versus those without HTN in General Health scale.

Besides, it was found that a combination of DM and ESRD negatively affect the physical dimension as measured by KDQoL, patients who had diabetes had worse scores versus those without diabetes in
Physical Functioning, General Health, Physical Role, and PCS scales. Other studies found that a combination of DM and ESRD negatively affect mental health status such as vitality, social functioning and role-emotional as measured by SF-36 [6].

ESRD patients who had CVD had worse scores versus those without CVD in Physical Role, Emotional Role, and MCS scales. When compared the results with the renal research institute, Rachel L. Perlman found that patients who had CHF had worse scores versus those without CHF in Physical Functioning, General Health, Mental Health, Emotional Role, Social Functioning, and MCS scales. Also, he found Diabetes, CAD, and HTN did not correlate with most QoL measurements [10].

Besides, this current study found that other factors such as marital status, duration of the disease, and HD duration were statistically significant associated with the QoL (P-value < 0.05). There was no statistically significant association between the family history of kidney disease and QoL.

**Conclusion**

Improving QoL in CKD patients has become as one of the main goals of RRT [9]. QoL is multidimensional where many factors affect patients' overall QoL. The present study confirmed that patients on chronic HD had a significant limitation in their QoL, with different ranges of severity. Also, it provides several associations between patient variables such as socio-demographic factors and their perception of QoL. This study indicated that the main factors have a significant impact on the QoL were social status, origin, employment status, duration of the CKD, family history of kidney disease, time on HD, and HTN.

**Abbreviations**

BMI: Body Mass Index; CKD: Chronic Kidney Disease; CVD: Cardio-Vascular-Disease; DM: Diabetes Mellitus; ESRD: End Stage Renal Disease; HD: Hemodialysis; HTN: Hypertension; KDCS: Kidney Disease Components Summary; KDQOL-SF: Kidney Disease Quality Of Life-Short Form; MCS: Mental Component Summary; PCS: Physical Component Summary; QoL: Quality of Life; RRT: Renal Replacement Therapies; SD: Standard Deviation; SF -36: Sort Form-36; SIP: Sickness Impact Profile; WHO: World Health Organization.

**Declarations**

**Acknowledgements**

The author would like to thank all the patients who volunteered to participate in this study. Special thanks to Dr. Yasir Idriss, Dr. Walaa Mahjoub, and Dr. Fadwa M. S. Mohammed for their help with illustrations and valuable comments.

**Authors’ contributions**
Not applicable.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Availability of data and materials**

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

**Ethics approval and consent to participate**

The research followed the tenets of the Declaration of Helsinki. All methods were carried in accordance with relevant guidelines and regulations. The study was approved by Local Ethics Committee and Institutional Review Board of Faculty of Medicine of University of Khartoum, and administrative permission from the national center for kidney disease and surgery, and Dr Salma dialysis center administration for data collection.

Participation in this study was voluntary; all patients were fully informed of their rights to decline or withdraw from participation in the study if desired. Patients have received a verbal and written explanation of the purpose of the study. Informed consent has been obtained from the patients before data collection. Confidentiality was maintained on all data collection forms by using codes to identify each participant.

**Consent for publication**

Not applicable.

**Competing interests**

There is no conflict of interest with this study.

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