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Assessment of Quality of Life among Patients with Chronic Kidney Disease Undergoing Hemodialysis in Burundi

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Abstract

Introduction: Chronic kidney disease is a major public health problem. In Burundi, hemodialysis represents the main modality of renal replacement therapy. However, its impact on patients' quality of life (QoL) remains poorly documented. This study aimed to assess the QoL of chronic hemodialysis patients and to identify factors associated with its impairment. **Methods:** A multicenter cross-sectional study was conducted from December 2022 to January 2023 in five hemodialysis centers in Burundi. Patients aged ≥ 18 years, on hemodialysis for at least three months and clinically stable, were included. Quality of life was assessed using the KDQOL-SF™ questionnaire. Data were collected via interviewer- or self-administered surveys in Kirundi. Bivariate, and multivariate linear regressions identified factors associated with quality of life. **Results:** Sixty-six patients were included, 80.3% of whom were male. The mean age was 49.27 ± 12.13 years. The mean score for the physical component summary was 45.29 ± 21.41, and for the mental component summary 48.99 ± 23.10. The overall mean score of the KDQOL-SF™ was 54.36 ± 15.62. Vitality (16.28 ± 32.07) and physical functioning (38.25 ± 33.01) were the most affected dimensions. In bivariate analysis, age and dialysis duration were negatively associated with quality of life, while socio-economic factors and hemoglobin were positively associated. Multivariate analysis confirmed these findings, identifying age, education, occupation, living conditions, insurance, dialysis duration, and hemoglobin as independent predictors (adjusted R^2 = 0.48). **Conclusion:** The QoL of hemodialysis patients in Burundi is markedly impaired, particularly in its physical dimensions. Socio-economic and clinical

factors significantly influence QoL, with modifiable determinants such as anemia management and access to healthcare playing a key role. These findings highlight the need for comprehensive and multidisciplinary interventions, including improved social support, optimization of clinical care, and strengthening of health coverage systems, to enhance the overall well-being of patients undergoing chronic hemodialysis.

Keywords

Chronic Kidney Disease, Hemodialysis, Quality of Life, KDQOL-SF™, Burundi

1. Introduction

Chronic kidney disease (CKD) is defined as a progressive and irreversible decline in renal function, often asymptomatic until advanced stages. As kidney function deteriorates, patients require renal replacement therapies such as hemodialysis, peritoneal dialysis, or kidney transplantation to survive. Among these treatments, hemodialysis is the most commonly used modality in Burundi. Although hemodialysis prolongs life, it is not curative and imposes a substantial daily burden on patients [1] [2].

Beyond clinical aspects, patients undergoing hemodialysis face physical, psychological, social, and economic challenges. Quality of life (QoL), a multidimensional concept incorporating patients' perceived well-being across various life domains, has become an important criterion for evaluating treatment effectiveness. In low-resource settings, few studies have explored QoL among hemodialysis patients. Burundi, where renal health infrastructure remains limited, is no exception.

This study aims to fill this gap by assessing the quality of life of chronic hemodialysis patients in Burundi using the KDQOL-SF™ questionnaire, a tool specific to chronic kidney disease, in order to identify the main determinants of QoL impairment and propose avenues for improvement.

2. Materials and Methods

2.1. Study Design and Setting

This was a multicenter cross-sectional study conducted between December 2022 and January 2023 among patients with chronic kidney disease receiving maintenance hemodialysis in five hemodialysis centers in Burundi. These centers represent the main specialized facilities for chronic kidney disease (CKD) management in the country.

2.2. Participants

Eligible patients were aged ≥ 18 years, had been on hemodialysis for at least three months, were clinically stable, and had not been hospitalized during the month preceding the study.

Patients who refused to participate or had cognitive impairment preventing them from properly answering the questionnaire were excluded.

During the study period, there were 93 patients on chronic hemodialysis in the five dialysis centers in Burundi. Of these, 68 were eligible according to the inclusion criteria, of whom two were excluded due to cognitive impairment. And, 66 patients constituted our sample.

2.3. Instruments

Quality of life was assessed using the Kidney Disease Quality of Life Short Form (KDQOL-SF™), a validated instrument developed by Hays *et al.* in 1994 [3]. It comprises a total of 79 items and combines a generic tool, the Short Form (SF-36), which includes 36 questions grouped into eight dimensions, with a kidney disease-specific module consisting of 43 items distributed across 11 dimensions.

In this study, item responses were transformed to a 0 - 100 scale, with a score > 50 indicating better quality of life. Mean dimension scores (MDS) were calculated for each domain, and results were expressed as mean ± standard deviation. The overall score was obtained by averaging the domain scores.

A nonstandard grouping of SF-36 domains was applied. Instead of using the conventional weighted scoring algorithm to derive the Physical Component Summary (PCS) and Mental Component Summary (MCS), these composite scores were calculated as the unweighted mean of selected SF-36 domains. This simplified approach was adopted due to the lack of locally validated normative data and to enhance interpretability within the study context.

Furthermore, we chose, on the one hand, to standardize the initial SF-36-dimension scores to a mean of 50 and a standard deviation of 10 in accordance with the "USA 98" general population study, and on the other hand, to group the eight dimensions into two main components: Physical Component Summary (PCS) and Mental Component Summary (MCS) [4] [5].

2.4. Data Collection

Following informed consent, two modes of questionnaire administration were employed: interviewer-administered during hemodialysis sessions for patients unable to read or complete the questionnaire, and self-administered for those able to do so. The KDQOL-SF™ was translated into Kirundi, the national language spoken by entire population and understood by all participants in the study. Data collection procedures strictly adhered to the KDQOL-SF™ administration guidelines to ensure standardization and minimize interviewer bias.

2.5. Data Analysis

Variables were performed using IBM SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA). Univariate analysis described the distribution of independent variables and dependent variables.

The dependent variables were the continuous quality of life scores derived from

the KDQOL-SF™, including both the overall KDQOL-SF™ score and selected dimension scores (Mean Dimension Scores, MDS), expressed on a 0 - 100 scale, where scores > 50 indicating better quality of life.

Independent variables included sociodemographic (age, sex, educational level, occupation, living conditions), clinical (duration on hemodialysis, vascular access, comorbidities), and biological parameters (hemoglobin level). Categorical variables were coded as binary or dummy variables, while continuous variables were retained in their original scale.

2.6. Statistical Analysis

Continuous variables were summarized as means ± standard deviations and categorical variables were summarized as counts or percentages. Missing data were assessed; variables with >10% missing values were carefully reviewed, and multiple imputation was considered.

Bivariate linear regression analyses were performed to explore the association between each independent variable and quality of life (dependent variable). Independent variables included: age, sex, educational level, occupation, living conditions, health insurance coverage, duration on hemodialysis, hemoglobin level, diabetes, hypertension, and type of vascular access (arteriovenous fistula vs catheter). Crude regression coefficients (β), 95% confidence intervals (CI), and p-values were calculated. Variables with p-values ≤ 0.20 were considered for inclusion in the multivariable model.

Regarding multivariate analysis, selected variables from the bivariate analysis were entered into a multivariable linear regression model to identify independent predictors of quality of life. Adjusted regression coefficients (β), 95% confidence intervals, and p-values were reported. Model fit was assessed using the adjusted R^2. Statistical significance was defined as $p < 0.05$.

2.7. Ethical Considerations

The study protocol was approved by the Ethics Committee of the Faculty of Medicine of the University of Burundi. Informed consent was obtained from all participants.

3. Results

3.1. Sociodemographic and Clinical-Biological Characteristics

A total of 66 patients constituted the sample. The mean age was 49.27 ± 12.13 years, with marked male predominance (80.3%). The majority (93.9%) had some form of health coverage, although it did not always cover indirect disease-related costs (see **Table 1**).

3.2. Quality of Life Assessment

The overall mean KDQOL-SF™ score was 54.36 ± 15.62, ranging from 16.28 ± 32.07 to 80.11 ± 25.66 (**Table 2**). SF-36 overall mean score was 47.14 ± 19.73. All

Table 1. Sociodemographic and clinico-biological characteristics of the participants.

Variable/Category	Value/Frequency
Age	49.27 ± 12.13 years
≤30 years	9.10%
31 - 45 years	24,24%
46 - 60 years	46.96%
>60 years	19.70%
Sex-ratio (M/F)	4.07
Educational level	
Illiterate	12/1%
Primary	16.10%
Middle school	16,70%
High school	22.70%
University	31.80%
Married	86.4%
Occupation	
Civil servants	27.3%
Private sector employees	10.6%
Self-employees	9.1%
Farmers	12.1%
Retirees	18.2%
Unenmployed	22.7%
Living with familly	65.20%
Health insurance coverage	93.9%
Comorbidities	
Diabetes associated with hypertension	54.54%
Hypertension alone	30.30%
Cardiovascular diseases	13.63%
Mean duration on diaysis	22.06 ± 17.97 months
Frequency of hemodialysis sessions	
Tree times per week	1.52%
Twice per week	95.45%
Once per week	3.03%
Vascular access	
Arteriovenous fistula	51.5%
Central venous catheter	48.5%

Continued

Hemoglobin	
<10 g/dl	71.43%
≥10/dl	28.57%

Table 2. Distribution of mean scores by KDQOL-SF™ scale among hemodialysis patients.

Dimension	**Mean score ± SD**
Physical functioning (D1)	38.25 ± 33.01
Role physical (D2)	44.12 ± 20.65
Bodily pain (D3)	57.46 ± 29.49
Vitality (D4)	16.28 ± 32.07
General health perception (D5)	41.34 ± 20.93
Social functioning (D6)	66.36 ± 30.64
Role emotional (D7)	51.01 ± 42.65
Mental health (D8)	62.30 ± 20.42
Physical component summary—PCS (D1, D2, D3, D4)	45.29 ± 21.41
Mental component summary—MCS (D5, D6, D7, D8)	48.99 ± 23.10
SF-36 overall mean score	47.14 ± 19.73
Symptoms of kidney disease (D9)	64.96 ± 18.73
Effects of kidenye disease on daily life (D10)	60.60 ± 21.48
Burden of kidney disease (D11)	36.64 ± 24.33
Work status (D12)	21.96 ± 35.22
Cognitive function (D13)	71.45 ± 20.80
Quality of social interactions (D14)	79.58 ± 18.11
Sexual function (D15)	57.75 ± 30.14
Sleep (D16)	58.47 ± 20.38
Social support (D17)	66.41 ± 25.23
Dialysis staff encouragement (D18)	80.11 ± 25.66
Patient satisfaction (D19)	73.98 ± 14.65
KDQOL-SF ™ overall mean score	54.36 ± 15.62

SF-36 dimensions were affected to varying degrees. In ascending order of impairment, the most affected scales were Vitality (D4), Physical Functioning (D1), General Health Perceptions (D5), Role Limitations due to Physical Health (D2), Role Limitations due to Emotional Problems (D7), Bodily Pain (D3), Mental Health (D8), and Social Functioning (D6). The PCS (45.29 ± 21.41) was slightly lower than the MCS (48.99 ± 23.10).

3.3. Factors Associated with Quality of Life in Hemodialysis Patients

Table 3 presents the bivariate analysis of factors associated with quality of life among hemodialysis patients. Age was significantly negatively associated with quality of life ($\beta = -0.32$; 95% CI: −0.48 to −0.16; $p < 0.001$), indicating that older patients tended to have lower quality of life scores. Similarly, duration on hemodialysis was also negatively associated with quality of life ($\beta = -0.26$; 95% CI: −0.44 to −0.08; $p = 0.006$).

In contrast, several socio-economic and clinical variables were positively associated with better quality of life. These included educational level ($\beta = 0.38$; $p < 0.001$), occupation ($\beta = 0.35$; $p = 0.001$), living conditions ($\beta = 0.45$; $p < 0.001$), and health insurance coverage ($\beta = 0.40$; $p < 0.001$). Additionally, higher hemoglobin levels were significantly associated with improved quality of life ($\beta = 0.37$; $p < 0.001$).

Regarding clinical characteristics, vascular access showed a significant association, with catheter use being negatively associated with quality of life compared to arteriovenous fistula ($\beta = -0.24$; 95% CI: −0.44 to −0.04; $p = 0.020$).

On the other hand, sex ($p = 0.140$) and hypertension ($p = 0.280$) were not significantly associated with quality of life. Diabetes showed a borderline association ($\beta = -0.18$; $p = 0.078$), suggesting a potential negative effect that did not reach statistical significance.

Table 3. Bivariate analysis of factors associated with quality of Life.

Variable	Crude β (95% CI)	*p*-value
Age (years)	−0.32 (−0.48, −0.16)	<0.001
Sex (M/F)	0.15 (−0.05, 0.35)	0.140
Educational level	0.38 (0.18, 0.58)	<0.001
Occupation	0.35 (0.15, 0.55)	0.001
Living conditions	0.45 (0.25, 0.65)	<0.001
Health insurance coverage	0.40 (0.20, 0.60)	<0.001
Duration on hemodialysis (months)	−0.26 (−0.44, −0.08)	0.006
Hemoglobin (g/dL)	0.37 (0.18, 0.56)	<0.001
Diabetes	−0.18 (−0.38, 0.02)	0.078
Hypertension	−0.11 (−0.31, 0.09)	0.280
Vascular access (Catheter vs AVF)	−0.24 (−0.44, −0.04)	0.020

M: male; F: female; AVF: arteriovenous fistula.

Table 4 presents the results of the multivariate linear regression analysis identifying independent factors associated with quality of life among hemodialysis patients.

After adjustment for potential confounders, several variables remained signifi-

cantly associated with quality of life. Age was negatively associated with quality of life ($\beta = -0.28$; 95% CI: −0.45 to −0.11; p = 0.002), indicating that older patients had lower quality of life scores. Similarly, duration on hemodialysis was also negatively associated ($\beta = -0.22$; 95% CI: −0.40 to −0.04; p = 0.017).

Several factors were positively associated with better quality of life. These included educational level ($\beta = 0.31$; p = 0.004), occupation ($\beta = 0.29$; p = 0.006), living conditions ($\beta = 0.41$; $p < 0.001$), and health insurance coverage ($\beta = 0.36$; p = 0.002). In addition, higher hemoglobin levels were significantly associated with improved quality of life ($\beta = 0.33$; p = 0.003).

Clinical variables andvascular access showed a borderline association, with catheter use tending to be associated with lower quality of life compared to arteriovenous fistula ($\beta = -0.19$; p = 0.065). Diabetes was not significantly associated with quality of life after adjustment (p = 0.230), nor was sex (p = 0.240).

The model explained 48% of the variance (adjusted $R^2 = 0.48$).

Table 4. Multivariate analysis of actors associated with quality of life.

Variable	Adjusted β (95% CI)	*p*-value
Age (years)	−0.28 (−0.45, −0.11)	0.002
Sex (M/F)	0.12 (−0.08, 0.32)	0.240
Educational level	0.31 (0.10, 0.52)	0.004
Occupation	0.29 (0.08, 0.50)	0.006
Living conditions	0.41 (0.19, 0.63)	<0.001
Health insurance coverage	0.36 (0.14, 0.58)	0.002
Duration on Hemodialysis (months)	−0.22 (−0.40, −0.04)	0.017
Hemoglobin (g/dL)	0.33 (0.12, 0.54)	0.003
Diabetes	−0.12 (−0.32, 0.08)	0.230
Vascular access (Catheter vs AVF)	−0.19 (−0.39, 0.01)	0.065
Adjusted R^2	0.48	

M: male; F: female; AVF: arteriovenous fistula.

4. Discussion

The study sample consisted of 66 chronic hemodialysis patients nationwide, with a mean age of 49.27 ± 12.13 years, reflecting a relatively young population compared with Western cohorts [6]. The predominance of male (male/female ratio = 4.07) suggests either a higher incidence of CKD among men or inequality in access to care for women. According to Jungers P. *et al.* [7] [8], this male predominance may be attributed to a higher incidence of kidney diseases in men as well as a faster progression to end-stage disease. Indeed, men are more likely to adopt risk behaviors such as smoking and excessive alcohol consumption, which are risk factors for kidney disease. In addition, biological, hormonal, and genetic differences, such as testosterone levels, may influence the progression of kidney disease [9]. How-

ever, female predominance has also been reported in some studies, such as that of Kane *et al.* [10] in Senegal in 2019, with a male/female ratio of 0.88.

The majority of patients had health coverage, although it remained partial and did not cover indirect costs, which may negatively influence quality of life. This situation is common in several sub-Saharan African countries [11] [12].

The SF-36 overall mean score of 47.14 ± 19.73 confirms significant impairment of QoL, with the mental component (48.99 ± 23.10) slightly higher than the physical component (45.29 ± 21.41). These results reflect the considerable burden of CKD and its replacement therapy on autonomy, functional capacity, and overall well-being. Comparison with other similar African studies shows a consistent trend. Nasr *et al.* [1] reported an overall mean score of 51.4 ± 24.3, with 65% impaired QoL, while Gataa *et al.* [13] observed impaired QoL in 75.2% of patients, with a mean score of 55.1 ± 11.7. A study conducted in Cameroon [14] reported a mean score of 44.34, and 76.2% of patients had a QoL score < 50. The study by Shumbusho *et al.* [11], reporting an even lower SF-36 mean score of 38.3, illustrates the severity of impairment in certain contexts. Thus, despite worsening physical health, the mental health of dialysis patients remains relatively preserved, as shown in other studies [15]-[17]. This may reflect the ability of patients with end-stage renal disease to psychologically adapt to their condition over time. Furthermore, a Romanian multicenter study [18] observed that among patients who maintained their initial dialysis modality, physical quality of life progressively declined, whereas mental quality of life tended to remain stable.

The severe impairment in vitality (16.28 ± 32.07) and physical functioning (38.25 ± 33.01) is consistent with the high prevalence of anemia, the burden of comorbidities, and suboptimal dialysis modalities. These factors are known to increase chronic fatigue and reduce functional capacity [15] [16] [19]. It is also known that, among hemodialysis patients, the use of erythropoiesis-stimulating agents significantly contributes to improving the physical health component.

The dimensions related to occupational status (21.96 ± 35.22) and burden of kidney disease (36.64 ± 24.33) reflect the significant socioeconomic burden of end-stage renal disease, particularly in low-resource settings [15] [17]. In contrast, the high scores observed for quality of social interactions (79.58 ± 18.11), social support (66.41 ± 25.23), and encouragement from the dialysis team (80.11 ± 25.66) suggest a protective role of social networks and healthcare staff—factors recognized as improving psychological adaptation and quality of life among hemodialysis patients [20]. In the literature, social support is associated not only with psychological benefits but also with better physical outcomes in hemodialysis patients.

The relatively satisfactory scores for cognitive functioning (71.45 ± 20.80) and overall satisfaction (73.98 ± 14.65) may reflect psychosocial resilience despite the chronic nature of the disease. Compared with data from developed countries, physical scores remain lower, probably due to limited access to rehabilitation services and comprehensive multidisciplinary care [21]. Overall, these findings con-

firm the multidimensional nature of quality of life in hemodialysis and highlight the importance of integrated interventions targeting physical, psychological, and social dimensions.

The present analysis highlights that both socio-demographic and clinical factors significantly influence quality of life (QoL) among hemodialysis patients in Burundi. In the bivariate analysis, older age and longer duration on hemodialysis were significantly associated with poorer QoL, a finding that remained robust after multivariate adjustment. This is consistent with existing literature, as aging is often accompanied by increased comorbidities, functional decline, and reduced physical capacity, all of which negatively impact QoL [22]-[24]. Similarly, prolonged exposure to hemodialysis may lead to treatment fatigue, complications, and psychosocial burden.

Conversely, several socio-economic factors—educational level, occupation, living conditions, and health insurance coverage—were positively associated with QoL in both analyses. These associations persisted after adjustment, indicating that they are independent predictors. Higher education may improve health literacy and adherence to treatment, while stable employment and better living conditions likely enhance financial security and access to care [14] [25]. Health insurance coverage plays a crucial role in reducing the economic burden of chronic treatment, particularly in low-resource settings like Burundi.

Hemoglobin level emerged as a strong positive predictor of QoL in the multivariate model, confirming the importance of anemia management in hemodialysis patients. Adequate hemoglobin levels are associated with improved physical functioning, reduced fatigue, and better overall well-being [26].

In contrast, sex, diabetes, and hypertension were not significantly associated with QoL after adjustment. The lack of association with diabetes may be explained by confounding factors or limited statistical power, despite a negative trend observed in the bivariate analysis. But is known that the presence of diabetes and hypertension is associated with the negative impact of comorbidities on both physical and mental dimensions, as reported in several studies [27]-[29]. Vascular access showed a borderline association, suggesting that catheter use may be linked to poorer QoL compared to arteriovenous fistula, possibly due to higher complication rates. Therefore, the arteriovenous fistula is associated with better survival and lower morbidity compared with catheters, thus positively impacting QoL [30].

These findings underscore the multifactorial nature of QoL in hemodialysis patients and highlight the need for comprehensive interventions addressing both clinical and socio-economic determinants.

This study has certain limitations. The complexity of adapting the SF36 questionnaire into Kirundi and the use of a questionnaire not validated in the Burundian population may introduce social desirability bias. Also, the absence of a comparative group (peritoneal dialysis, kidney transplantation, or general population) limits the scope of comparative conclusions. A further limitation is the potential

for residual confounding due to unmeasured variables, as well as possible selection and survivor bias inherent to this cross-sectional sample, which may limit the generalizability and causal interpretation of the findings.

5. Conclusion

The quality of life of chronic hemodialysis patients in Burundi is globally impaired, particularly in physical dimensions. Despite this, mental health appears relatively preserved, suggesting adaptive coping mechanisms. Socio-economic factors such as education, occupation, living conditions, and health insurance play a major role in QoL. Clinical factors, especially anemia and duration on dialysis, significantly influence patient outcomes. Older age and prolonged dialysis are associated with poorer QoL. Social support and healthcare team involvement provide important protective effects. The findings highlight the multidimensional nature of QoL in this population. Comprehensive strategies addressing both clinical management and socio-economic support are essential to improve patient well-being.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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