Original Research

Evaluating Health-Related Quality of Life After Kidney Transplantation in Kazakhstan

Gulmira Derbissalina [1], *Dinara Zhunussova* [1]*, *Natalya Zemlyanskaya* [1], *Raushan Kassymova* [2], *Ayagyoz Umbetzhanova* [1], *Zhanagul Bekbergenova* [1], *Elvira Aitenova* [1], *Dauren Moldazhanov* [3], *Mussenov Yerlan* [4]

[1] *NJSC "Astana Medical University", Astana, Kazakhstan*
[2] *Kazakh National Medical University, Almaty, Kazakhstan*
[3] *City Polyclinic No. 7 of Astana, Kazakhstan*
[4] *Municipal State Enterprise on the Right of Economic Management "City Polyclinic No. 1" of the Akimat of Astana City.*

ARTICLE INFO

Article history:
Received 25 Jul. 2026
Accepted 15 Sep. 2026

Keywords:
Quality of Life
Kidney Transplantation
Transplant Recipients
Self-Concept
Renal Insufficiency
Post-transplant outcomes
Health-related quality of life

ABSTRACT

Objective: To assess health-related quality of life and the associations between selected quality-of-life domains among kidney transplant recipients in Astana, Kazakhstan. **Methods:** A cross-sectional study was conducted involving 31 kidney transplant recipients from 2022 to 2024. A validated Russian-language version of the KDQOL-SF™ version 1.3 was used to assess health-related quality of life. **Results:** The mean age of participants is 43,6 ± 12 .019 years. Central Asian ethnic groups predominate among the study participants (63.4%). Analysis of the SF-36 dimensions revealed that the lowest score was observed for general health (50.2 ± 13.6), whereas the highest score was recorded for bodily pain (77.2 ± 24.4). Among the specific KDQOL-SF quality-of-life measures, the lowest score was observed for Sleep (47.6 ± 12.3). The Sexual Function score, calculated for 22 participants who reported sexual activity during the previous four weeks, was 89.2 ± 19.4. Correlation analysis of the lowest scores on the scales: Sleep, Burden of Kidney Disease (KDQOL-SF), and General Health, Physical Role (SF-36) revealed a significant association between Burden of Kidney Disease and General Health ($r = 0.527$, $p = 0.002$), and between the Burden of Kidney Disease and Physical Role ($r = 0.546$, $p = 0.001$). A moderate association was found between Sleep and Physical Activity ($r = 0.418$, $p = 0.019$) and between Sleep and General Health Status ($r = 0.363$, $p = 0.044$). **Conclusion:** In this cross-sectional study of kidney transplant recipients in Astana, HRQoL varied considerably across physical, functional, and kidney disease-specific domains, with the lowest scores observed for general health, kidney disease burden, and sleep. Nevertheless, it has limitations, primarily the requirement for lifelong immunosuppressive treatment and ongoing clinical follow-up. Characterizing quality-of-life outcomes in kidney transplant recipients can provide important information for identifying care gaps, standardizing post-transplant monitoring, preserving long-term transplant function, and reducing adverse complications throughout the post-transplant period.

1. Introduction

Chronic kidney disease (CKD) is a global problem in modern medicine. This disease is characterised by a progressive course, high morbidity and mortality, and irreversible progressive decline in kidney function, resulting in tubular atrophy and fibrosis [1][2][3]. The diagnosis of CKD is determined by the presence of a marker of kidney damage and a decrease in glomerular filtration rate to less than 60 ml/min for three months or more [4][5].

Today, the prevalence of this disease worldwide remains high. According to a systematic review, the number of people with CKD worldwide is 843.6 million, of whom 3.9 million with end-stage chronic renal failure (ESCRF) are on renal replacement therapy [6][7].

One study indicates an annual increase of 7% in patients with CKD [8]. According to various sources, research into the global burden of CKD

* *Corresponding author: Dinara Zhunussova*
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DOI: 10.64904/20260901

shows that over the past 30 years, the incidence of this disease has increased by 89% and mortality by 98%. In 2017, 1-2 million people worldwide died from CKD, and the global mortality rate among all ages increased by 41-5% [9][10][11].

According to data from the US Centers for Disease Control and Prevention (CDC), approximately 37 million people (15% of the adult population) suffer from CKD in the United States [12]. According to forecasts, by 2040, CKD will become the fifth leading cause of death worldwide, compared to 2016 (13th place) [13][14].

In the Republic of Kazakhstan, as in the rest of the world, there has been an increase in the number of patients with end-stage chronic renal failure (ESCRF). The prevalence, incidence and mortality rates in Kazakhstan for 2014 were 97.9, 66.3 and 25.8 per 100,000 population, respectively, compared to 2018, when the indicators differed significantly – 336.1, 96.3 and 18.9 per 100,000 population, respectively [15][16].

This is associated with an increase in the number of patients with diseases that lead to CKD and, subsequently, to ESRD, such as diabetes mellitus, arterial hypertension, chronic pyelonephritis, glomerular diseases, systemic diseases, etc. [1][17][18][19].

Regardless of the aetiology and pathogenetic mechanisms of kidney damage, these diseases lead to progressive, therapy-resistant, irreversible sclerosis of the renal parenchyma. The prevalence of CKD is also influenced by universal factors such as population ageing, overall increase in morbidity, and increased life expectancy of patients with CKD.

Kidney transplantation is undoubtedly the most promising method of renal replacement therapy for ESRD [20][21], which increases life expectancy and improves quality of life. According to some studies, the quality of life of patients after kidney transplantation is higher than that of patients on haemodialysis. [22][23]

According to data from the WHO and Global Organ Donation and Transplantation, 77,319 kidney transplant operations were performed worldwide in 2017, and this figure is growing as transplant centres develop in individual countries around the world [24].

Kidney transplantation reduces the costs of renal replacement therapy, leads to longer survival, and improves quality of life [25][26]. However, in the period after kidney transplantation, patients require ongoing immunosuppressive therapy and dynamic medical supervision.

Patients with transplanted kidneys have a significant comorbidity index due to the large number of pre-existing conditions and the use of immunosuppressive drugs. These patients are at higher risk of developing conditions such as cardiovascular disease, dyslipidemia, post-transplant diabetes, and anemia [27][28][29][30]. Moreover, they are particularly susceptible to infections such as urinary tract infections, including pyelonephritis, malignant tumors, and gastrointestinal complications such as diarrhea, which in turn may be associated with drug side effects or infectious causes [31][32][33]. Along with these issues, careful management of electrolytes and allograft function is important [34]. Before prescribing any new medications, caution should be exercised in identifying potential interactions with immunosuppressants [35][36].

It is widely recognized that patients' quality of life improves significantly after kidney transplantation compared to patients undergoing hemodialysis. Therefore, assessing the quality of life of this category of patients is an important measure of outcome following solid organ transplantation [37][38].

Increasing attention is being paid to the concept of quality of life being assessed by patients themselves [39]. When choosing a treatment method or approach, doctors take into account the interests of the patient, their understanding of their illness, and the expected outcome of treatment. As is well known, the WHO defines health as «a state of complete physical, mental and social well-being' and quality of life as 'individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their own goals, expectations, standards and concerns» [40].

There are also fundamental criteria for quality of life: physical (strength, energy, fatigue, pain, discomfort, sleep, rest), psychological (positive emotions, thinking, learning, concentration, self-esteem, experiences), level of independence (daily activity, ability to work, dependence on medication and treatment), social life (personal relationships, social value of the subject, sexual activity), environment (living conditions, well-being, safety, accessibility and quality of medical and social care, security, ecology, educational opportunities, accessibility of information), spirituality (religion, beliefs) [41].

The main method currently used to assess quality of life is questionnaires. Questionnaires are created in accordance with clearly defined criteria and are tested for psychometric properties before use. There are many different methods for assessing quality of life. They are divided into two groups: non-specific (used to assess the quality of life of patients with any disease) and specific (designed to study it in patients suffering from a specific disease or condition) [42].

Quality of life assessment provides information about the patient's physical, psycho-emotional, and social functioning, and also allows comparison with other patient populations, including patients receiving various types of renal replacement therapy. This makes it possible to monitor these functions during treatment and determine the results of past and current therapy through dynamic observation. Information about the quality of life of an individual patient contributes to more accurate planning and timely adjustment of treatment, which is especially important in the treatment and management of chronic diseases, as well as in the period after kidney transplantation. Currently, the quality of life of patients with kidney disease is assessed using various questionnaires, the most common of which are SF-36, KDQOL-SF, and HR-QoL [42].

Most researchers believe that preference should be given to specific questionnaires designed to assess the quality of life of patients with specific diseases, one of which is the Kidney Disease Quality of Life Short Form (KDQOL-SF). This questionnaire includes general characteristics of all diseases, as well as specific characteristics of kidney diseases [43].

Understanding the specific quality of life of patients who have undergone transplantation can provide important information for standardizing the management and monitoring of patients during this period of their lives.

Hypothesis: Different quality-of-life domains in kidney transplant recipients are interrelated, with more favorable scores in individual physical, functional, and psychosocial aspects of quality of life being associated with more favorable scores in other related quality-of-life domains.

2. Materials and methods

The objective of this study was to analyze the quality of life of kidney transplant recipients in Astana city, Kazakhstan, from 2022 to 2024.

The present investigation is a descriptive, cross-sectional, quantitative study that was carried out in the primary health care clinics in Astana city, Kazakhstan.

The study included individuals who underwent a kidney transplant between 2011 and 2020. All patients resided in Astana (Kazakhstan) and were under regular follow-up with a nephrologist in clinics in Astana starting from the postoperative period. Data collection and analysis were carried out over a two-year period, from April 2022 to March 2024. A total of 85 kidney transplant recipients were initially identified for participation in the study

and were receiving regular follow-up care at primary healthcare facilities in Astana. After applying the exclusion criteria, 31 (36.5%) eligible patients were included in the study. Of the 54 patients who were not included in the study, contact could not be established with 22 (40.7%) despite repeated attempts to reach them by telephone; in some cases, patients did not answer calls from unknown numbers or did not follow the links provided to them because they were concerned about unsolicited or potentially fraudulent communications. A further 18 (33.3%) patients declined participation, primarily because they did not wish to spend the time required to complete the relatively detailed questionnaire; 5 (9.3%) patients were excluded because of cognitive impairment that prevented completion of the questionnaire, and 9 (16.7%) because of malignant neoplasms diagnosed after transplantation.

The average number of years since the transplant operation was 7.70 ± 4.070. The median glomerular filtration rate was 65.0 (38.0–84.0) ml/min/1.73 m². In men, this figure was 71.5 (40.0–88.5) ml/min/1.73 m², and in women, 60.0 (34.0–78.5) ml/min/1.73 m² (p = 0.045).

Regarding immunosuppressive therapy, mycophenolate (CellCept/Myfortic) was the most frequently used medication, with an estimated 29 patients (92.4%) receiving this treatment. Tacrolimus (Advagraf/Prograf) was used in 26 patients (85.3%), while cyclosporine was used in 4 patients (14.2%). Methylprednisolone (Metipred) was used in 3 patients (9.6%).

For the sample of 31 patients included in the quality of life analysis: living donor − 17 patients (54.8 %), deceased donor −7 patients (22.6 %), living unrelated donor −7 patients (22.6%).

We have established the following inclusion and exclusion criteria.

Inclusion criteria: Adults (of legal age (⩾ 18 years), recipients of transplanted kidneys observed in primary health care clinics in Astana city (City Polyclinic No. 2 and 7 of Astana), residing in Kazakhstan, with preserved kidney transplant function and absence of dialysis therapy.

Exclusion criteria: patient's refusal to participate in the questionnaire; presence of cognitive disorders in the patient preventing participation in the questionnaire; patients with malignant neoplasms diagnosed after transplantation.

According to the above exclusion criteria, the majority of patients withdrew from the study.

The study was conducted in accordance with the Declaration of Helsinki and was approved by the local Ethics Committee of "Astana Medical University" NJSC. Patients were informed about the objectives of the study by the researcher and signed informed consent forms.

During the data collection, individual interviews were conducted in an especially reserved place previously agreed upon with each participant, usually in the primary health care clinics.

To assess health-related quality of life, the validated KDQOL-SF™ questionnaire, version 1.3, designed to assess the quality of life of patients with kidney disease, was used. The instrument comprises 80 items, including 36 items from the SF-36, 43 items specific to kidney disease, and one item for assessing general health. The kidney disease-specific section comprises 11 items. Two dialysis-specific domains, «Dialysis Staff Encouragement» and «Patient Satisfaction,» were not applied and were not included in the analysis, as all participants were kidney transplant recipients and were not receiving dialysis treatment. The following kidney disease-specific domains were included in the analysis: «symptoms/problems», «impact of kidney disease on daily activities», «burden of kidney disease», «employment status», «cognitive function», «quality of social interaction», «sexual function» and «sleep». The assessment uses a scoring scale from 0 to 100: the higher the score, the higher the quality of life is assessed.

We also conducted an assessment of the socio-demographic characteristics of the selected group, including ethnic affiliation, level of education, marital status, income level, the country in which transplantation was performed, and the presence of concomitant chronic diseases.

3. Data and statistical analysis

The KDQOL-SF scoring process involves two sequential stages. First, the original pre-coded item responses are transformed into a standardized 0–100 scale, where higher scores indicate better quality of life. This transformation assigns 0 to the lowest and 100 to the highest possible response for each item. In the second stage, items belonging to the same domain are averaged to generate the corresponding scale scores.

Quantitative variables were described using the mean and standard deviation (M ± SD), as well as the median and interquartile range (Me [Q1; Q3]). The distribution of quantitative variables and homogeneity of variances were assessed before performing intergroup comparisons. Depending on whether the parametric assumptions were met, the Student's t-test or Mann–Whitney U test was applied.

To assess the magnitude of between-group differences, effect sizes with 95% confidence intervals were calculated. Cohen's d was used for comparisons performed using the Student's t-test, whereas the rank-biserial correlation (r_B) was used for comparisons performed using the Mann–Whitney U test.

Pearson's chi-square test was used to compare qualitative indicators. In the case of an expected occurrence in the range of 5 to 9 in at least one cell of the four-field table, the chi-square test was calculated with Yates's continuity correction. If the expected occurrence was less than 5 in at least one cell, Fisher's exact test was used for the analysis.

Subsequently, Pearson's correlation analysis was used to assess linear associations between scores of the most compromised quality-of-life dimensions. Correlation coefficients (r) between 0.10 and 0.29 were considered small, those between 0.30 and 0.49 moderate, and those ⩾0.50 large. For this study, a statistical significance level of $\alpha \leqslant 0.05$ was selected.

Cronbach's alpha (α) coefficient was calculated to assess the reliability and internal consistency of the responses to the instrument items. Values of $\alpha > 0.70$ were considered indicative of acceptable internal consistency.

To account for multiple comparisons in the intergroup analyses, the Benjamini–Hochberg procedure was applied to control the false discovery rate (FDR). Adjusted p-values were used to assess statistical significance.

The statistical processing of the obtained data was carried out using Microsoft Excel 2019 and SPSS for Windows (v.27.0) software.

4. Results

The total number of respondents was 31. The number of males was 17 (54.8%) and females 14 (45.2%). The age of patients ranged from 26 to 74 years and averaged 43.6 ± 12.019 years. The mean age of men was 46.12 ± 12.5; women 40.43 ± 11.05 (p = 0.194).

Among all patients in the total sample, 19 (63.4%) belonged to Central Asian ethnicities, 10 (33.3%) to Slavic ethnicities, and 1 (3.3%) to Caucasian ethnicities. No statistically significant difference in ethnic distribution was observed between men and women (p=0.520).

By level of education, the following data were obtained: incomplete secondary 1 (3.2%), complete secondary 2 (6.5%), specialised secondary 10 (32.2%), incomplete higher 2 (6.5%), higher 16 (51.6%). No statistically significant difference in education levels between men and women was

found (p = 0.340). People with higher education prevail among patients (51.6%), followed by people with secondary specialised education (32.2%). Among the respondents, a total of 26 (83.9%) people are married, of whom 15 (57.7%) are male, and 11 (42.3%) are female. No statistically significant difference was found between men and women (p = 0.636).

The next important factor of quality of life is the financial and material condition of patients. For this purpose, monthly incomes per 1 family member for the previous calendar year were determined for all patients: less than $150 in 1 (3.2%) patient, $150-200 in 1 (3.2%) patient, 200-300 in 7 (22.6%), 300-600 in 16 (51.6%), 600-1000 in 6 (19.4%) patients. No statistically significant difference was found between men and women (p = 0.365).

The next group of questions is devoted to the geographic distribution of transplant procedures. It was found that 22 (71.0%) of the survey participants had a kidney transplant performed in the Republic of Kazakhstan, 4 (12.9%) in the Republic of Turkey, 3 (9.7%) in the Islamic Republic of Pakistan, and 2 (6.4%) in the Republic of Belarus. The number of respondents who received a kidney transplant was in the Republic of Kazakhstan. No statistically significant difference was found between men and women (p = 0.854).

The most frequent donors, in 58.2% of cases, were persons in the age range of 30 to 44 years. No statistically significant difference was found between men and women (p = 0.342).

The majority of patients developed chronic glomerulonephritis as the cause of terminal renal failure (n = 18, 58.1%). The next most frequent causes were chronic pyelonephritis (n = 4, 12.9%) and diabetes mellitus (n = 4, 12.9%). There were 3 (9.7%) patients with arterial hypertension, 1 (3.2%) patient with hydronephrosis, and 1 (3.2%) patient with an unknown cause. No statistically significant differences in the questionnaire scale scores were detected between men and women in the present sample (p = 0.693). Arterial hypertension was more common among men than women (82.4% vs. 42.9%); however, this difference did not remain statistically significant after adjustment for multiple comparisons (Table 1).

Table 1. Presence of chronic diseases

Nosology	Total, n=31	Man, n=17	Woman, n=14	p
Arterial hypertension, n (%)	20 (64.5)	14 (82.4)	6 (42.9)	0.031
Coronary heart disease, n (%)	4 (12.9)	4 (23.5)	0	0.107
Thyroid disorders, n (%)	5 (16.1)	2 (11.8)	3 (21.4)	0.636
Gastrointestinal disorders, n (%)	8 (26.7)	4 (23.5)	4 (28.6)	0.698
Central nervous system disorders, n (%)	5 (16.1)	2 (11.8)	3 (21.4)	0.636
Respiratory disorders, n (%)	4 (12.9)	2 (11.8)	2 (14.3)	1.000
Diabetes mellitus, n (%)	4 (12.9)	2 (11.8)	2 (14.3)	1.000
Iron deficiency anemia, n (%)	1 (3.2)	0	1 (7.1)	0.452
Gout, n (%)	2 (6.5)	2 (11.8)	0	0.488

When analysing the indicators of the general quality of life assessment scales (SF-36), the lowest mean score was observed on the 'general health' scale – 50.2 ± 13.6, and the highest – on the 'pain' scale – 77.2 ± 24.4 (Table 2).

Table 2. Indicators of general quality of life assessment scales (SF-36)

Questionnaire indicators	Total, n=31	Man, n=17	Woman, n=14	p	Effect size	95% CI
Physical functioning	68.4 ± 31.2	65.8 ± 34.0	71.2 ± 28.3	0.769	$r_\beta = -0.07$	−0.47; 0.34
Role-physical	58.1 ± 42.5	63.2 ± 39.6	51.8 ± 46.5	0.493	$r_\beta = 0.15$	−0.24; 0.53
Pain	77.2 ± 24.4	77.1 ± 27.1	77.3 ± 21.6	0.799	$r_\beta = 0.06$	−0.33; 0.46
General health	50.2 ± 13.6	50.9 ± 15.9	49.3 ± 10.7	0.752	d = 0.12	−0.59; 0.82
Vitality (Energy/Fatigue)	61.5 ± 19.9	60.6 ± 18.8	62.5 ± 21.9	0.795	d = −0.09	−0.80; 0.61
Social function	66.5 ± 22.7	66.2 ± 22.0	67.0 ± 24.3	0.925	d = −0.03	−0.74; 0.67
Role-emotional	65.6 ± 40.8	68.6 ± 39.9	61.9 ± 43.1	0.653	$r_\beta = 0.10$	−0.29; 0.48
Emotional well-being	59.7 ± 20.1	58.1 ± 18.6	61.7 ± 22.4	0.629	d = −0.18	−0.89; 0.53

Among the specific KDQOL-SF quality-of-life measures (Table 3), the lowest score was observed for Sleep (47.6 ± 12.3). The Sexual Function score, calculated for 22 participants who reported sexual activity during the previous four weeks, was 89.2 ± 19.4. Of the 31 respondents, only 22 (71.0%) reported having had sexual contact in the past 4 weeks. Therefore, this score does not indicate a higher reported sexual functioning in this area among all study participants. No statistically significant differences were found in the questionnaire scales by gender.

Table 3. Indicators of specific quality of life assessment scales (KDQOL-SF)

Questionnaire indicators	Total, n=31	Man, n=17	Woman, n=14	p	Effect size	95% CI
Symptoms/problems	77.3 ± 21.3	77.4 ± 21.8	77.2 ± 21.5	0.860	$r_\beta = -0.04$	−0.45; 0.39
Effects of kidney disease	73.7 ± 22.2	72.4 ± 25.9	75.2 ± 25.1	0.739	$r_\beta = -0.08$	−0.47; 0.35
Burden of kidney disease	57.5 ± 29.4	59.6 ± 29.9	54.9 ± 29.7	0.669	d = 0.16	−0.55; 0.86
Work status	67.7 ± 43.9	64.7 ± 42.4	71.4 ± 46.9	0.597	$r_\beta = -0.12$	−0.47; 0.26
Cognitive function	76.8 ± 24.1	78.0 ± 23.1	75.2 ± 26.1	0.769	$r_\beta = 0.06$	−0.34; 0.46

Questionnaire indicators	Total, n=31	Man, n=17	Woman, n=14	p	Effect size	95% CI
Quality of social interaction	64.5 ± 11.8	67.1 ± 11.9	61.4 ± 11.5	0.297	r_{β} = 0.23	−0.17; 0.59
Sexual function[1]	89.2 ± 19.4	94.2 ± 11.0	81.9 ± 26.6	0.182	r_{β} = 0.21	−0.23; 0.64
Sleep	47.6 ± 12.3	45.0 ± 14.2	50.9 ± 9.0	0.187	d = −0.49	−1.21; 0.23
Social support	76.9 ± 29.4	84.3 ± 21.6	67.9 ± 35.5	0.200	r_{β} = 0.28	−0.11; 0.64
General health assessment	75.2 ± 22.0	80.0 ± 20.3	69.3 ± 23.4	0.182	d = 0.49	−0.23; 1.21

[1] The Sexual Function domain was calculated for 22 participants (71.0%) who reported sexual activity during the previous 4 weeks, including 13 men and 9 women.

Over the past four months, patients most frequently reported fatigue (38.7%), episodes of weakness or dizziness (38.7%), and, least frequently, itchy and dry skin (16.1%).

In terms of gender, the most common complaints over the past four months among men were loss of strength (35.3%) and nausea or stomach upset (35.3%). In contrast, the least common complaints were shortness of breath (17.6%) and chest pain (17.6%). Over the past four months, women most often complained of episodes of weakness or dizziness (42.9%) and, like men, loss of strength (42.9%). Only 7.1% of women complained of itchy skin.

The most significant stress factor among men is the need to follow a diet (47.1%), while the least significant are restrictions on fluid intake (29.4%) and the impact of the disease on sex life (29.4%). The most significant stress factor among women is stress or anxiety related to kidney disease (42.8%), while the least significant are restrictions on fluid intake (14.3%) and the ability to perform household chores (14.3%). In addition, a statistically significant difference was found between men and women in terms of concerns about the impact of the disease on appearance. This factor was of greater concern to women (64.3% vs. 35.3%, respectively) (p = 0.021).

Correlation analysis of the lowest scores on the Sleep, Burden of Kidney Disease (KDQOL-SF), and General Health and Physical Role (SF-36) scales revealed significant positive associations. A large correlation was observed between Burden of Kidney Disease and General Health (r = 0.527, p = 0.002), as well as between Burden of Kidney Disease and Physical Role (r = 0.546, p = 0.001). Moderate positive correlations were identified between Sleep and Physical Activity (r = 0.418, p = 0.019) and between Sleep and General Health Status (r = 0.363, p = 0.044).

To assess the robustness of the observed associations with regard to multiple comparisons, an additional analysis was performed using the Benjamini–Hochberg procedure to control the false discovery rate (FDR). All four initially identified correlations remained statistically significant after adjustment (adjusted p-values = 0.004, 0.004, 0.025, and 0.044, respectively).

Assessment of the internal consistency of the measures demonstrated high Cronbach's alpha values: 0.80 for the KDQOL-SF and 0.85 for the SF-36.

5. Discussion

The results of our study of the clinical and epidemiological structure of adult patients with end-stage chronic renal failure (ESCRF) provide data on the demographic and clinical characteristics of this group. A slight predominance of men (54.8%) was found in the sample, which corresponds to the data of a number of international studies [44][45][46]. This gender distribution may be associated with a higher prevalence of chronic kidney disease among men, which, in turn, is due to biological and behavioral factors. Men are more likely to have comorbidities, such as arterial hypertension, and are less likely to seek medical help in the early stages of the disease, which may contribute to faster progression of chronic kidney disease and the need for transplantation.

The average age of participants (43.6 ± 12.019 years) indicates that ESCRF affects a relatively young population, highlighting the need for early diagnosis and preventive measures.

Central Asian ethnic groups predominate among the study participants (63.4%), which may reflect both the ethnic characteristics of the region and socio-economic factors affecting health. The high level of education (51.6% with higher education) may indicate a better understanding of the importance of health and access to medical services.

The results on the 'general health' scale (50.2% ±13.6) indicate significant problems in the quality of life of adult kidney transplant recipients, which requires attention from healthcare professionals.

In terms of age and marital status, some of the data in our sample are almost identical to data from other populations identified in other studies [39].

Financial aspects also play an important role in patients' lives. Just over half of respondents have a monthly income in the range of $300-600, which may limit their access to quality medical care and necessary medications. This highlights the need to develop support programmes for low-income patients.

The main cause leading to the development of ESCRF, chronic glomerulonephritis (58.1%), highlights the need to study risk factors and preventive measures aimed at reducing morbidity.

The most common concomitant disease is arterial hypertension (64.5%), which also requires attention, as it can exacerbate the course of the underlying disease and reduce quality of life. The Sexual Function score was relatively high (89.2 ± 19.4); however, this result was based only on the 22 participants (71.0%) who reported sexual activity during the previous 4 weeks and therefore should not be interpreted as reflecting the sexual health of the entire study population.

The positive correlations observed between sleep and role-physical functioning reflect a statistical association between these aspects of quality of life. However, given the cross-sectional design of the study, the observed correlations do not allow the direction of a causal relationship to be established. It is not possible to determine whether changes in sleep quality are associated with changes in physical functioning, whether physical functioning affects sleep quality, or whether the observed association reflects reciprocal effects between these factors or the influence of other unmeasured factors.

The lowest score for 'general health' among the SF-36 scales (50.0%) is low compared to other data in similar studies (65.9% and 64.7%) [44,45]. This may indicate poorer perceived general health in this study population. The SF-36 pain scale score of 77.2 ± 24.4 correlates significantly with data from other authors [45].

The results of our study show that kidney transplant recipients score low on the Burden of Kidney Disease scale. On this scale, patients are asked to rate on a five-point scale how true the following statements are in relation to them: «kidney disease greatly interferes with my ability to live a full life», «kidney disease takes up too much of my time», «I feel very upset when I

encounter specific manifestations of my disease», «I feel that I have become a burden to my family».

A low score on this scale may indicate several important aspects. First, it may suggest that patients are not fully aware of the impact of their disease on their quality of life. They may have adapted to their condition and learned to cope with its manifestations, which may lead to an underestimation of the burden of the disease. However, such adaptation may be superficial and not reflect the true level of suffering those patients experience in their daily lives.

Second, these findings may reflect the perceived burden of kidney disease and its psychosocial implications, although the underlying reasons cannot be established from the present cross-sectional data. Patients may find it difficult to openly discuss their feelings and experiences, which can lead to the suppression of emotions and, as a result, to a deterioration in their psycho-emotional state. This highlights the need to create a more supportive environment, both in healthcare facilities and within the family.

In the present study, no statistically significant differences between men and women were detected. However, given the small sample size and limited statistical power, the absence of statistical significance should not be interpreted as evidence of the absence of true differences or associations.

6. Limitations

A major limitation of the present study is the relatively small final sample size (n = 31). Of the 85 initially identified potential participants, 31 were included in the final analysis. This limits the generalizability of the findings. In addition, the study was conducted among kidney transplant recipients residing in Astana and receiving regular follow-up care at primary healthcare facilities in the city. Therefore, the findings should be interpreted as descriptive data for this specific clinical population, and extrapolation to all kidney transplant recipients in Kazakhstan should be undertaken with caution.

The exclusion of patients with cognitive impairment may have introduced selection bias and potentially resulted in an overestimation of HRQoL, assuming that cognitive impairment is associated with poorer quality of life. The relatively small sample size also limits the statistical power of the study, particularly for detecting moderate associations and differences between subgroups. Therefore, statistically non-significant findings, including the absence of statistically significant differences between men and women, should be interpreted with caution and should not be considered evidence of the absence of true differences or associations.

7. Conclusion

In this cross-sectional study of kidney transplant recipients in Astana, HRQoL demonstrated substantial variation across physical, functional, and kidney disease-specific domains, with particularly low scores for general health, burden of kidney disease, and sleep. The observed associations between selected HRQoL domains suggest correlations between physical and kidney disease-specific aspects of quality of life; however, their cross-sectional nature precludes conclusions about causality. Given the small and selectively recruited sample, these findings should be interpreted as descriptive and hypothesis-generating. However, this method of renal replacement therapy has its drawbacks, the main ones being lifelong immunosuppressive therapy and the need for regular visits to the doctor. Understanding the characteristics of quality of life in kidney transplant recipients can provide valuable information for identifying shortcomings, standardizing care and monitoring in the post-transplant period, which will make it possible to maintain long-term graft function and reduce undesirable complications in all periods after kidney transplantation.

CRediT authorship contribution statement

Gulmira Derbissalina: project administration and conceptualization, writing – review & editing. **Dinara Zhunussova:** project administration and conceptualization, analyzing data, writing – original draft, editing. **Natalya Zemlyanskaya:** conducting research, analyzing data, Data curation, Investigation. **Raushan Kassymova:** Investigation, conducting research. **Ayagyoz Umbetzhanova:** Investigation, approval of the final text of the article. **Zhanagul Bekbergenova:** Investigation, approval of the final text of the article. **Elvira Aitenova:** Investigation, approval of the final text of the article. **Dauren Moldazhanov:** Conceptualization, Investigation, Data curation, data, approval of the final text of the article. **Mussenov Yerlan:** Investigation, Data curation.

Declaration of generative AI and AI-assisted technologies in the writing process

The free versions of Grammarly were used for spell-checking and grammar corrections. After using these tools, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the publication.

Funding

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

Declaration of competing interests

The authors declare that they have no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical aspects

The study was conducted in accordance with the Declaration of Helsinki and was approved by the local Ethics Committee (Decision No. 7 of the Local Bioethics Committee of “Astana Medical University” NJSC dated 01.04.2022).

Acknowledgment

We thank the reviewer for their knowledgeable contributions to the manuscript.

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