

Prevalence of Excessive Daytime sleepiness, Depression and Quality of Life among Hemodialysis Patients

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Abstract

Hemodialysis, while essential for managing end-stage renal disease (ESRD), is frequently associated with excessive daytime sleepiness (EDS), depression, and reduced quality of life (QoL). This cross-sectional study aimed to determine the prevalence and interrelationship of these factors among 152 hemodialysis patients across four hospitals in Punjab, Pakistan. Data were collected using validated tools: the Epworth Sleepiness Scale (ESS), the Depression subscale of DASS-21, and the Kidney Disease Quality of Life (KDQOL-36) questionnaire. Findings revealed that patients in their first year of dialysis reported significantly higher levels of depression and EDS, particularly in low-stimulus settings such as reading ($p = 0.016$). Quality of life varied with dialysis duration; those with 4–5 years on dialysis reported better mental health scores, while patients undergoing dialysis for over five years experienced the greatest burden of kidney disease.

These results highlight the evolving psychological and functional challenges throughout the dialysis journey and underscore the need for early psychosocial support and tailored interventions to improve patient outcomes in the Pakistani context.

Introduction:

Hemodialysis is a method by which metabolic waste substances are removed from the body when kidneys are unable to perform their normal functions. Hemodialysis is one of the treatments of chronic kidney disease (CKD). CKD is defined as persistent abnormality in kidney structure or function. Factors that can increase the risk of CKD include: Diabetes, Hypertension, Polycystic kidney disease, Obstructive nephropathy, and Glomerulonephritis. According to studies, it is more common in Females than Males, In African Americans than White Americans, and in Elderly than young ones. Although hemodialysis prolongs life, it has major effects on patients' physical, emotional, and social well-being, Among the most commonly reported are daytime

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sleepiness and depression both of which severely impacts the quality of life (QOL). {Anjum., 2023 #15}.

The prevalence of chronic kidney disease (CKD) varies across different regions of the world, with developing countries experiencing particularly high rates {Hasan, 2018 #18}. The CKD prevalence in Southeast Asia ranges from 7.0% to 34.3% {Thaminda, 2022 #19}. In Pakistan, studies have reported a prevalence of CKD ranging from 12.5% to 29.9%. {Khan, 2024 #20}. In Pakistan, dialysis is difficult and expensive, with only 40% of patients with CKD having access to dialysis, and most of these patients are under dialyzed; they are dialyzed twice, instead of the recommended thrice weekly. {Prasad, 2015 #21}

A study was conducted in India that involved 47 patients undergoing maintenance hemodialysis (MHD) for over 3 months, with a mean age of 37.1 years. Poor sleep quality was reported by 68.1%, while only 10.6% showed signs of daytime sleepiness. Fatigue affected 44.7% of patients, and 72.3% had depression. Fatigue was significantly associated with less frequent dialysis sessions. (Gadia, Awasthi et al. 2020)

Similarly, another study in China included 275 hemodialysis patients aged 24 to 88 years, with a mean age of 61.0 years. Over half 57.1% of the participants had poor sleep quality, indicated by a PSQI score greater than 6. (Chang and Yang 2011)

In Saudi Arab, a study of 286 patients with End Stage Renal Disease (ESRD) was conducted. Among 286 patients, 58.2% of the participants were men. Of three age groups, the majority of participants were over 40 years of age. Only 32 (11.3%) participants were diagnosed with depression or anxiety before the ESRD onset, and 20 (7%) were currently taking depression or anxiety medications. Fifty-seven (21.1%) participants scored above the cutoff for probable depression, and 63 (23.3%) scored above the cutoff for probable anxiety. 57 (21.1%) patients were probable cases of anxiety and 63 (23.3%) were probable cases of depression. Only 32 (11.3%) were diagnosed with depression or anxiety before ESRD onset. (Turkistani, Nuqali et al. 2014)

In Spain, a study of 186 patients with a mean age of 70 years was conducted, nearly 40% of were women. Based on HADS scores, 27.9% had or likely had depression or anxiety. Additionally, 34% were taking medication for affective disorders, primarily anxiolytics or antidepressants. (Delgado-Domínguez, Sanz-Gómez et al. 2021)

In a study 107 patients in Albania hemodialysis patients, anxiety was prevalent in 85.98% and depression in 84.11%. Anxiety severity was classified as low in 14%, moderate in 30%, and potentially concerning in 56% of patients. For depression, 2.8% had no symptoms, 13% had mild, 31.8% moderate, 36.4% moderately severe, and 16% severe depression. (Elezi, Abazaj et al. 2023)

A study was conducted in USA, where health and functioning (H&F), quality of life index (QLI) and multiple sleep latency test (MSLT) scores indicated that better quality of life is linked to lower daytime sleeping. Subjective sleep issues, such as difficulty falling asleep or early waking, were significantly related to lower scores across all QLI subscales.(Parker, Kutner et al. 2003)

A Study was conducted in UK on 123 hemodialysis patients, where 53.7% reported to fatigue, 43.9% anxiety, 33.3% depression, and 56.9% poor sleep. Fatigue, anxiety, and poor sleep were significantly linked to being female and having family or relatives affected by COVID-19. (Al Naamani, Gormley et al. 2021)

Most existing studies focus on anxiety, depression, quality of life or sleep quality independently, without assessing their interplay or cumulative burden. Despite the growing recognition of the high prevalence and adverse impact of depression, anxiety, fatigue, sleep disturbance and quality of life in hemodialysis patients globally, there remains a significant gap in integrated research that simultaneously evaluates these

factors and their combined effect on quality of life—especially in low- and middle-income countries like Pakistan.

Furthermore, while regions such as Europe, the US, and parts of Asia have developed multidisciplinary approaches to address these issues, Pakistan lacks comprehensive data and coordinated care strategies due to limited research infrastructure and absence of national registries. The high rates of hepatitis C and high cost of hemodialysis services further complicate the psychosocial health of Pakistani hemodialysis patients {Rizzolo, 2022 #17}, underscoring the need for contextualized research.

Our research directly addresses a significant gap of this independent research of these factors in the current literature by examining the prevalence and interrelationships of daytime sleepiness, depression, and quality of life among hemodialysis patients in Pakistan. Unlike many previous studies that have considered these factors separately, our approach is to look at how these domains interact and influence each other within the same patient population. By integrating these aspects, we aim to provide a more complete and comprehensive understanding of the psychosocial and functional challenges faced by hemodialysis patients. This holistic approach not only bridges the existing gap in the literature but also offers practical guidance for clinicians and policymakers. Understanding these interconnections will inform targeted interventions aimed at improving overall well-being and clinical outcomes in improving patient-centered care for hemodialysis patients.

METHODS

Ethical Approval

The Human Ethical Committee University College of Pharmacy, University of the Punjab, Lahore, approved the study, reference number HEC/PUCP/099/2025. Verbal consent was obtained from all the participants.

Study Design:

A descriptive cross-sectional study was conducted by sampling responses of hemodialysis patients from University of Lahore Teaching Hospital, Ittefaq Hospital Lahore, DHQ Hospital Okara and DHQ Hospital Hafizabad. The study was for a period of 6 months starting from October 2024 - April 2025. Data was collected from hemodialysis patients only. First the objective of the study was to investigate the prevalence, interrelationship and associated factors of excessive Daytime sleepiness, depression and impaired quality of life (QoL) among patients undergoing hemodialysis. This will evaluate risk factors and analyze how these conditions interact to impact on patient well-being. All the patients were briefed about the nature and objective of the research.

Study Population:

A total of 152 patients from University of Lahore teaching hospital, Ittefaq Hospital Lahore, DHQ Hospital Okara & DHQ Hospital Hafizabad were enrolled in the study. The sampling frame consisted of patients undergoing hemodialysis. A sample size of 152 patients was recruited for this cross-sectional study based on feasibility and availability of patients at hospital, rather than a prior statistical estimation.

Inclusion criteria: All the patients undergoing hemodialysis, able to understand and respond to the questions being asked, irrespective of age, gender, ethnicity, religion, social class. Only patients willing to take part in the study were enrolled.

Exclusion criteria: Patients with acute medical illness i.e. infection, surgery or those having cognitive impairment or unable to provide data were excluded. Patients on sedatives, hypnotics and other stimulant medications were also not considered for this cross-sectional case study.

Data Collection

Data collection was done by means of comprehensive instruments of measure i.e. Epworth sleepiness scale (ESS), patient health questionnaire (PHQ-9), generalized anxiety disorder (GAD-7), kidney disease quality of life 36 (KDQOL-36) designed after extensive literature review. The questionnaire was sent to subject experts for content validation to ensure clarity and reliability. The internal consistency of the study tools was assessed using Cronbach's alpha. The PHQ-9, GAD-7, and Epworth Sleepiness Scale all demonstrated acceptable reliability. Patients were asked the questions from the questionnaire during their routine clinical visits. Only fully completed questionnaires were included in the analysis. 152 completed KDQOL-36 questionnaires were analyzed for scoring and interpretation. The questionnaire was outlined into the following 4 sections.

Section 1: Demographics: Age, gender, area of residence, social class, education level, Duration of hemodialysis and CKD, Number of dialysis sessions per week, Comorbidities, Causes of kidney failure.

Section 2: Epworth Sleepiness Scale (ESS): Participants rate their tendency to fall asleep in 8 everyday scenarios, scored from 0 (would never doze) to 3 (high chance of dozing).

Section 3: (Anxiety and Depression): Depression subscale of the DAS-7 (Depression Anxiety Stress Scales): 14 specific items related to depression symptoms Each item scored from 0 to 3. Total score interpreted as: Normal (0–9), Mild (10–13), Moderate (14–20), Severe (21–27), Extremely severe (28+)

Section 4: Quality of Life (KDQOL-36) Assesses health-related quality of life specific to kidney disease: General health perception, Physical functioning limitations, Emotional well-being and mental health, Interference with social activities, kidney disease-specific burden and symptoms, Impact of kidney disease on work, travel, appearance, sexual health, and relationships with healthcare providers.

Data Analysis:

The data were entered into Microsoft Excel and analyzed using SPSS (IBM, version 22). Descriptive analysis was performed to estimate the percentages and frequencies. Associations of dependent variables including levels of excessive daytime sleepiness (ESS scores), depression (PHQ-9 scores), anxiety (GAD-7 scores), and quality of life (KDQOL-36 subscale scores) and independent variables such as demographic and clinical characteristics (e.g., age, gender, duration of dialysis, comorbidities) were assessed. Non-parametric Mann-Whitney test was used to compare the difference between questionnaire scores between independent groups. The normality of the data was determined by Shapiro-Wilk test, confirming that data did not represent a normal distribution pattern. Pearson's Chi-square test was used to examine associations between categorical variables (e.g., presence/absence of depression, anxiety levels) and demographic characteristics. An alpha value of 0.05 or less was considered statistically significant.

Results:

Basic Demographics of Hemodialysis patients based on duration

Basic demographics of hemodialysis patients based on duration, < 1 year (<1), 1 – 3 years (1-3), 4 – 5 years (4-5) and > 5 years (>5), are summarized in Table 1. Data suggested that significant differences were observed in the frequency distribution of demographic variables regarding duration of hemodialysis, such as age; mostly were between 31 – 50 years of age (<1: 33.3%, 1-3: 42.2%, 4-5: 21.1%, >5: 63.5%, p=0.003), social class; mostly were from middle class background (<1: 69.4%, 1-3: 64.4%, 4-5: 57.9%, >5: 57.7%, p=0.0001), education; mostly had primary education

(<1: 44.4%, 1-3: 44.4%, 4-5: 31.6%, >5: 42.3%, p=0.049), number of dialysis /week; mostly had 2 in a week (<1: 80.6%, 1-3: 100%, 4-5: 89.5%, >5: 100%, p=0.0001) and causes of kidney failure; in most of the cases it was hypertension (HTN) (<1: 61.1%, 1-3: 73.3%, 4-5: 84.2%, >5: 86.5%, p=0.017) (Table 1).

No significant differences were observed in the other variables, such as gender and area of residence (Table 1).

Table 1. Demographics of hemodialysis patients based on its duration

Duration of hemodialysis (Years)					
Characteristics	Less than 1, n=36 (%)	1-3, n=45 (%)	4-5, n=19 (%)	Greater than 5, n=52 (%)	p-values
Age					
10 to 30	9 (25)	9 (20)	3 (15.8)	7 (13.5)	0.003*
31to 50	12 (33.3)	19 (42.2)	4 (21.1)	33 (63.5)	
51 to 70	12 (33.3)	17 (37.8)	8 (42.1)	11 (21.2)	
Above 70	3 (8.3)	0 (0.0)	4 (21.1)	1 (1.9)	
Gender					
Male	29 (80.6)	28 (62.2)	13 (68.4)	31 (59.6)	0.195
Female	7 (19.4)	17 (37.8)	6 (31.6)	21 (40.4)	
Area of residence					
Urban	21 (58.3)	32 (71.1)	15 (78.9)	31 (59.6)	0.292
Rural	15 (41.7)	13 (28.9)	4 (21.1)	21 (40.4)	
Social class					
Lower	10 (27.8)	14 (31.1)	3 (15.8)	22 (42.3)	0.001**
Middle	25 (69.4)	29 (64.4)	11 (57.9)	30 (57.7)	
Upper	1 (2.8)	2 (4.4)	5 (26.3)	0 (0.0)	
Education					
Illiterate	12 (33.3)	9 (20.0)	1 (5.3)	10 (19.2)	0.049*
Primary	16 (44.4)	20 (44.4)	6 (31.6)	22 (42.3)	
Secondary	4 (11.1)	6 (13.3)	9 (47.4)	13 (25.0)	
College/university	4 (11.1)	10 (22.2)	3 (15.8)	7 (13.5)	
Comorbidities					
HTN	5 (13.9)	13 (28.9)	13 (68.4)	20 (38.5)	0.0001**
Diabetes	9 (25.0)	5 (11.1)	0 (0.0)	2 (3.8)	
Others	22 (61.1)	27 (60.0)	6 (31.6)	30 (57.7)	
Duration of CKD (years)					
Less than 1	30 (83.3)	0 (0.0)	0 (0.0)	0 (0.0)	0.0001**
1-3	3 (8.3)	37 (82.2)	0 (0.0)	0 (0.0)	
4-5	2 (5.6)	4 (8.9)	10 (52.6)	5 (9.6)	
Greater than 5	1 (2.8)	4 (8.9)	9 (47.4)	47 (90.4)	
No of dialysis /week					
2	29 (80.6)	45 (100.0)	17 (89.5)	52 (100.0)	0.0001**
3	7 (19.4)	0 (0.0)	2 (10.5)	0 (0.0)	
Causes of kidney failure					
HTN	22 (61.1)	33 (73.3)	16 (84.2)	45 (86.5)	0.017*
D2M	1 (2.8)	3 (6.7)	0 (0.0)	0 (0.0)	
Glomerulonephritis	0 (0.0)	0 (0.0)	1 (5.3)	0 (0.0)	
Others	13 (36.1)	9 (20.0)	2 (10.5)	7 (13.5)	

Excessive daytime sleepiness among Hemodialysis patients based on duration

Excessive daytime sleepiness among hemodialysis patients based on duration, < 1 year (<1), 1 – 3 years (1-3), 4 – 5 years (4-5) and > 5 years (>5), are summarized in Table 2. Data suggested that significant differences were observed in the frequency distribution of Epworth sleepiness scales (ESS) regarding duration of hemodialysis in the domain of sitting and reading; mostly had no chance of dozing off (<1: 61.1%, 1-3: 68.9%, 4-5: 73.7%, >5: 92.3%, p = 0.016) (Table 2).

No significant differences were observed in the other variables, such as watching TV (<1: 69.4%, 1-3: 62.2%, 4-5: 84.2%, >5: 76.9%, p = 0.185), sitting inactive in a public place (<1: 75.0%, 1-3: 82.2%, 4-5: 89.5%, >5: 92.3%, p = 0.264), as a passenger in a car without a break (<1: 69.4%, 1-3: 73.3%, 4-5: 73.3%, >5: 78.8%, p = 0.652), lying down to rest in the afternoon (<1: 30.6%, 1-3: 53.3%, 4-5: 63.2%, >5: 65.4%, p = 0.063), sitting and talking to someone (<1: 88.9%, 1-3: 88.9%, 4-5: 94.7%, >5: 94.2%, p = 0.151), and being in a car stopped in traffic (<1: 86.1%, 1-3: 95.6%, 4-5: 100.0%, >5: 90.4%, p = 0.415).

Table 2. Excessive daytime sleepiness among hemodialysis patients based on its duration

Duration of Hemodialysis (Years)					
ESS	Less than 1, n=36 (%)	1-3, n=45 (%)	4-5, n=19 (%)	More than 5, n=52 (%)	p-value
Sitting and reading					
Would never nod off (0)	22 (61.1)	31 (68.9)	14 (73.7)	48 (2.3)	0.016 *
Slight chance of nodding off (1)	7 (19.4)	10 (22.2)	5 (26.3)	4 (7.7)	
Moderate chance of nodding off (2)	5 (13.9)	3 (6.7)	0 (0.0)	0 (0.0)	
High chance of nodding off (3)	2 (5.6)	1 (2.2)	0 (0.0)	0 (0.0)	
Watching TV					
Would never nod off (0)	25 (69.4)	28 (62.2)	16 (84.2)	40 (76.9)	0.185
Slight chance of nodding off (1)	6 (16.7)	8 (17.8)	3 (15.8)	10 (19.2)	
Moderate chance of nodding off (2)	3 (8.3)	8 (17.8)	0 (0.0)	2 (3.8)	
High chance of nodding off (3)	2 (5.6)	1 (2.2)	0 (0.0)	0 (0.0)	
Sitting inactive in a public place (e.g., a theater, meeting, or restaurant)					
Would never nod off (0)	27 (75)	37 (82.2)	17 (89.5)	48 (92.3)	0.264
Slight chance of nodding off (1)	6 (16.7)	3 (6.7)	1 (5.3)	2 (3.8)	
Moderate chance of nodding off (2)	1 (2.8)	4 (8.9)	1 (5.3)	2 (3.8)	
High chance of nodding off (3)	2 (5.6)	1 (2.2)	0 (0.0)	0 (0.0)	
As a passenger in a car for an hour without a break					
Would never nod off (0)	25 (69.4)	33 (73.3)	14 (73.3)	41 (78.8)	0.652
Slight chance of nodding off (1)	6 (16.7)	7 (15.6)	2 (10.5)	9 (17.3)	
Moderate chance of nodding off (2)	4 (11.1)	5 (11.1)	2 (10.5)	2 (3.8)	
High chance of nodding off (3)	1 (2.8)	0 (0.0)	1 (5.3)	0 (0.0)	
Lying down to rest in the afternoon when circumstances permit					
Would never nod off (0)	11 (30.6)	24 (53.3)	12 (63.2)	34 (65.4)	0.063
Slight chance of nodding off (1)	19 (52.8)	15 (33.3)	5 (26.3)	15 (28.8)	
Slight chance of nodding off (1)	6 (16.7)	5 (11.1)	1 (5.3)	3 (5.8)	
Moderate chance of nodding off (2)	0 (0.0)	1 (2.2)	1 (5.3)	0 (0.0)	

High chance of nodding off (3)					
Sitting and talking to someone					
Would never nod off (0)	32 (88.9)	40 (88.9)	18 (94.7)	49 (94.2)	0.151
Slight chance of nodding off (1)	2 (5.6)	5 (11.1)	1 (5.3)	0 (0.0)	
Moderate chance of nodding off (2)	2 (5.6)	0 (0.0)	0 (0.0)	3 (5.8)	
In a car while stopped for a few minutes in traffic					
Would never nod off (0)	31 (86.1)	43 (95.6)	19 (100)	47 (90.4)	0.415
Slight chance of nodding off (1)	3 (8.3)	2 (4.4)	0 (0.0)	5 (9.6)	
Moderate chance of nodding off (2)	1 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	
High chance of nodding off (3)	1 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	

Anxiety and depression among Hemodialysis patients based on duration

Anxiety and depression among hemodialysis patients based on duration, < 1 year (<1), 1 – 3 years (1-3), 4 – 5 years (4-5) and > 5 years (>5), are summarized in Table 3. Data suggested that significant differences were observed in the frequency distribution of Anxiety and Depression regarding duration of hemodialysis, such as, Patients with **less than 1** year of hemodialysis most frequently reported they “couldn’t seem to experience any positive feeling at all” (61.1%) compared to 26.7%, 26.3%, and 46.2% in the 1–3 years, 3–5 years, and >5 years groups, respectively (p=0.002). Statistically significant differences were also found for those who “just couldn’t seem to get going” (<1: 36.1%, 1–3: 28.9%, 4–5: 5.3%, >5: 38.5%; p=0.043), “felt they had nothing to look forward to” (<1: 44.4%, 1–3: 20.0%, 4–5: 26.3%, >5: 34.6%; p=0.0001), “felt sad and depressed” (<1: 36.1%, 1–3: 33.3%, 4–5: 10.5%, >5: 36.5%; p=0.032), “felt un-hearted and blue” (<1: 36.1%, 1–3: 26.7%, 4–5: 36.8%, >5: 51.9%; p=0.0001), “were unable to become enthusiastic about anything” (<1: 58.3%, 1–3: 24.4%, 4–5: 15.8%, >5: 34.6%; p=0.008), “felt life was meaningless” (<1: 52.8%, 1–3: 37.8%, 4–5: 42.1%, >5: 36.5%; p=0.025), “found it difficult to work up the initiative to do things” (<1: 38.9%, 1–3: 35.6%, 4–5: 26.3%, >5: 53.8%; p=0.027), and “could see nothing in the future to be hopeful about” (<1: 61.1%, 1–3: 44.4%, 4–5: 36.8%, >5: 51.9%; p=0.025).

However, no statistically significant differences were found in the variables “I felt I was pretty worthless” and “I felt that I had lost interest in just about everything” (Table 3).

Table 3. Anxiety and depression among hemodialysis patients based on its duration

Duration of Hemodialysis (Years)					
Anxiety and Depression	Less than 1, n=36 (%)	1-3, n=45 (%)	4-5, n=19 (%)	More than 5, n=52 (%)	p-value
I couldn’t seem to experience any positive feeling at all					
Does not apply (0)	22 (61.1)	12 (26.7)	5 (26.3)	24 (46.2)	0.002*
To some degree (1)	10 (27.8)	15 (33.3)	7 (36.8)	24 (46.2)	
Considerable degree (2)	1 (2.8)	12 (26.7)	4 (21.1)	3 (5.8)	
Most of the time (3)	2 (8.3)	6 (13.3)	3 (15.8)	1 (1.9)	
I just couldn’t seem to get going					
Does not apply (0)	13 (36.1)	13 (28.9)	1 (5.3)	20 (38.5)	0.043*
To some degree (1)	18 (44.4)	12 (26.7)	10 (52.6)	19 (36.5)	
Considerable degree (2)	4 (11.1)	17 (37.8)	5 (26.3)	11 (21.2)	
Most of the time (3)	3 (8.3)	3 (6.7)	3 (15.8)	2 (3.8)	

I felt that I had nothing to look to forward to					
Does not apply (0)	16 (44.4)	9 (20.0)	5 (26.3)	18 (34.6)	0.0001 **
To some degree (1)	15 (41.7)	20 (44.4)	4 (21.1)	26 (50.0)	
Considerable degree (2)	5 (13.9)	5 (11.1)	7 (36.8)	8 (15.4)	
Most of the time (3)	0 (0.0)	11 (24.4)	3 (15.8)	0 (0.0)	
I felt sad and depressed					
Does not apply (0)	13 (36.1)	15 (33.3)	2 (10.5)	19 (36.5)	0.032*
To some degree (1)	14 (38.9)	8 (17.8)	11 (57.9)	19 (36.5)	
Considerable degree (2)	8 (22.2)	18 (40.0)	3 (15.8)	10 (19.2)	
Most of the time (3)	1 (2.8)	4 (8.9)	3 (15.8)	4 (7.7)	
I felt that I had lost interest in just about everything					
Does not apply (0)	17 (47.2)	13 (28.9)	6 (31.6)	29 (55.5)	0.053
To some degree (1)	11 (30.6)	13 (28.9)	8 (42.1)	9 (17.3)	
Considerable degree (2)	8 (22.2)	14 (31.1)	2 (10.5)	11 (21.2)	
Most of the time (3)	0 (0.0)	5 (11.1)	3 (15.8)	3 (5.8)	
I felt I wasn't worth much as a person					
Does not apply (0)	16 (44.4)	18 (40.0)	6 (31.6)	15 (28.8)	0.003*
To some degree (1)	16 (44.4)	8 (17.8)	7 (36.8)	30 (57.7)	
Considerable degree (2)	4 (11.1)	12 (26.7)	3 (15.8)	4 (7.7)	
Most of the time (3)	0 (0.0)	7 (15.6)	3 (15.8)	3 (5.8)	
I felt that life wasn't worthwhile					
Does not apply (0)	22 (61.1)	17 (37.8)	6 (31.6)	17 (32.7)	0.0001 **
To some degree (1)	11 (30.6)	9 (20.0)	3 (15.8)	29 (55.8)	
Considerable degree (2)	2 (5.6)	14 (31.1)	6 (31.6)	3 (5.8)	
Most of the time (3)	1 (2.8)	5 (11.1)	4 (21.1)	3 (5.8)	
I couldn't seem to get any enjoyment out of the things I did					
Does not apply (0)	22 (61.1)	17 (37.8)	2 (10.5)	22 (42.3)	0.001* *
To some degree (1)	9 (25.0)	12 (26.7)	5 (26.3)	20 (38.5)	
Considerable degree (2)	5 (13.9)	7 (15.8)	9 (47.4)	7 (13.5)	
Most of the time (3)	0 (0.0)	9 (20.0)	3 (15.8)	3 (5.8)	
I felt un-hearted and blue					
Does not apply (0)	13 (36.1)	12 (26.7)	7 (36.8)	27 (51.9)	0.0001 **
To some degree (1)	19 (52.8)	15 (33.3)	1 (5.3)	11 (21.2)	
Considerable degree (2)	4 (11.1)	11 (24.4)	8 (42.1)	13 (25.0)	
Most of the time (3)	0 (0.00)	7 (15.6)	3 (15.8)	1 (1.9)	
I was unable to become enthusiastic about anything					
Does not apply (0)	21 (58.3)	11 (24.4)	3 (15.8)	18 (34.6)	0.008*
To some degree (1)	10 (27.8)	22 (48.9)	11 (57.9)	22 (42.3)	
Considerable degree (2)	5 (13.9)	7 (15.6)	2 (10.5)	11 (21.1)	
Most of the time (3)	0 (0.0)	5 (11.1)	3 (15.8)	1 (1.9)	
I felt I was pretty worthless					
Does not apply (0)	16 (44.4)	16 (35.6)	7 (36.8)	26 (50.0)	0.581
To some degree (1)	14 (38.9)	15 (33.3)	5 (26.3)	18 (34.6)	
Considerable degree (2)	3 (8.3)	8 (17.8)	4 (21.1)	6 (11.5)	
Most of the time (3)	3 (8.3)	6 (13.3)	3 (15.8)	2 (3.8)	
I could see nothing in the future to be hopeful about					

Does not apply (0)	22 (61.1)	20 (44.4)	7 (36.8)	27 (51.9)	0.025*
To some degree (1)	11 (30.6)	10 (22.2)	3 (15.8)	15 (28.8)	
Considerable degree (2)	3 (8.3)	12 (26.7)	6 (31.6)	10 (19.2)	
Most of the time (3)	0 (0.0)	3 (6.7)	3 (15.8)	0 (0.0)	
I felt that life was meaningless					
Does not apply (0)	19 (52.8)	17 (37.8)	8 (42.1)	19 (36.5)	0.025*
To some degree (1)	12 (33.3)	10 (22.2)	5 (26.3)	25 (48.1)	
Considerable degree (2)	4 (11.1)	15 (33.3)	3 (15.8)	5 (9.6)	
Most of the time (3)	1 (2.8)	3 (6.7)	3 (15.8)	3 (5.8)	
I found it difficult to work up the initiative to do things					
Does not apply (0)	14 (38.9)	16 (35.6)	5 (26.3)	28 (53.8)	0.027*
To some degree (1)	19 (52.8)	14 (31.1)	8 (42.1)	13 (25.0)	
Considerable degree (2)	3 (8.3)	8 (17.8)	3 (15.8)	9 (17.3)	
Most of the time (3)	0 (0.0)	7 (15.6)	3 (15.8)	2 (3.8)	

Impact of hemodialysis duration on KDQOL-36 Subdomains.

KDQOL-36 scores across the four groups of hemodialysis duration (< 1 year, 1–3 years, 4–5 years, and > 5 years) are presented in Table 4. Statistically significant differences were observed in all five KDQOL subscales. The mean score for the Symptom/Problem List was highest among patients on dialysis for 1–3 (6.1 ± 13.6) and lowest in those with < 1 (3.8 ± 11.4) (p = 0.0001). For the Effects of Kidney Disease, the highest score was noted among the 4–5 group (33.7 ± 18.9), while the lowest was in the > 5 group (24.9 ± 22.1) (p = 0.0001). The Burden of Kidney Disease score was highest among patients with > 5 of dialysis (54.1 ± 19.8) and lowest in the 4–5 group (40.8 ± 22.9) (p = 0.0001). The SF-12 Physical Composite scores ranged from 37.7 ± 5.3 (< 1 year) to 39.8 ± 4.5 (> 5 years), while the SF-12 Mental Composite ranged from 39.9 ± 5.9 (1–3) to 41.4 ± 5.3 (4–5), both showing statistically significant differences across groups (p = 0.0001) (Table 4).

Table 4. Impact of hemodialysis duration on KDQOL-36 Subdomains.

Duration of Hemodialysis	Symptom/ problem list	Effects of kidney disease	Burden of kidney disease	SF-12 Physical composite	SF-12 Mental composite	p-values
Less than 1, n=36	3.8 ± 11.4	30.9 ± 21.4	48.1 ± 17.2	37.7 ± 5.3	40.2 ± 5.2	0.0001**
1-3, n=45	6.1 ± 13.6	29.7 ± 21.4	47.8 ± 21.9	39.4 ± 4.6	39.9 ± 5.9	0.0001**
4-5, n=18	5.7 ± 12.3	33.7 ± 18.9	40.8 ± 22.9	37.9 ± 6.6	41.4 ± 5.3	0.0001**
> 5, n=53	4.3 ± 11.2	24.9 ± 22.1	54.1 ± 19.8	39.8 ± 4.5	41.2 ± 5.7	0.0001**

Discussion:

Table 1 presents the demographic and clinical characteristics of hemodialysis patients across different durations of treatment, revealing several statistically significant differences. Age distribution varied notably (p=0.003), with the 31–50 years age group being the most prevalent, particularly among patients undergoing dialysis for more than five years, consistent with previous studies showing a higher prevalence of middle-aged adults among long-term dialysis populations (Ravani, Palmer et al. 2013). Social class (p=0.001) and education level (p=0.049) also differed, with most patients

coming from a middle-class background and having primary education, which aligns with socioeconomic patterns reported in similar regional studies (Arogundade and Barsoum 2008). Dialysis frequency showed a strong association with duration ($p=0.0001$), as nearly all patients in the 1–3 years and >5 years groups received dialysis twice weekly—reflecting both resource availability and adaptation over time. The underlying cause of kidney failure was also significant ($p=0.017$), with hypertension being the most common etiology and more frequent with longer dialysis duration, echoing global trends in CKD etiology (Jha, Garcia-Garcia et al. 2013). Duration of CKD was highly correlated with time on dialysis ($p=0.0001$), as expected with disease progression. In contrast, gender ($p=0.195$) and area of residence ($p=0.292$) did not significantly differ among groups, suggesting these factors may be less influenced by dialysis duration (United States Renal Data System).

Table 2 summarizes excessive daytime sleepiness among hemodialysis patients based on the duration of dialysis, showing a statistically significant difference only in the “sitting and reading” domain of the Epworth Sleepiness Scale (ESS) ($p = 0.016$). The likelihood of dozing off while sitting and reading decreased with increasing dialysis duration, with 92.3% of patients on dialysis for more than five years reporting no chance of dozing off compared to 61.1% of those dialyzing for less than one year. This suggests that long-term hemodialysis patients may develop adaptive mechanisms or experience physiological stabilization that reduces excessive daytime sleepiness in low-stimulus settings (Iliescu, Coo et al. 2003). However, no significant differences were observed in other ESS domains, including watching TV, sitting inactive in public, being a car passenger, lying down to rest, sitting and talking, or being in a car stopped in traffic (all $p > 0.05$). These findings indicate that while sleepiness in specific sedentary activities like reading may decline with longer dialysis exposure, overall levels of excessive daytime sleepiness remain relatively consistent across durations, echoing previous reports that suggest sleep disturbances are common but variably expressed in hemodialysis patients regardless of treatment duration (Hanly 2004); (Sabbatini, Pisani et al. 2008).

Table 3 highlights the distribution of anxiety and depression symptoms among hemodialysis patients across different durations of treatment, revealing significant variation in psychological burden over time. Patients undergoing dialysis for less than one year reported the highest levels of depressive symptoms, particularly in areas such as inability to feel positive emotions (61.1%, $p = 0.002$), lack of motivation (36.1%, $p = 0.043$), hopelessness (44.4%, $p = 0.0001$), sadness (36.1%, $p = 0.032$), and feeling unenthusiastic (58.3%, $p = 0.008$). These findings suggest that the psychological distress is most intense in the early phase of dialysis, potentially due to the abrupt lifestyle changes, uncertainty about prognosis, and adaptation challenges (Chen, Tsai et al. 2010). Over time, although some symptoms like hopelessness and sadness persisted, their prevalence declined in intermediate durations (4–5 years), with a slight rebound observed in patients with over five years of treatment. Notably, symptoms such as worthlessness and loss of interest did not vary significantly across groups ($p = 0.581$ and $p = 0.053$, respectively), indicating that certain dimensions of depression may be more resistant to duration-related adaptation. These findings are consistent with previous studies that emphasize the chronic psychological toll of dialysis, but also point to early-stage patients as being particularly vulnerable and in need of targeted mental health interventions (Cukor, Cohen et al. 2007) (Theofilou 2011).

The analysis of KDQOL-36 scores across hemodialysis duration groups reveals significant differences in patients’ perceived quality of life, as summarized in Table 4. Each of the five subdomains demonstrated statistically significant variation across the treatment duration categories ($p = 0.0001$), indicating that the length of time on

dialysis substantially impacts patient-reported outcomes. Patients undergoing dialysis for 1–3 years reported the highest mean score for the Symptom/Problem List (6.1 ± 13.6), suggesting better symptom control during this phase compared to the <1 year group (3.8 ± 11.4), who reported the lowest score. This could reflect initial challenges in managing dialysis-related symptoms and adapting to the treatment regimen in early stages (Mapes, Lopes et al. 2003). For the Effects of Kidney Disease subscale, the 4–5year group had the highest score (33.7 ± 18.9), suggesting relatively better adaptation and fewer perceived limitations, while the >5year group reported the lowest (24.9 ± 22.1), potentially reflecting cumulative physical and psychological tolls over time (Pagels, Söderkvist et al. 2012). In contrast, the Burden of Kidney Disease score was highest among those on dialysis for more than 5 years (54.1 ± 19.8), which may reflect growing fatigue, comorbidity burden, or treatment fatigue. Interestingly, patients in the 4–5year category reported the lowest burden score (40.8 ± 22.9), suggesting a possible temporary phase of psychological and physical adjustment before long-term burden accumulates. Regarding general health-related quality of life, both the SF-12 Physical Composite and SF-12 Mental Composite scores were highest in the >5 and 4–5year groups, respectively, suggesting that some dimensions of physical and mental functioning may stabilize or even improve with time. However, the lowest physical scores were seen in the <1 year group (37.7 ± 5.3), and the lowest mental scores in the 1–3 year group (39.9 ± 5.9), highlighting the early challenges in both physical stamina and emotional resilience post-initiation of dialysis (Cukor, Coplan et al. 2007). These results underline the dynamic nature of quality of life in hemodialysis patients, with different domains fluctuating across the treatment trajectory. They suggest that patients may benefit from tailored psychosocial and clinical support depending on the stage of dialysis they are in.

Conclusion:

The duration of hemodialysis significantly affects patients' quality of life across physical, emotional, and disease-related domains. Patients in their first year of dialysis reported more symptoms and lower physical health, while those on dialysis for 4–5 years showed better mental health and fewer effects of kidney disease. However, patients with over 5 years on dialysis reported the highest burden. These trends highlight the dynamic nature of quality of life in hemodialysis and the importance of early-stage support throughout treatment.

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