Common Factors Affecting Physical Function Level among Hemodialysis Patients

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Abstract

Background: Hemodialysis dependency in end-stage renal disease often results in reduced physical functioning and poor health outcomes. **Aim of the Study:** This study aims to assess common factors affecting physical function level among hemodialysis patients. **Research Design:** Descriptive cross-sectional research design. **Subjects:** The study involved a purposive sample of 102 patients undergoing hemodialysis. **Setting:** The research was conducted at the Hemodialysis unit of Minia University Hospital in Minia Governorate. **Tools:** Data was collected using three tools: 1) A structured interview assessment sheet covering socio-demographic characteristics. 2) The ShortForm-36 (SF-36) Physical Functioning (PF) scale. And 3) an assessment sheet identifying factors affecting physical functioning in hemodialysis patients. **Results:** The results indicated that 37.3% of patients experienced high disability, while 62.7% had low disability according to the SF-36 scores. Significant associations were observed between physical function and body mass index (BMI) ($p = 0.001$), vitamin supplementation ($p = 0.023$), and muscle strength ($p = 0.008$). However, no significant associations were found with other nutritional factors, comorbidities, renal replacement therapy-related factors, or depression status. There was a positive correlation between albumin levels and physical functioning ($r = 0.230$, $p = 0.020$). **Conclusion:** This study highlights that physical function in ambulatory hemodialysis patients is significantly influenced by BMI, nutritional factors such as vitamin supplementation, and muscle strength. **Recommendations:** improving nutritional intake, maintaining healthy body weight, and enhancing muscle strength to mitigate physical disability in this population. Regular monitoring of clinical parameters such as albumin and hemoglobin levels should also be prioritized

Keywords: Factors affecting, Hemodialysis, Physical Function Level

INTRODUCTION

End-stage kidney disease (ESKD) represents a critical reduction in renal function for over three months, characterized by an estimated glomerular filtration rate of less than 15 mL/min/1.73 m² and/or symptomatic uremia requiring renal replacement therapy. Primary causes include diabetes mellitus and hypertension, which account for approximately 75% of cases (Xu et al., 2023).

Chronic kidney disease (CKD) is a global health concern, affecting around 14.3% of the population. Its high prevalence, poor prognosis, and costly treatment underscore the severity of this issue. CKD progression often leads to end-stage renal disease (ESRD), with hemodialysis (HD) being the most common treatment (Chen et al., 2024). Advances over the past two decades have improved survival rates for CKD patients (Alkubati & Zoromba, 2024).According to recent data, the prevalence of chronic kidney disease is estimated to be between 10% and 15% worldwide, making it a growing global health concern. With an estimated 2.6 million people receiving life-sustaining treatment for end-stage kidney disease (ESKD) worldwide, the number of patients needing dialysis is also increasing **(Francis et al ,. 2024)** .

According to the most recent assessment conducted in 2019, Egypt's dialysis incidence and prevalence were estimated to be 0.192 and 0.61 pmp, respectively. In 2020, half of dialysis patients in Egypt were 55 years of age or older, and 58.7% of patients were men. Among dialysis patients, glomerulonephritis was the most common diagnosis for 3% of ESKD cases, while diabetes and hypertension were responsible for 14% and 14% of cases, respectively.**(Peralta et al., 2021 &Farag et al., 2021).**In the last two decades, advances in the treatment of CKD have helped increase the survival of people who have this morbidity **(Alkubati, & Zoromba, 2024).**The common treatment method for ESRD patients is hemodialysis. However, hemodialysis is associated with short-term and long-term complications such as intradialytic hypotension, muscle cramps, headache, nausea and vomiting, itching, dialysis disequilibrium syndrome, dialyzer reactions, acute hemolysis, air embolism, bloodstream infections, and vascular access stenosis (**Mirzaei, et al., 2023**). Patients receiving hemodialysis are often faced with physical, psychological, and emotional problems that affect their QoL **(Sharif-Nia, et al., 2024)**

Hemodialysis, despite its life-saving role, is associated with both short-term and long-term complications, including intradialytic hypotension, muscle cramps, headaches, nausea, vomiting, itching, dialysis disequilibrium syndrome, dialyzer reactions, acute hemolysis, air embolism, bloodstream infections, and vascular access stenosis (Mirzaei et al., 2023). These complications, along with physical, psychological, and emotional challenges, significantly affect patients' quality of life (QoL) (Sharif-Nia et al., 2024)

Hemodialysis patients experience poor quality of life (QOL) during different stages of their medical condition. This may be attributed to many factors, including the time spent during the dialysis procedure, access to care, the complications associated with vascular access, and the burden of the disease. Furthermore, overall health, disease status, satisfaction with care, and demographic information affect their quality of life. In addition, the patient's social life, mental health, physical health, and capability to do daily activities can be adversely affected. The quality of life of hemodialysis patients affects patient's survival, hospitalizations, and overall disease outcome (**Naseef et al., 2023**).

Dialysis induced changes include physical, self-care, and social activity limitations, intense body pain, frequent episodes of fatigue, and poor self-assessment of physical health. Mental changes include psychological distress, emotional problems related to the social impact of treatment, and poor mental health assessment **(Burdelis & Cruz, 2023).**

Patients with ESKD receiving dialysis is suffering from impaired physical function (ie, the ability to perform activities of daily living that require physical capability to complete), which worsens with increasing dialysis vintage and is linked to condition-specific muscle wasting. Reduced physical function is an important consideration in this population, as it is an independent risk factor for all-cause mortality, and low physical function predisposes individuals to an increased likelihood of falls, loss of independence, and reduced quality of life (**Tarca et al ,. 2023).** Physical function is physiologically linked to several modifiable physical factors including cardiorespiratory fitness, muscular strength, physical activity (PA), and sedentary behavior levels.Manipulation of these modifiable physical factors through exercise training has been consistently demonstrated to improve morbidity and quality of life outcomes for patients with ESKD. However, there is a paucity of evidence about what specific modifiable physical factors should be targeted, when prescribing exercise, to maximize physical function outcomes in patients with ESKD.(**Tarca., & Ferrar,. (2024).**

Hemodialysis patients often experience diminished QoL due to various factors such as the time commitment for dialysis, access to care, complications from vascular access, and the overall burden of the disease. Their overall health, disease status, care satisfaction, and demographic details also play a role in their QoL. Social life, mental health, physical health, and daily activity capabilities are adversely affected, impacting survival rates, hospitalizations, and disease outcomes (Naseef et al., 2023).

Nurses are integral to managing CKD patients due to their multifaceted physical, psychological, and social needs. Nurses conduct initial and ongoing assessments, ensuring they remain vigilant to changes in patients' health and illness responses (Abd-Elgany et al., 2020).

SIGNIFICANCE OF STUDY:

Kidney disease significantly impacts global health, being a leading cause of morbidity and mortality worldwide (Chronic Kidney Disease Collaboration, 2020). The prevalence of ESKD is rising globally, particularly in developing countries such as Egypt. Approximately 850 million people are affected by renal disease globally, with CKD accounting for 843.6 million cases (Hamza et al., 2021). From 1990 to 2016, the global incidence and prevalence of chronic renal disease increased by 89% and 87%, respectively (Xie et al., 2018).Number of patients undergoing hemodialysis at the nephrology and urology hospital at Minia University in 2019 (175 patients) and number of patients in 2020 (164 patients)

CKD is the most common cause of end-stage renal failure worldwide. In Egypt, the incidence and prevalence of ESRD have increased significantly, posing a substantial burden on the health system. The prevalence of ESRD in Egypt rose from 225 per million population (pmp) in 1996 to 483 pmp in 2004. By 2009, the estimated number of ESRD patients in Egypt had nearly doubled from 18,000 in 2000 to 33,693 (Yehia & Saied, 2022).

Aim of the study:

The present study aimed to evaluate factors affecting physical function for ambulatory hemodialysis patients.

Research hypotheses

The patient who received hemodialysis treatment needed to evaluation of physical function in CKD enables clinicians to identify patient with high risk to morbidity and mortality and impairment in physical function

Subjects and Methods

I - Technical Item: The methodology section covers such details as the study's design, participants, and methods for collecting data.

Research Design: This study employed a cross-sectional research design to achieve its objectives.

Setting: The study was conducted at the hemodialysis unit of the Nephrology and Urology Hospital at Minia University Hospital in Minia Governorate.

Subjects: A purposive sample of 102 patients undergoing hemodialysis was selected.

Inclusion Criteria:

- Patients with chronic kidney disease undergoing hemodialysis
- Age group <64 years
- On routine hemodialysis (more than 6 months)
- Ambulatory
- No progressive neuromuscular disease
- Able to understand and provide consent for participation in research

Exclusion Criteria:

- Patients not meeting the inclusion criteria mentioned above

Tools of Data Collection: Data was collected using four tools prepared by the researcher after a literature review:

Tool I: Structured Interview Assessment Sheet: This sheet covered patients' sociodemographic characteristics, including code, age, gender, occupation, marital status, education level, and place of residence.

Tool II: Assessment of Physical Function Level Using the ShortForm-36 (SF-36) Physical Function Scale (PF): The SF-36 is an indicator of overall health status, comprising eight domains: physical functioning, physical role, pain, general health, vitality, social function, emotional role, and mental health **(Erez & Murtagh, 2016).** The scoring system ranges from 0 to 100, with lower scores indicating more disability and higher scores indicating less disability.

The Short Form-36 (SF-36) is a widely used quality of life assessment tool that can effectively measure the physical function of individuals undergoing hemodialysis. Specifically, the SF-36 includes a Physical Functioning (PF) subscale, which consists of questions that assess the ability to perform a range of physical activities, from basic self-care tasks to more vigorous activities. By evaluating responses to these questions, healthcare providers can gain insights into the physical limitations and capabilities of hemodialysis patients. This information is crucial for tailoring treatment plans, monitoring progress, and improving overall patient care. Additionally, the SF-36 can help identify areas where patients may need additional support or interventions to enhance their physical functioning and quality of life.

Scoring system: The SF-36 has eight scaled scores; the scores are weighted sums of the questions in each section. Scores range from (0 – 100)

Determining the Level

To determine the level of physical function, The stratification of scores was determined using ≥ 50 as cutoff (**Wilson,et al, 2017).** The resulting score will range from 0 to 100, where:

- Lower scores = more disability Scores range from (0 – < 50)
- Higher scores = less disability Scores range from (50 – 100)

Tool III: Factors Affecting Physical Functioning in HD Patients: This included

- Nutritional factors (e.g. body mass index, dietary pattern, and dietary supplement).
- Comorbidities (e.g., diabetes, hypertension), renal replacement therapy-related factors (e.g., times of dialysis per week, range of dialysis-session time over the last month, occurrences of post-dialysis weight gain, fatigue after dialysis), muscle strength
- Clinical parameters (e.g., serum albumin, serum creatinine, hemoglobin level, potassium, and calcium).
- Depression index: short scale 10-item version of the Center for Epidemiological Studies was used to assess depressive symptoms in the last 7 days. Each response item is rated on a scale ranging from 0 to 3. The presence of depressive symptoms was defined as a score of ≥ 10.

Validity and Reliability: Content validity was confirmed by a jury of five experts from various academic fields in medical-surgical nursing at Minia University. The tools were slightly modified based on their feedback. Reliability was estimated using the Cronbach alpha test, resulting in a score of 0.897.

Pilot Study: A pilot study was conducted on 10% of the total sample (6 patients) to test the feasibility, objectivity, and applicability of the data collection tools. No modifications were necessary based on the pilot study results, and these patients were included in the main study.

Ethical Consideration: Official permission was obtained from the ethical committee of the Faculty of Nursing, the dean of the Faculty, the Minia University Hospital director, and the Nephrology department director. Participation was voluntary, with subjects informed about the study's purpose, procedure, benefits, and their right to withdraw at any time. Oral and written consent was obtained, ensuring data confidentiality and anonymity.

Assessment and Planning Phase: This phase involved developing data collection tools after reviewing related literature, obtaining expert opinions to ensure tool validity, and measuring reliability. Formal agreement papers were prepared a month before conducting the study. The researcher explained the study's aim, potential benefits, and discomforts to participants, obtained consent, and collected data during hemodialysis sessions over 12 sessions per patient per month, lasting 3 to 4 hours each.

B. Implementation Phase: Data was collected from the study group as follows:

1. **Socio-demographic Data (Tool I):** Collected through individual interviews.
2. **Physical Function Assessment (Tool II):** The SF-36 Physical Function Scale was applied, observing and questioning patients during and after hemodialysis sessions.
3. **Factors Affecting Physical Function (Tool III):** Data on comorbidities, renal replacement therapy factors, motor function indicators, nutritional factors, clinical parameters, and depressive symptoms were collected using observational checklists and questionnaires.

C. Evaluation Phase: This phase focused on evaluating the factors affecting physical function in ambulatory hemodialysis patients.

IV. Statistical Design: Descriptive statistics were used to summarize data, including frequency distributions, percentages, means, and standard deviations. SPSS (version 21) was utilized for statistical analysis, with significant levels set at a p-value of less than 0.05. Highly significant results were considered at p-values less than 0.001, and correlation coefficients were calculated using the Pearson correlation test.

Limitations of the Study:

- Initial inadequate cooperation from some physicians and nurses, despite explanations of the study's purpose.
- Lack of awareness among nurses about the benefits of evaluating physical function in CKD patients, which could identify those at high risk of morbidity and mortality

Results:

Table (1): Distribution of Studied Subjects regarding to Their Socio-demographic and clinical characteristics (n=102)

Socio-demographic Characteristics	Study subjects (n=102)	
	No.	%
Age / Years		
• 18 to ≤ 30 years	15	14.7
• > 30 to ≤ 50 years	48	47.1
• > 50 to 65 years	39	38.2
Mean ± SD	45.4 ± 12.9	
Gender		
Male	43	42.2
Female	59	57.8
Employment Status		
Employed	15	14.7
Retired	22	21.6
Others	65	63.7
Work Character		
Office work/not working	72	70.6
Regular work	21	20.6
Vigorous work	9	8.8
Living Status		
Alone	3	2.9
Not alone	99	97.1
Marital Status		
Single	14	13.7
Married	85	83.3
Widow / divorced	3	2.9
Financial Status		
Not enough	14	13.7
Enough	81	79.4
Enough and save	7	6.9
Residence		
Urban	36	35.3
Rural	66	64.7
Did you get in a close contact with any one with renal failure before your diagnosis with renal failure?		
No	84	82.4
Yes	18	17.6

Table 1 presents the socio-demographic characteristics of 102 hemodialysis patients, revealing a diverse age distribution with the highest proportion (47.1%) falling in the >30 to ≤50 years range, then 38.2% aged >50 to 65 years, with mean age 45.4 ± 12.9. Gender representation is nearly balanced, with 57.8% females. The majority (63.7%) is categorized as 'Others' in employment status. Most participants engage in office work or are not working (70.6%). Living with others is predominant (97.1%), and 83.3% are married. Financially, 79.4% of hemodialysis patients report having enough resources. The sample includes both urban (35.3%) and rural (64.7%) residents. Notably, 82.4% had no close contact with patients with renal failure before diagnosis.

Table (2): Mean Score of Studied Subjects Regarding to Their Score of ShortForm-36 (SF) physical function scale (n=102

SF36 Domains	Study Subjects (n=100)	
	Mean ± SD	Range
General Health	**32.3 ± 7.39**	**27**
Physical Functions	**37 ± 6.57**	**56**
Role Physical	**37.9 ± 5.91**	**26**
Bodily Pain	**41.3 ± 5.52**	**22**
Vitality	**39.1 ± 4.70**	**18**
Social Role	**40.1 ± 5.57**	**34**
Emotional Role	**43.3 ± 9.61**	**33**
Mental Health	**47.5 ± 8.94**	**30**

Table (2) presents the mean scores of hemodialysis patients on the Short Form-36 (SF-36) questionnaire. The study sample demonstrates relatively higher mean scores in mental health (47.5 ± 8.94), emotional role (43.3 ± 9.61), social role (40.1 ± 5.57), and vitality (39.1 ± 4.70). In contrast, lower mean scores are observed in physical function (37 ± 6.57), bodily pain (41.3 ± 5.52), general health (32.3 ± 7.39), and role physical (37.9 ± 5.91).

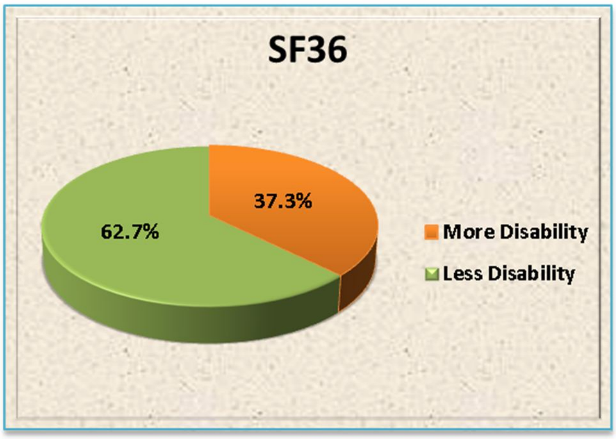

Figure (1): Distribution of Studied Subjects Regarding to Total Score of ShortForm-36 (SF) physical function scale (n=102)

Figure (1) shows that 37.3% of the participants fall into the category of "High Disability" with SF36 scores less than 50%, while the majority, comprising 62.7%, is categorized as "Low Disability" with SF36 scores equal to or greater than 50%.

Table (2): Association between Nutrition factors and Total Score of Short Form 36 Physical Function Scale among Studied Subjects (n=102)

Influencing Factors	SF 36 Physical Function Scale	
	More disability (n=38)	Less disability (n=64)
	No. (%)	No. (%)
- **Body mass index (kg/m2)**:		
• Under weight	7 (18.4)	12 (18.8)
• (18.5-24.5) Healthy weight	29 (76.3)	38 (59.4)
• (25-30) Overweight	0 (0)	14 (21.9)
• (> 30 - 40) Obese	2 (5.3)	0 (0)
X^2 (P-value)	13.9 (0.001**)	
- **Dietary patterns:**		
• Vegetarian	1 (2.6)	14 (21.9)
• Non-vegetarian	25 (65.8)	35 (54.7)
• Others	12 (31.6)	15 (23.4)
X^2 (P-value)	7.70 (0.020*)	
- **Vitamin supplements:**		
• Yes	26 (68.4)	56 (87.5)
• No	12 (31.6)	8 (12.5)
X^2 (P-value)	5.50 (0.023*)	
- **Carnitine supplements**:		
• Yes	8 (21.1)	21 (32.8)
• No	30 (78.9)	43 (67.2)
X^2 (P-value)	1.62 (0.203)	
- **Erythropoietin – Stimulating Agents(ESA) injections:**		
• Yes	28 (73.7)	40 (62.5)
• No	10 (26.3)	24 (37.5)
X^2 (P-value)	1.34 (0.247)	

* Statistical significant difference (P ≤ 0.05) ** highly Statistical significant difference (P ≤ 0.01)

Table (2) shows that physical function has highly significant positive association with body mass index and significant positive association with Vitamin supplements among hemodialysis patients. There is no significant association with other nutritional factors.

Table (3): Association between Comorbidities, Renal Replacement Therapy Related Factors and Total Score of Short Form 36 Physical Function Scale among Studied Subjects (n=102)

Influencing Factors	Total	SF 36 Physical Function Scale		X^2	*P*- value
	N=102	More disability (n=38)	Less disability (n=64)		
	No. (%)	No. (%)	No. (%)		
Comorbidities					
- Diabetes mellitus	25 (24.5)	11 (28.9)	14 (21.9)	8.75	0.062
- Hypertensive nephrosclerosis	28 (27.5)	14 (36.8)	14 (21.9)		
- Glomerulonephritis	32 (31.4)	6 (15.8)	26 (40.6)		
- Polycystic kidney disease	10 (9.8)	3 (7.9)	7 (10.9)		
- Other diagnosis	7 (6.9)	4 (10.5)	3 (4.7)		
Renal replacement therapy related factors					
- Dialysis sessions per week:				1.41	0.758
• One session	4 (3.9)	1 (2.6)	3 (4.7)		
• Two sessions	10 (9.8)	3 (7.9)	7 (10.9)		
• Three sessions	86 (84.3)	34 (89.5)	52 (81.3)		
• Four sessions	2 (2)	0 (0)	2 (3.1)		

Influencing Factors	Total	SF 36 Physical Function Scale		X^2	*P*- value
	N=102	More disability (n=38)	Less disability (n=64)		
	No. (%)	No. (%)	No. (%)		
- Hours per hemodialysis session:					
• Two hours	7 (6.9)	2 (5.3)	5 (7.8)	0.848	0.956
• Three hours	13 (12.7)	5 (13.2)	8 (12.5)		
• Four hours	81 (79.4)	31 (81.6)	50 (78.1)		
• Five hours	1 (1)	0 (0)	1 (1.6)		
- Prior dialysis duration (months):					
• ≤ 12 months	94 (92.2)	37 (97.4)	57 (89.1)		
• > 12 to ≤ 24 months	4 (3.9)	1 (2.6)	3 (4.7)		
• > 24 to ≤ 36 months	3 (2.9)	0 (0)	3 (4.7)		
• > 36 months	1 (1)	0 (0)	1 (1.6)		
X2 (P-value)		2.28 (0.567)			
- Times of post-dialysis weight-gain over last month:					
• ≤ 5 times	14 (13.7)	5 (13.2)	9 (14.1)	0.498	0.914
• > 5 to ≤ 10 times	4 (3.9)	2 (5.3)	2 (3.1)		
• > 10 times	84 (82.4)	31 (81.6)	53 (82.8)		
- Fatigue after dialysis over last month:					
• None	1 (1)	0 (0)	1 (1.6)	2.18	0.647
• 1 - 3 times	86 (84.3)	31 (81.6)	55 (85.9)		
• 4 - 6 times	14 (13.7)	7 (18.4)	7 (10.9)		
• More than 6 times	1 (1)	0 (0)	1 (1.6)		
- History of kidney transplant					
• Yes	99 (97.1)	38 (100)	61 (95.3)	1.83	0.176
• No	3 (2.9)	0 (0)	3 (4.7)		
- Pain in the past 7 days:					
• Times of mild pain	16 (15.7)	4 (10.5)	12 (18.8)	1.39	0.541
• Times of moderate pain	63 (61.8)	24 (63.2)	39 (60.9)		
• Times of severe pain	23 (22.5)	10 (26.3)	13 (20.3)		
Muscle strength					
No muscle activation	0 (0)	0 (0)	0 (0)	12.6	(0.008**
Flicker of movement	15(14.7)	6 (15.8)	9 (14.1)		
Muscle activation with gravity eliminated	20 (19.6)	8 (21.1)	12 (18.8)		
Muscle activation against gravity	24 (23.5)	15 (39.5)	9 (14.1)		
Muscle activation against some resistance	41 (40.3)	8 (21.1)	33 (51.6)		
Muscle activation against examiner's full resistance	2 (1.9)	1 (2.6)	1 (1.6)		

Table (3) reveals that there are no significant differences in total Score of Short Form 36 Physical Function Scale based on comorbidities, renal replacement therapy related factors and experienced pain. However, the presence of certain comorbidities, such as diabetes mellitus and hypertensive nephrosclerosis, shows a trend towards higher disability, although the differences are not statistically significant (p = 0.062). Muscle strength shows a highly significant association.

Tabe (4): Clinical Parameters for Hemodialysis Patients and its correlation with physical functioning:

Clinical Parameters	Values	Normal Values	*R*	*p-value*
Albumin	4.9 ± 0.89 g/dL	3.5 - 5.0 g/dL	0.230*	0.020
Creatinine	4.19 ± 0.96 mg/dL	0.6 - 1.2 mg/dL	-.047	.637
Hemoglobin	8.52 ± 1.1 g/dL	Female:12.0 - 15.5 g/dL Male: 13.5 - 17.5 g/dL	.106	.288
Calcium	7.34 ± 1.3 mg/dL	8.5 - 10.2 mg/dL	.050	.618
Potassium	4.41 ± 0.838 mmol/L	3.5 - 5.0 mmol/L	-.043	.670

Table 4 shows that the subjects generally had good mean albumin value but are experiencing anemia and hypocalcemia, both of which are common in this patient population. The potassium levels are within the normal range. The study found a significant positive correlation between hemoglobin and physical functioning (r = 0.230, p = 0.020) and other parameters showed non-significant correlations.

Table (5): Association between Total Score of Depression Index and Total Score of Short Form 36 Physical Function Scale among Studied Subjects (n=102)

Depression Index		SF 36 Physical Function Scale	
	Total N=102	**More disability (n=38)**	**Less disability (n=64)**
	No. (%)	**No. (%)**	**No. (%)**
• Not depressed	21 (20.6)	7 (18.4)	14 (21.9)
• Depressed	81 (79.4)	31 (81.6)	50 (78.1)
X^2 (P-value)		0.174 (0.677)	

Table (5) illustrates that a substantial 79.4% of participants were depressed as indicated by a score of ≥ 10 on the self-report depression index. There is no statistically significant difference in the distribution of patients with disability level based on their depression status (p = 0.677). The proportions of patients classified as not depressed and depressed are 18.4% and 81.6%, respectively, among those with more disability, and 21.9% and 78.1% among those with less disability.

Table (6): Association between Demographic Data and Total Score of Short Form 36 Physical Function Scale among Studied Subjects (n=102)

Socio-demographic Characteristics	SF 36 Physical Function Scale	
	More disability (n=38)	Less disability (n=64)
	No. (%)	No. (%)
Age / Years		
• 18 to ≤ 30 years	7 (18.4)	8 (12.5)
• > 30 to ≤ 50 years	15 (39.5)	33 (51.6)
• > 50 to 65 years	16 (42.1)	23 (35.9)
X^2 (P-value)	1.61 (0.464)	
Gender		
Male	17 (44.7)	26 (40.6)
Female	21 (55.3)	38 (59.4)
X^2 (P-value)	1.64 (0.836)	
Employment Status		
Employed	8 (21.1)	7 (10.9)
Retired	11 (28.9)	11 (17.2)
Others	19 (50)	46 (71.9)
X^2 (P-value)	4.99 (0.084)	
Work Character		
Office work/not working	26 (68.4)	46 (71.9)
Regular work	12 (31.6)	9 (14.1)
Vigorous work	0 (0)	9 (14.1)
X^2 (P-value)	9.31 (0.009**)	
Living Status		
Alone	1 (2.6)	2 (3.1)
Not alone	37 (97.4)	62 (96.9)
X^2 (P-value)	0.020 (1.000)	
Marital Status		
Single	7 (18.4)	7 (10.9)
Married	31 (81.6)	54 (84.4)
Widow / divorced	0 (0)	3 (4.7)
X^2 (P-value)	2.37 (0.299)	
Financial Status		
Not enough	3 (7.9)	11 (17.2)
Enough	34 (89.5)	47 (73.4)
Enough and save	1 (2.6)	6 (9.4)
X^2 (P-value)	3.50 (0.199)	
Residence		
Urban	16 (42.1)	20 (31.3)
Rural	22 (57.9)	44 (68.8)
X^2 (P-value)	1.23 (0.291)	
Did you get in a close contact with any one with renal failure before your diagnosis with renal failure?		
No	32 (84.2)	52 (81.3)
Yes	6 (15.6)	12 (18.8)
X^2 (P-value)	0.144 (0.793)	

* Statistical significant difference (P ≤ 0.05) ** highly Statistical significant difference (P ≤ 0.01)

Table (6) shows that there are no statistically significant differences in were observed in physical function scores based on age, gender, employment status, marital status, financial status, residence, or close contact with renal failure before diagnosis (all p > 0.05). However, there were significant associations found in work character (p = 0.009), indicating that individuals engaged in vigorous work demonstrated less disability compared to those with office work or not working

DISCUSSION

This study provides a comprehensive analysis of the factors influencing the quality of life (QoL) among patients with chronic kidney disease (CKD). By examining demographic characteristics, comorbidities, and various physical and mental health domains, we can better understand the multifaceted challenges faced by these patients.

As for age, the current study showed that nearly half of the samples were aged between 30 to 50 years old, with a mean age of 45.4 ± 12.9 years. This aligns with the findings of Tayea et al. (2022), who reported a mean patient age of 41.7 ± 14.1 years, and Yaya et al. (2019), who noted that less than three-quarters of patients were aged between 14 and 43 years. This can be explained by the fact that end-stage renal disease (ESRD) affects younger populations due to the influence or faster progression of known risk factors such as high blood pressure and diabetes.

However, these findings contrast with a study conducted in Egypt by Ahmed et al. (2020), who found that more than one-quarter of study subjects were aged between 50-59 years. Additionally, a study by Hussien and Sayed (2021), focusing on the effect of a training program on nurses' knowledge and practice of total parenteral feeding in critically ill children, found that only approximately one-third of the nurses studied were older than 25.

Turning to Gender, in the current study, more than half of the sample was females. This finding is supported by Ali et al. (2020), who reported that the majority of patients were female. This may be due to lifestyle differences between genders, with more females potentially having unhealthier lifestyles that increase the risk factors for hypertension and diabetes, the most common causes of ESRD. In contrast, Megahed and Ahmed (2021) reported that two-thirds of their studied patients were male.

Concerning marital status, the majority of the studied sample were married, which is consistent with the findings of Tayea et al. (2022), who also reported that most of their studied patients were married.

As for occupation, the current study indicated that more than half of the sample were unemployed, aligning with findings from Alshammari et al. (2024), who found that more than one-third of participants were unemployed. However, these findings contradict a study by Al Salmi et al. (2021), which reported that more than three-quarters of patients were employed.

Moving to financial status, the current study showed that the majority of the sample had sufficient income. Choi (2020) similarly reported that almost two-fifths of the sample had a high income. This contrasts with findings from Hamdi Elzeiny and Mahmoud Mohamed (2023) and Tharwat Mohamed et al. (2023), who reported that their studied patients had insufficient family income.

Concerning residence, the highest percentage of the studied sample lived in rural areas, possibly due to greater exposure to contaminated water and salty food, which can cause more renal symptoms and urinary tract damage. This finding is supported by Elshafie et al. (2023), who confirmed that the majority of their patients lived in rural areas.

As for comorbidities, the current study revealed that nearly one-third of patients had glomerulonephritis, contrasting with Elsayed Rady et al. (2020), who found that nearly half of the studied participants had diabetes mellitus.

Importantly, physical functioning levels of patients in the current study was determined by the SF-36 domains, revealing mean scores of 37.9 ± 5.91 for role physical, 41.3 ± 5.52 for body pain, 40.1 ± 5.57 for social role, 43.3 ± 9.61 for emotional role, and 47.5 ± 8.94 for mental health. These results are consistent with Yapa et al. (2021), who found similar mean scores for the same SF-36 domains. Lower mean scores in general health, physical function, and role function were attributed to the pathophysiology of diseases affecting the patients' ability to perform activities.

This was supported by Donar et al. (2022), who noted that the lowest mean sub-dimensions were Role Physical and General Health, and Martini et al. (2018) & Kefale et al. (2019), who found the lowest scores in general health, role physical, and pain in their dialysis patients.

The sub-domain with the highest mean score was related to mental health and emotional role, possibly due to the dynamic adaptation of patients to the hemodialysis (HD) routine, reflecting the psychological adaptability of Egyptian patients. This finding agrees with Yehia and Saied (2022) who reported high levels of emotional well-being among their studied patients.

As for the **Total Score of Physical Function Scale, t**he current study found that nearly two-thirds of patients had low disability scores, consistent with Tayea et al. (2022) and Fradelos (2021), who found that the majority of their patients had satisfactory overall quality of life (QoL) values. However, Bagasha et al. (2021) and Kim et al. (2021) reported lower health-related QoL (HRQoL) among their ESRD patients. Khan and Ahmad (2020) also found that CKD patients suffer from depression, anxiety, and poor QoL.

Regarding the Hemodialysis Sessions, the majority of patients in this study had been undergoing hemodialysis for one year, with sessions three times per week for four hours each. Ahmed et al. (2020) similarly reported that the majority of their patients had four-hour sessions three times weekly.

Moving to the motor function indicators, Gait Speed and Muscle Strength, the study showed that the highest percentage of patients had lowered gait speed, slow standing balance, and low muscle strength. This aligns with Shirai et al. (2021) and Kimura et al. (2022), who found similar results in their HD patients.

Concerning nutritional factors, about two-thirds of the studied patients had a healthy weight with a body mass index (BMI) of 21.3 ± 3.47. This was supported by Kang et al. (2021), who reported a mean BMI of 23.7 ± 3.6 in their HD patients. The current study also found that the mid-arm circumference was 26.1 ± 8.43, consistent with Kim et al. (2020), who documented a mid-arm circumference of 28.63 ± 5.01 among HD patients.

As for Diet and Supplement Intake, the highest percentage of patients was non-vegetarian, took vitamin supplements, and received Erythropoietin-Stimulating Agents (ESA) injections. These findings are supported by Kim et al. (2020), who reported that HD patients often consume nutrients above the recommended allowance, including vitamins E, B6, B12, phosphorus, sodium, and potassium.

Regarding the Laboratory Findings, the current study displayed findings about Albumin, creatinine, hemoglobin, calcium and potassium.

Albumin is a crucial protein in the blood, reflecting the nutritional and inflammatory status of the patient. The normal range for albumin is typically 3.5-5.0 g/dL. The observed mean value of 4.9 g/dL is within the normal range, indicating good nutritional status and protein reserves among the hemodialysis patients.

Creatinine is a waste product of muscle metabolism and a key marker for kidney function. Normal levels typically range from 0.6 to 1.2 mg/dL in non-dialysis individuals, but higher levels are expected in dialysis patients due to impaired kidney function. The mean creatinine level of 4.19 mg/dL, while elevated, is expected in this population and reflects the reduced clearance capacity of their kidneys.

Hemoglobin is essential for oxygen transport in the blood. The normal range for hemoglobin is 13.8 to 17.2 g/dL for men and 12.1 to 15.1 g/dL for women. The mean hemoglobin level of 8.52 g/dL is significantly below the normal range, indicating anemia, which is common in hemodialysis patients due to factors such as reduced erythropoietin production by the kidneys and loss of blood during dialysis.

Calcium levels are vital for various bodily functions, including bone health and muscle function. The normal range for calcium is 8.5 to 10.2 mg/dL. The observed mean value of 7.34 mg/dL is below the normal range, suggesting hypocalcemia, which can occur in hemodialysis patients due to factors such as phosphate binders, vitamin D deficiency, and dialysis-related calcium losses.

Potassium is crucial for heart and muscle function. The normal range for potassium is 3.5 to 5.0 mmol/L. The mean potassium level of 4.41 mmol/L falls within the normal range, indicating that the patients are maintaining acceptable potassium levels, which is important as both hyperkalemia and hypokalemia can have serious cardiac consequences in dialysis patients.

Overall, the current study found that hemoglobin and calcium levels were below normal, while creatinine levels were above normal, consistent with Mohamed Fahm et al. (2024), who also documented reduced hemoglobin and calcium levels and increased urea and creatinine levels in HD patients. Regular monitoring and appropriate management of these parameters are crucial to ensuring optimal patient outcomes and mitigating complications associated with dialysis treatment.

Concerning Depression, the study revealed that the majority of patients experienced depression, possibly due to the awareness that HD is a lifelong management modality. This finding is supported by Alencar et al. (2020) and Hamdi & Mahmoud (2023), who reported high rates of depression among their HD patients. Similarly, Nagy et al. (20) found that dependence on the HD machine causes anxiety, depression, and impaired physical health.

As for the Demographic Influence on Depression, higher levels of depression were found among patients below 50 years, female, married, living in rural areas, and having sufficient income. This is supported by Hamdi & Mahmoud (2023), who found significantly higher depression scores among younger patients, and Alshelleh et al. (2023), who reported higher depression scores among female patients. Rambod et al. (2020) demonstrated the positive effect of psychosocial support on depression scores and hope in HD patients.

Finally, the results indicate that **QoL** in CKD patients is low and affected by multiple factors, such as age, education level, employment status, dialysis frequency, and duration. The study showed no significant difference between patients' socio-demographic data and physical functions, except for occupation. This finding is supported by Manavalan et al. (2017), who found a significant relationship between QoL and occupation.

Conclusion

The study findings underscore the critical role of nutritional factors, BMI, and muscle strength in determining physical function among ambulatory hemodialysis patients. Notably, higher BMI, the use of vitamin supplements, and better muscle strength were significantly associated with lower levels of disability. Although comorbidities such as diabetes and hypertensive nephrosclerosis showed a trend toward higher disability, they did not reach statistical significance. Furthermore, clinical parameters such as albumin levels exhibited a significant positive correlation with physical functioning, suggesting that nutritional status is an essential determinant of patient outcomes.

Recommendations

Based on the findings, the investigator suggests:

1. Further studies are needed to explore the connection between influencing factors and physical functions in CKD patients.
2. Interventions should focus on improving nutritional intake, maintaining healthy body weight, and enhancing muscle strength to mitigate physical disability in this population.
3. Regular monitoring of clinical parameters such as albumin and hemoglobin levels should also be prioritized.
4. Longitudinal studies are needed to investigate symptom changes in CKD patients over time.
5. Future research on physical functions and QoL to evaluate effective therapeutic techniques for managing physical function disorders.

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