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Patient-Reported Social Frailty and Its Relationship with Depression in End-Stage Renal Disease

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ABSTRACT

Background and Objectives: Due to the associated impact on quality of life, chronic kidney disease leads to the development of depression. This study was done to assess the relationship between social frailty and depression in End-Stage Kidney Disease patients.

Materials and Methods: This study was conducted at the Combined Military Hospital Lahore, including patients aged> 13 years of either gender with ESKD. All patients were evaluated for depression using the Patient Health Questionnaire-9 and for frailty using the Social Frailty Index-7 questionnaire. The effect modifiers such as age, duration of dialysis, concern regarding serum creatinine, fear of disability, dialysis-associated fatigue, and haematological parameters were also assessed using binary logistic regression analysis.

Results: A total of 150 patients with a mean age of 56.93 ± 13.78 years were enrolled. Among these, 106 (70.6%) were males, 61 (40.67%) had diabetes mellitus, 71 (47.33%) often felt fatigued, 103 (68.67%) had unintentional weight loss, and 59 (39.33%) reported slight concern about serum creatinine levels. Frailty and depression showed a significant correlation ($r = -0.305$, $p<0.001$). Similarly, socially frail patients had markedly higher odds of depression (adjusted OR 105.74, 95% CI 13.38 – 835.00; $p < 0.001$) compared with non-frail individuals. Associations observed for education, income, fear of disability or death, unintentional weight loss, polypharmacy, and serum albumin were no longer significant after adjustment for confounders; however, fatigue frequency and concerns about serum creatinine levels remained significant.

Conclusions: Frailty, fatigue, and psychological concern about serum creatinine levels were independently associated with depression in ESKD patients

Keywords: Depression, Frailty, Patient reported outcome measures, Quality of life, Renal Replacement Therapy, End stage kidney disease.

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Introduction

Chronic Kidney Disease is defined as long-standing kidney damage with a GFR of less than 60ml/min/1.73 m2 for more than 3 months, with the onset of End-stage Kidney Disease (ESKD) considered when GFR drops below 15ml/min/1.73 m2 and is considered a terminal condition.[1] Despite no definitive statistics present worldwide regarding the incidence and prevalence of ESKD, global cases of kidney failure requiring replacement therapy were estimated at 4.59 million according to a systematic analysis conducted in 2025 referencing data from 2023.[2] Pakistan also

experiences an ever increasing burden, with studies reporting a prevalence of 12.5-29.9% with an expected increase in the upcoming years.[3]

ESKD carries a high short-term mortality, as evidenced by a scoping review of 113 studies, with mortality being high in the first 3 years of onset.[4] The associated morbidity due to the underlying chronic inflammatory processes leads to an overall decline in quality of life of patients, with patients scoring significantly lower as compared to healthy controls on the Health-related quality of life (HRQOL) across various domains.[5]

Due to the associated impact on quality of life, ESKD leads to frequent development of depression, which, according to the WHO, is defined as a prolonged loss of interest in daily activities, which can affect all aspects of life and occur due to various reasons.[6] The prevalence of depression in ESKD patients in Pakistan has been reported to be as high as 79.4% according to a study conducted in Bahawalpur in 2023.[7] This leads to overall poor coping and quality of life among patients, which can affect the adherence to treatment and associated patient outcomes.

An important contributor to depression in patients of ESKD is frailty, which is a multi-dimensional clinical syndrome characterised by reduced physiologic reserve, increased vulnerability to adverse outcomes such as hospitalisation, functional decline, and even minor ailments.[8] Social frailty has emerged alongside physical frailty and encompasses social isolation, reduced communication, and reduced perceived sense of support from surrounding individuals.[9] Due to its significant effect on physiologic wellbeing, individuals, especially those with chronic illness, who experience social frailty have an increased incidence of depression as compared to their non-frail counterparts.[10] In patients undergoing maintenance haemodialysis, social frailty has been shown to be independently associated with depression, even after adjustment for clinical and biochemical factors, highlighting the predominance of psychosocial determinants over disease severity alone.[11] Therefore, it's important to address social frailty as much as physical frailty in such populations.

Our study aimed to determine the correlation between social frailty and depression among patients with ESKD undergoing dialysis and those who were not on dialysis. There were no data available in the literature on this subject from Pakistan, and frailty in non-dialysis ESKD patients. This prompted us to collect data on our population to better understand the subject. We believe that the results from this study will help in better planning by health care professionals in emphasizing means to treat depression, lessen/ control those factors that increase the social frailty index, in order to decrease the morbidity and mortality in ESKD patients.

Methods

The study was observational cross-sectional research conducted at the Department of Dialysis and Nephrology, Combined Military Hospital (CMH) Lahore, from August to October 2025. Ethical approval was obtained from the Institutional Review Board of CMH Lahore (Approval# 695/2025). The study purpose was explained to participants and their caretakers, and informed consent was obtained. The sample population was selected using non-probability, convenience sampling.
Adults and adolescents aged 13 years and above, diagnosed with ESKD who had been undergoing dialysis for at least three months, and had preserved verbal communication abilities, presenting to

the dialysis unit or the outpatient department of nephrology were included. Patients with any diagnosed or reported psychiatric illness, sepsis, decompensated liver disease, meningitis, active infection, or those who declined to participate were excluded. Data were collected using a structured questionnaire on Google Form via a direct face-to-face interface. The questionnaire consisted of three sections: the first section addressed basic demographic characteristics like age, education, marital status, monthly income and lab parameters such as recent lab value of serum creatinine, serum urea, serum albumin, haemoglobin; Second section of questionnaire included seven questions from Social Frailty Index-7 (SFI-7), and third section consisted of nine questions from the Patient Heath Questionnaire-9 (PGQ-9) to rule out depression. The laboratory investigations were ordered in accordance with the requirements of the second part of the questionnaire. The primary variable was to see correlation and association between social frailty and depression in ESKD patients, while the secondary variable was to assess factors associated with depression in ESKD.

The statistical analysis was done using SPSS version 25.0. Descriptive statistics were used to summarize categorical and numerical variables. The Spearman's Correlation analysis was used to check the correlation between the SFI-7 score and the PHQ-9 score. The binary logistic regression analysis was used to see the associations of different factors and predictors of depression in ESKD patients. The p-value<0.05 was considered statistically significant.

Results

This patient reported outcome measures (PROMs) based study included one hundred and fifty patients with a mean age of 56.93±13.78 years and 106 (70.67%) males. Among the included population, 128 (85.33%) were married, 84 (56%) had baseline primary education, 49 (32.67%) were smokers, and the largest proportion, 110 (73.33%), lived with their spouse and children. The majority 86 (57.33%) of patients had a CKD history of 1 to 5 years. Forty-two (28.00%) had coronary artery disease, 61 (40.67%) had diabetes mellitus, and 106 (70.67%) had hypertension, as shown in Table 1.

The included population was anemia with haemoglobin of 9.89±1.78g/dl. The mean eGFR was 7.18±3.64 mL/min/1.73m^2. The majority of patients, 64 (42.67%), had no fear of CKD outcomes, while 38 (25.33%) were afraid of disability, and the remaining were fearful of death due to CKD. Similarly, 71 (47.33%) often felt fatigued, 103 (68.67%) had unintentional weight loss, and 59 (39.33%) reported slight concern about their serum creatinine levels (Table 2). As per the PHQ-9 questionnaire, 102 (68.00%) patients showed depressive illness.

In the present study, responses to items assessing social engagement and emotional wellbeing revealed a high level of social isolation among participants. Nearly three-quarters of respondents 111 (74.0%) reported going out less frequently than in the previous year, and a similar proportion 114 (76.0%) stated that they were living alone. Feelings of boredom were also common, with 103 (68.7%) of participants reporting often feeling bored as shown in Table 3. Social interaction appeared limited, as only 68 (45.3%) reported visiting friends sometimes. Overall, these findings suggest reduced social interaction and frequent emotional disengagement within the included population.

Table 1: Baseline Demographics of 150 patients undergoing maintenance hemodialysis.

Characteristics	Descriptive Statistics
Age, Years	56.93±13.78
Gender, n (%)	
Female	44 (29.33%)
Male	106 (70.67%)
Marital Status, n (%)	
Married	128 (85.33%)
Single	10 (6.67%)
Widow/ Divorced	12 (8.00%)
Educational Status	
No Formal Education	25 (16.67%)
Primary	84 (56.00%)
Secondary	24 (16.00%)
Intermediate	13 (8.67%)
Graduation and above	4 (2.67%)
Smoking	49 (32.67%)
Employment Status	
Employed	20 (13.33%)
Unemployed	88 (58.67%)
Retired	42 (28.00%)
Household Monthly Income	
Below 50,000 Rs	61 (40.67%)
Between 50,000 – 100,000 Rs	57 (57.38%)
Between 100,001 – 200,000 Rs	22 (14.67%)
Above 200,000 Rs	10 (6.67%)
Living With Whom	
Alone	2 (1.33%)
Spouse	3 (2.00%)
Children	23 (15.33%)
Parents	8 (5.33%)
Spouse and Children	110 (73.33%)
Relatives / Others	4 (2.67%)
Duration of CKD	
Less than 1 year	42 (28.00%)
1 to 5 years	86 (57.33%)
6 to 10 years	16 (10.67%)
More than 10 years	6 (4.00%)
Family History of CKD	19 (12.67%)
Comorbid Conditions	
Diabetes Mellitus	61 (40.67%)
Hypertension	106 (70.67%)
Coronary Artery Disease / IHD	42 (28.00%)
CVA	15 (10.00%)

Table 4 presents patient-reported outcomes using the PHQ-9 among dialysis-dependent patients and indicates a high burden of depressive symptoms. Little interest or pleasure in doing things was reported for several days by 74 (49.33%) patients and for more than half the days by 53 (35.33%) patients. Feelings of being down, depressed, or hopeless were present for several days in 69 (46.00%) patients, nearly every day in 16 (10.67%) patients, and with 14 (9.33%) patients reporting

no such feelings. Sleep disturbances were particularly prominent, reported nearly every day by 44 (29.33%) patients, and for several days by 43 (28.67%) patients. Feeling tired or having little energy was reported by 73 (48.67%) patients for several days, with only 9 (6.00%) reporting no fatigue. Appetite disturbances were reported by 50 (33.33%) patients for several days, by 39 (26.00%) for more than half the days, and by 22 (14.67%) for no days. 65 (43.33%) patients reported negative self-perception for several days. Difficulty concentrating on activities such as reading or watching television was reported by 74 (49.33%) patients for several days, and by 42 (28.00%) for more than half the days. Overall, the distribution of responses highlights a high frequency of depressive symptoms of varying severity among dialysis-dependent patients as shown in Table 4.

Table 2: Clinical Parameters of included sample Population of 150 maintenance hemodialysis patients.

Characteristics	Descriptive Statistics
Haemoglobin, g/dL	9.89±1.78
Serum Creatinine, mmol/l	638.17±296.25
Serum Urea, mmol/l	29.28±17.82
eGFR, mL/min/1.73m²	7.18±3.64
Serum Albumin, g/L	31.99±4.95
BMI	24.00±5.32
Fear of	
I am not afraid	64 (42.67%)
Disability	38 (25.33%)
Death	48 (32.00%)
Frequency of Feeling Fatigue	
Sometimes	38 (25.33%)
Often	71 (47.33%)
Always	33 (22.00%)
Never	8 (2.33%)
Unintentional Weight Loss	
Yes	103 (68.67%)
No	47 (31.33%)
Concern about Serum Creatinine Levels	42 (28.00%)
Not Worried	59 (39.33%)
Slightly Worried	22 (14.67%)
Moderately Worried	27 (18.00%)
Very Worried	
Polypharmacy	
No (≤ 5 Medications)	64 (42.67%)
Yes (> 5 Medications)	86 (5733%)
Median PHQ-9 Score	13.00 (8.00-17.00)
Depression as Per PHQ-9	
Depressed	102 (68.00%)
Not Depressed	48 (32.00%)

The correlation between SFI-7 score and PHQ-9 was highly significant ($p<0.001$) with a negative correlation ($r = -0.305$). On univariate analysis, lower educational level (OR 0.58, 95% CI 0.40 – 0.85; $p = 0.006$) and lower monthly income (OR 0.57, 95% CI 0.38 – 0.84; $p = 0.004$) were significantly associated with depression. Psychological and symptom-related factors including fear of disability or death (OR 2.84, 95% CI 1.75 – 4.60; $p < 0.001$), increased frequency of fatigue (OR 1.66, 95% CI 1.06 – 2.60; $p = 0.028$), unintentional weight loss (OR 2.27, 95% CI 1.10 – 4.69; $p =$

0.026), and concern regarding serum creatinine levels (OR 2.55, 95% CI 1.64 – 3.97; p < 0.001), were also significantly associated with depression in ESKD patients. Other sociodemographic variables, comorbidities, dialysis-related parameters, and biochemical indices did not show significant associations, as shown in Table 4.

Table 3: Patient-reported outcome of Social Frailty Index

Questions	Patients Responses	
	Yes	No
Do you go out less frequently compared to last year?	111 (74.00%)	39 (26.00%)
Do you sometimes visit your friends?	68 (45.33%)	82 (54.67%)
Do you feel you are helpful to friends or family?	76 (50.67%)	74 (49.33%)
Do you often get bored?	103 (68.67%)	47 (31.33%)
Do you live alone?	114 (76.00%)	36 (24.00%)
Do you have friends you talk to on the phone?	8 (5.33%)	142 (94.67%)
Do you talk with someone every day?	43 (28.67%)	107 (71.33%)

Table 4: Patient-reported outcomes among dialysis-dependent patients

Questions	Frequency of PHQ-9 Responses			
	Not at all	Several days	More than half the days	Nearly every day
Little interest or pleasure in doing things	10 (6.67%)	74 (49.33%)	53 (35.33%)	13 (8.67%)
Feeling down, depressed, or hopeless	14 (9.33%)	69 (46.00%)	51 (34.00%)	16 (10.67%)
Trouble falling or staying asleep, or sleeping too much	21 (14.00%)	43 (28.67%)	42 (28.00%)	44 (29.33%)
Feeling tired or having little energy	9 (6.00%)	73 (48.67%)	53 (35.33%)	15 (10.00%)
Poor appetite or overeating	22 (14.67%)	50 (33.33%)	39 (26.00%)	39 (26.00%)
Feeling bad about yourself — or that you are a failure or have let yourself or your family down	21 (14.00%)	65 (43.33%)	46 (30.67%)	18 (12.00%)
Trouble concentrating on things, such as reading the newspaper or watching television	24 (16.00%)	74 (49.33%)	42 (28.00%)	10 (6.67%)
Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	20 (13.33%)	75 (50.00%)	39 (26.00%)	16 (10.67%)

In the multivariate regression model, increased fatigue frequency (adjusted OR 5.15, 95% CI 1.58 – 16.84; p = 0.007) and concern about serum creatinine levels (adjusted OR 6.59, 95% CI 1.43 – 30.47; p = 0.016) remained independent predictors of depression. The social frailty index demonstrated the strongest independent association with depression, even after adjustments. The patients who were classified as frail had markedly higher odds of depression (adjusted OR 105.74, 95% CI 13.38 – 835.00; p < 0.001) compared with non-frail individuals (Table 4). Variables such as educational level, monthly income, fear of disability or death, unintentional weight loss,

polypharmacy, and serum albumin lost statistical significance after adjustment for potential confounders as shown in Table 5.

Table 5. Multivariable logistic regression analysis of factors associated with depression among patients with end-stage renal disease

Variable	Univariate regression		Multivariate regression	
	B (95%CI)	p	B (95%CI)	p
Age	1.004 (0.980 -1.030)	0.723	-	-
Gender	1.900 (0.846 – 4.267)	0.120	-	-
Marital Status	1.167 (0.191 – 7.116)	0.867	-	-
Educational Level	0.584 (0.399 – 0.854)	0.006	0.908 (0.316 – .610)	0.857
Smoking	1.100 (0.527 – 2.297)	0.800	-	-
Employment Status	1.476 (0.973 – 2.241)	0.67	-	-
Monthly Income	0.567 (0.384 – 0.837)	0.004	0.447 (0.136 – .463)	0.183
Living with Whom (Alone/ Parents/ Spouse and Children, etc)	0.869 (0.645 – 1.171)	0.356	-	-
Duration of CKD	0.867 (0.588 – 1.279)	0.472	-	-
Family History of CKD	0.781 (0.287 – 2.128)	0.629	-	-
Fear of Disability or Death or No Fear	2.835 (1.747 – 4.600)	<0.001	1.436 (0.295 – .998)	0.654
Frequency of Fatigue	1.655 (1.056 – 2.596)	0.028	5.153 (1.577 – 6.843)	0.007
Unintentional Weight Loss	2.274 (1.103 – 4.687)	0.026	1.284 (0.206 – 7.988)	0.789
Concerned about Serum Creatinine Levels	2.553 (1.643 – 3.967)	<0.001	6.592 (1.427 – 0.466)	0.016
Polypharmacy	2.259 (1.123 – 4.542)	0.022	2.722 (0.311 – 3.825)	0.366
Haemoglobin	0.862 (0.706 – 1.051)	0.142	-	-
Serum Creatinine Levels	1.000 (0.999 – 1.002)	0.586	-	-
Serum Urea	0.990 (0.971 – 1.008)	0.274	-	-
eGFR	1.028 (0.933 – 1.131)	0.580	-	-
Serum Albumin	1.088 (1.011 – 1.171)	0.024	1.170 (0.966 - 1.417)	0.109
BMI	0.994 (0.932 – 1.060)	0.843	-	-
CAD/IHD	0.919 (0.430 – 1.963)	0.827	-	-
CVA	3.360 (0.727 – 15.525)	0.121	-	-
Diabetes Mellitus	1.068 (0.531 – 2.152)	0.853	-	-
Hypertension	0.442 (0.192 – 1.015)	0.054	-	-
Haemodialysis Vintage	1.002 (0.991 – 1.013)	0.742	-	-
Haemodialysis Session Duration	0.416 (0.151 – 1.144)	0.089	-	-
SFI Prefrail Frail	 0.005 (0.001 – 0.028) 0.021 (0.005 – 0.080)	 <0.001 <0.001	105.74 (13.381 – 835.001)	<0.001

Discussion

We conducted a cross-sectional study to determine the authenticity of social frailty as a predictor of depression in ESKD patients. Overall, there was a high prevalence of depression (68%) which was much higher comparable to the cumulative prevalence of 27.6% worldwide.[12] The SFI demonstrated

frailty as the strongest predictor of depression after multivariate analysis with fatigue and creatinine levels being independent predictors of depression. There was a strong association of depression low education level and income indicating that lack patient awareness of the situation lead to ambiguity and increased stress among patients whereas financial burden had an independent mental impact on patients. Severity of biochemical markers and dialysis parameters did not significantly impact depression which suggests that symptomatic severity and associated psychosocial parameters affected patients more. This is supported by recent evidence suggesting these factors to play a more prominent role than biochemical severity alone in determining emotional well-being.[13]

While the worldwide prevalence of depression is significantly lower than our reported value, a study conducted by Copaja-Corzo et al. in Peru in 2024 reported a prevalence of 65.3% while using the HSCL-25 comparable to our findings.[14] Similarly, Pandey RK et al. reported a prevalence of 68% in a single centre study conducted in India in 2025.[15] Another study conducted in Sudan in 2020 reported a prevalence of 66.7% among patients of ESKD receiving dialysis for less than a year.[16] Our results were further validated by M. Bahall et al. in who using the PHQ-9 like us also reported a prevalence of 62.1% of moderate depression or more among patients of ESKD.[17] These findings not only validate the use of PHQ-9 as a valid tool for assessing depression but also indicate that there is a significantly higher prevalence of depression among developing countries due to lack or resources, financial constraints and lack access to high-quality medical facilities which, as mentioned earlier, can negatively impact adherence to treatment and associated clinical outcomes.

An important consideration that should be made is that over the past years, physical frailty has been used as an index to predict disability, hospitalization and mortality. Recently, social frailty (loneliness, anxiety, financial/social constraints etc.) has been brought to light due to the interlinked relationship of both physical and social frailty in the development of disability.[18] Emerging evidence has pointed out that there is a high prevalence of social frailty, especially among the elderly, with a prevalence of as much as 53.1% reported by a multi-centre study conducted in Sichuan Province, China.[11] A scoping review published in 2022 by Xiaojing Qi et al. explains that there is an established correlation between depression and social frailty due to the physical restrictions imposed on a patient which contribute to loneliness and isolation leading to the development of depressive symptoms. Furthermore, financial constraints lead to increased stress which adds to the increasing burden on patients.[19] By using the Social frailty index (SFI) we establish a structured index to suggest that social frailty might be a central rather than a peripheral factor in the development of depression.

Our study also indicates that fatigue is an important driver in developing depression. Fatigue develops due to a combination of physiologic factors like anemia, malnutrition, uremia, coexisting chronic illnesses etc. and psychological elements like sleep disorders, side effects of medications, dietary modifications etc.[20] It acts both independently and contributes to social frailty by reducing activity, inducing social withdrawal and instilling a sense of hopelessness in patients. This leads to depression which exhibits a bi-directional relationship and further aggravates fatigue perception and a poor quality of life. Despite biochemical markers not having a significant association with depression, serum creatinine levels were also an independent driver of depression. Higher serum creatinine has shown to be positively associated with global psychological distress and significantly predicted stress in regression models.[21] However, due to poor understanding of biochemical markers especially among patients with lower educational levels doesn’ t make it a valid surrogate for illness

anxiety. Medical literature has demonstrated that illness perception contributes significantly to distress and depression beyond what is explained by clinical indices.[22] Negative illness perception leads to both morbidity as well as poor coping mechanisms among patients which is consistent with the Common Sense Model of Self-Regulation, which explains that such beliefs shape emotional responses and adjustments in chronic illness. Therefore, serum creatinine acts as subjective illness interpretation especially among patients with little knowledge and understanding.[23]

In our study, traditional markers such urea, eGFR, hemoglobin, dialysis vintage, and session duration did not show independent associations with depressive symptoms. Similar observations have been made in longitudinal studies where the stages of disease or dialysis dependency did not affect depressive symptoms significantly.[24] Therefore, as mentioned earlier, biochemical markers alone may not be accurate in determining the risk of depression in patients putting emphasis on the need for psychosocial assessment of patients.

The findings of this study emphasize the need to incorporate psychosocial assessment into routine ESKD care. Due to the strong association between social frailty and depression, screening for depressive symptoms alongside evaluation of social vulnerability may allow early identification of high-risk patients. Patient-reported outcome measures can help identify emotional distress and social isolation that are not reflected by laboratory or dialysis-related parameters. These results support a multidisciplinary approach to ESKD management, integrating medical care with psychosocial and mental health support to improve overall patient well-being.

Our study employs the use of validated Patient-reported outcome measures and a detailed assessment of various variables involved in the development of depression. The use of validated questionnaires such as the Patient Health Questionnaire and the Social Frailty Index allow us to develop a structured approach and construct a robust index to assess the various stressors contributing to depression. However, the cross-sectional design of the study limits casual inference due to a simplified methodology. Furthermore, the single-centre setting limits generalizability, and self-reported data may be subject to reporting bias. This calls for future longitudinal cohorts and interventional trials to clarify the relationship between depression and social frailty and to determine whether targeted multidisciplinary approaches, when combined with patient-related outcome measures, can improve mental health and associated long-term patient outcomes in ESKD patients.

Conclusion

The social frailty, frequency of fatigue, and concern about serum creatinine levels were independent predictors of depression in ESKD patients.

Conflict of Interest: None
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