

ORIGINAL ARTICLE

Prevalence and risk factors associated with frailty in end stage renal disease patients on maintenance haemodialysis.

Sania Amjad¹, Kiran Nasir², Ruqaya Qureshi³, Murtaza Dhrolia⁴, Aasim Ahmed⁵

ABSTRACT... Objective: To determine the frequency of frailty and identify its associated risk factors among end-stage renal disease (ESRD) patients undergoing maintenance haemodialysis. **Study Design:** Cross-sectional study. **Setting:** Hemodialysis Unit, The Kidney Centre. Postgraduate Training Institute, Karachi, Pakistan. **Period:** March 2025 to December 2025. **Methods:** A total of 200 participants of any genders, aged 18-70 years, with ESRD and undergoing maintenance hemodialysis were analyzed. Frailty was measured using the Frail Scale. Demographic, clinical, and laboratory data were collected. Data analysis was carried out using IBM-SPSS Statistics version 26, employing descriptive statistics. Chi-square tests, and independent t-tests were performed to compare frail and non-frail participants while logistic regression was used to determine predictors of frailty. Statistical significance was defined as $p < 0.05$. **Results:** In a total of 200 patients, 101 (50.5%) were males. The mean age, and weight were 52.8 ± 13.2 years, and 66.3 ± 12.6 kg, respectively. Regarding frailty status, 64 (32%) were robust, 82 (41%) pre-frail, and 54 (27%) frail. Age ($aOR = 1.1$, 95% CI: 1.1–1.2, $p = 0.019$), unemployment ($aOR = 6.9$, 95% CI: 1.1–42.2, $p = 0.036$), diabetes mellitus ($aOR = 7.3$, 95% CI: 1.8–30.7, $p = 0.006$), and history of hospitalization ($aOR = 5.1$, 95% CI: 1.04–24.6, $p = 0.044$) were found to be independent predictors of frailty. **Conclusion:** Frailty and pre-frailty affected a substantial proportion of patients on maintenance hemodialysis in ESRD patients. Relatively older age, unemployment, diabetes mellitus, and prior hospitalization identified patients at particularly high risk of frailty.

Key words: Chronic Kidney Disease, End-Stage Renal Disease, Frailty, Maintenance Hemodialysis, Parathyroid Hormone.

Article Citation: Amjad S, Nasir K, Qureshi R, Dhrolia M, Ahmed A. Prevalence and risk factors associated with frailty in end stage renal disease patients on maintenance haemodialysis. Professional Med J 2026; 33(10):1933-1937. <https://doi.org/10.29309/TPMJ/2026.33.10.10591>

INTRODUCTION

Chronic kidney disease (CKD) affects around 10% of the world, and its prevalence is increasing with the ageing of populations.^{1,2} Even though survival of end-stage renal disease (ESRD) has increased over the year but still almost 20-30% patients die within one year of commencing dialysis therapy.³⁻⁶ The accelerated onset of CKD is usually associated with an unfavourable prognosis like heart diseases.⁷

Patients with CKD are more prone to frailty, and it is closely linked to increased mortality, frequent hospitalization, kidney deterioration and dialysis related complications.^{9,10} The reported frailty in CKD patients has been reported in literature between 7-73% due to regional, clinical, and methodological differences.¹¹ According to recent literature, the issue of frailty is becoming more perplexing in CKD and ESRD patients. In one of the studies, frailty was observed in 34.5% CKD patients whereas in

the other study, 46% of the hemodialysis patients with ESRD were found to be frail.^{12,13} The increased interest has resulted in the emergence of different assessment too of them is the Frail scale, a self-assessment and brief questionnaire that has become a useful and valid instrument to be used in clinical practice, taking less than five minutes.¹⁴

Studies have continuously frail scale by indicating that it can be utilized in predicting hospitalizations and the occurrence of frailty in hemodialysis patients.¹⁴ This study aimed to find out the prevalence of frailty and its risk factors in ESRD patients undergoing maintenance hemodialysis using Frail scale.

METHODS

This cross-sectional study was carried out at the Hemodialysis Unit, The Kidney Centre Postgraduate Training Institute, Karachi, between March 2025 to December 2025, after obtaining approval from

1. MBBS, Postgraduate Resident Nephrology, The Kidney Center Hospital, PGTI, Karachi, Pakistan.
2. MBBS, FCPS, Professor Nephrology, The Kidney Center Hospital, PGTI, Karachi, Pakistan.
3. MBBS, FCPS, Professor Nephrology, The Kidney Center Hospital, PGTI, Karachi, Pakistan.
4. MBBS, FCPS, Professor Nephrology, The Kidney Center Hospital, PGTI, Karachi, Pakistan.
5. MBBS, FCPS, MBETH, Professor Nephrology, The Kidney Center Hospital, PGTI, Karachi, Pakistan.

Correspondence Address:

Dr. Sania Amjad
Department of Nephrology, The Kidney Center Hospital, PGTI, Karachi, Pakistan.
sanisania03@gmail.com

Article received on:

20/02/2026

Accepted for publication:

28/04/2026



the institute's Ethical Review Committee (No.188-NEPH-012025, dated: February 21, 2025). Considering the proportion of frailty in patients with ESRD as 38.5% with 95% confidence level and 7% margin of error, a sample size of 186 was calculated using WHO sample size calculator.¹⁵ For this study, a total of 200 adults of both genders, aged 18-70 years who had been receiving maintenance hemodialysis for more than 3 months and provided written informed consent were included. Patients with serious cardiac, liver, or mental health conditions were excluded. Non-probability, consecutive sampling technique was adopted.

At the time of enrollment, demographic, clinical, and laboratory information were collected. Frailty was assessed using the Frail Scale, measuring fatigue, resistance, ambulation, illnesses, and weight loss, with scores ranging from 0, indicating robust, to 5, indicating frail.¹⁴ Since Urdu is the primary language spoken in Pakistan, the Frail Scale was translated into Urdu (Frail Scale U) and validated, with ERC approval, on ten individuals from non-medical and non-renal backgrounds to ensure clarity and cultural suitability. After validation, patient interviews using the Frail Scale U during routine maintenance hemodialysis sessions were conducting, taking about five minutes per participant.

Data analysis was carried out using IBM-SPSS Statistics version 26, employing descriptive statistics. Chi-square tests, and independent t-tests were performed to compare frail and non-frail participants while logistic regression was used to determine predictors of frailty. Statistical significance was defined as $p < 0.05$.

RESULTS

In a total of 200 patients, 101 (50.5%) were males. The mean age, and weight were 52.8 ± 13.2 years, and 66.3 ± 12.6 kg, respectively. Regarding frailty status, 64 (32%) were robust, 82 (41%) pre-frail, and 54 (27%) frail. The mean age increased significantly with respect to frailty status ($p < 0.001$), while mean body weight declined with increasing frailty ($p = 0.002$). There were no significant differences in gender distribution ($p = 0.114$), or residence ($p = 0.832$), with respect to frailty status. Educational Status ($p < 0.001$), employment status ($p < 0.001$),

and marital status ($p < 0.001$) were significantly associated with frailty status. Presence of diabetes ($p < 0.001$), and ischemic heart disease ($p < 0.001$) was significantly more frequent with frailty status (Table-I).

After adjustment in the multivariate analysis, significant independent predictors of frailty included age (aOR=1.1, 95% CI: 1.1–1.2, $p = 0.019$), unemployment (aOR =6.9, 95% CI: 1.1–42.2, $p = 0.036$), diabetes mellitus (aOR=7.3, 95% CI: 1.8–30.7, $p = 0.006$), and history of hospitalization (aOR = 5.1, 95% CI:1.04–24.6, $p = 0.044$). Table-II is showing details about the univariate and multivariate logistic regression analyses for the predictors of frailty.

DISCUSSION

This study shows that frailty is common in adults receiving maintenance hemodialysis, with 27% classified as frail and a further 41% as pre-frail. The burden seen here places more than two-thirds of these patients somewhere along the frailty spectrum. The observed frailty prevalence is lower than the pooled global estimate of 39.6% from a 2025 meta-analysis, and lower than the 41.0% pooled prevalence reported among older maintenance hemodialysis populations.^{16,17} The present rate of frailty is also lower than the 38.5% frailty prevalence reported in central China, and much lower than the 72.1% reported in an older Chinese hemodialysis cohort.^{15,18} Differences in age structure, frailty instrument, case mix, and the inclusion of a broader adult age range rather than only elderly patients could be reasons behind these variations. The sizeable pre-frail group in the present study is especially relevant because it may point out potentially modifiable stage before overt functional decline becomes established.

Age emerged as a major determinant of frailty in this study. This is consistent with recent hemodialysis literature as local data found that age was the only variable that remained independently associated with frailty after multivariable analysis despite several other clinical factors appearing important on univariate testing.¹⁹ A Chinese cross-sectional study also found that age correlated positively with frailty.¹⁵

TABLE-I

Association of baseline demographic and clinical characteristics with frailty (N=200)

Demographic and clinical characteristics		Total (N=200) N (%)	Robust Health (n=64) n (%)	Pre-Frail (n=82) n (%)	Frail n=54) n (%)	P-Value
Age (years), mean±SD		52.8±13.2	41.2±11.4	54.4±10.1	63.9±6.9	<0.001
Weight (kg), mean±SD		66.3±12.6	69.8±12.0	66.7±12.4	61.7±12.4	0.002
Male gender		101 (50.5)	39 (60.9)	36 (43.9)	26 (48.1)	0.114
Rural residence		81 (40.5)	24 (37.5)	34 (41.5)	23 (42.6)	0.832
Educa- tional Status	Uneducated	47 (23.5)	4 (6.3)	17 (20.7)	26 (48.1)	<0.001
	Primary	24 (12)	7 (10.9)	8 (9.8)	9 (16.7)	
	Secondary	23 (11.5)	7 (10.9)	12 (14.6)	4 (7.4)	
	Intermediate	62 (31.0)	20 (31.3)	29 (35.4)	13 (24.1)	
	Above Intermediate	44 (22.0)	26 (40.6)	16 (19.5)	2 (3.7)	
Employ- ment Status	Unemployed	43 (21.5)	5 (7.8)	15 (18.3)	23 (42.6)	<0.001
	Office Job	59 (29.5)	36 (56.3)	21 (25.6)	2 (3.7)	
	Field Job	19 (9.5)	10 (15.6)	8 (9.8)	1 (1.9)	
	House Work	79 (39.5)	13 (20.3)	38 (46.3)	28 (51.9)	
Marital status	Married	169 (84.5)	43 (67.2)	73 (89)	53 (98.1)	<0.001
	Single	31 (15.5)	21 (32.8)	9 (11.0)	1 (1.9)	
Smokers		55 (27.5)	17 (26.6)	17 (20.7)	21 (38.9)	0.066
Diabetes mellitus		107 (53.5)	5 (7.8)	50 (61)	52 (96.3)	<0.001
Hypertension		193 (96.5)	60 (93.8)	79 (96.3)	54 (100)	0.183
Ischemic heart disease		61 (30.5)	1 (1.6)	18 (22.0)	42 (77.8)	<0.001
Chronic obstructive pulmonary disease		20 (10.0)	1 (1.6)	5 (6.1)	14 (25.9)	<0.001

TABLE-II

Univariate and multivariate logistic regression analysis for predictors of frailty among hemodialysis patients

Predictors		uOR (95% CI)	P-Value	aOR (95% CI)	P-Value
Age		1.1 (1.1-1.3)	<0.001	1.1 (1.0-1.2)	0.019
Weight		0.9 (0.8-0.9)	0.008	0.9 (0.9-1.0)	0.902
Female gender		0.5 (0.3-0.9)	0.044	0.2 (0.1-1.1)	0.059
Married		6.2 (2.7-14.1)	<0.001	1.2 (0.3-4.3)	0.804
Educational status (Graduate and above is the reference category)	Uneducated	15.5 (4.7-50.9)	<0.001	0.5 (0.1-3.9)	0.521
	Primary	3.5 (1.2-10.2)	0.021	0.2 (0.1-1.4)	0.105
	Secondary	3.3 (1.1-9.6)	0.029	0.6 (0.1-3.5)	0.543
	Inter	3 (1.4-6.8)	0.007	0.7 (0.2-2.6)	0.582
Employment status (office job is the reference category)	Unemployed	11.9 (4.1-34.7)	<0.001	6.9 (1.1-42.2)	0.036
	Field job	1.4 (0.5-4.0)	0.519	4.5 (0.8-24.7)	0.089
	House work	7.95 (3.6-17.5)	<0.001	4.1 (0.7-24.9)	0.123
Diabetes mellitus		35.4 (13.1-95.5)	<0.001	7.3 (1.8-30.7)	0.006
Ischemic heart disease		49.7 (6.7-369.1)	<0.001	3.6 (0.4-36.4)	0.280
History of hospitalization		18.6 (5.6-62.2)	<0.001	5.1 (1.0-24.6)	0.044

aOR: adjusted odds ratio; CI: confidence interval uOR: unadjusted odds ratio

The consistency of these findings across South Asia and East Asia data suggest that chronological age continues to capture cumulative disease burden, inflammation, vascular injury, sarcopenia, and reduced physiological reserve in end stage renal disease.

The mean body weight declined with worsening frailty status in this study. Data from China showed that frailty was independently related to malnutrition, sarcopenia, post dialysis tiredness, and lower serum albumin, pointing toward a nutritional and functional phenotype rather than age alone.²⁰ Data from pooled dialysis populations have also highlighted inflammation, undernutrition, and muscle loss as core contributors to frailty.²¹ The reduction in body weight seen here likely reflects anorexia, protein energy wasting, catabolic stress, and lower activity interact over time.²² Frailty assessment in dialysis units can be paired with nutrition screening, body composition surveillance where feasible, and exercise based rehabilitation, rather than being treated as an isolated geriatric label.

Educational status, employment status, and marital status were significantly associated with frailty while gender and residence were not. This social gradient aligns with recent evidence showing that frailty in hemodialysis is shaped not only by disease severity but also by social vulnerability.¹⁵ Dialysis schedules may reduce work capacity, financial insecurity limits nutrition and transport, and weak social support may amplify exhaustion, inactivity, and treatment fatigue. Regarding gender, a recent Pakistani study found female gender to be associated with frailty in univariate analysis but not after adjustment.¹⁹

Diabetes mellitus and ischemic heart disease were more frequent with worsening frailty status in the present study, and diabetes remained an independent predictor in the adjusted model. This again fits well with contemporary literature.²³ History of hospitalization also remained independently associated with frailty in this study. Although many studies focus more on comorbidity, and nutrition than on previous admissions, this result is strongly supported by current outcome data.^{21,24}

This study has several limitations. The cross-sectional

design prevents temporal inference so it cannot establish whether factors such as hospitalization, unemployment, or lower body weight precede frailty or result from it. The study was conducted at a single center, which may limit generalisability to other dialysis populations in Pakistan with different socioeconomic or clinical profiles. The sample size was adequate for prevalence estimation but could have been modest for a broad multivariable model. Comparative studies using FRAIL, Fried phenotype, and objective performance measures in the dialysis population would further help determine the best screening strategy for local practice.

CONCLUSION

Frailty and pre-frailty affected a substantial proportion of patients on maintenance hemodialysis in ESRD patients. Relatively older age, unemployment, diabetes mellitus, and prior hospitalization identified patients at particularly high risk of frailty. These findings support routine frailty screening in dialysis care and indicate that frailty should be approached as a multidimensional clinical problem shaped by biological illness burden and social vulnerability.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright© 28 April, 2026.

REFERENCES

1. Shahbazi F, Doosti-Irani A, Soltanian A, Poorolajal J. **Global trends and projection of aetiology-based chronic kidney disease incidence from 1990 to 2030: A Bayesian age-period-cohort modelling study.** *BMJ Open.* 2025; 15(9):e088104.
2. Kovesdy CP. **Epidemiology of chronic kidney disease: An update 2022.** *Kidney Int Suppl.* (2011). 2022; 12(1):7-11.
3. Liu P, Quinn RR, Lam NN, Al-Wahsh H, Sood MM, Tangri N, et al. **Progression and regression of chronic kidney disease by age among adults in a population-based cohort in Alberta, Canada.** *JAMA Netw Open.* 2021; 4(6):e2112828.
4. Jagdale A, Cooper DKC, Iwase H, Gaston RS. **Chronic dialysis in patients with end-stage renal disease: Relevance to kidney xenotransplantation.** *Xenotransplantation.* 2019; 26(2):e12471.

5. Johansen KL. **Life Expectancy Gains for Patients with ESRD.** Clin J Am Soc Nephrol. 2018; 13(1):11-12.

6. Wachterman MW, O'Hare AM, Rahman OK, Lorenz KA, Marcantonio ER, Alicante GK, et al. **One-Year mortality after dialysis initiation among older adults.** JAMA Intern Med. 2019; 179(7):987-90.

7. Saeed D, Reza T, Shahzad MW, Karim MA, Bakht D, Qizilbash FH, et al. **Navigating the crossroads: Understanding the link between chronic kidney disease and cardiovascular health.** Cureus. 2023; 15(12):e51362.

8. Yang C, Xiao C, Zeng J, Duan R, Ling X, Qiu J, et al. **Prevalence and associated factors of frailty in patients with chronic kidney disease: A cross-sectional analysis of PEAKING study.** Int Urol Nephrol. 2024; 56(2):751-58.

9. Mei F, Gao Q, Chen F, Zhao L, Shang Y, Hu K, et al. **Frailty as a predictor of negative health outcomes in chronic kidney disease: A systematic review and meta-analysis.** J Am Med Dir Assoc. 2021; 22(3):535-543.e7.

10. Anderson BM, Qasim M, Correa G, Evison F, Gallier S, Ferro CJ, et al. **Correlations, agreement and utility of frailty instruments in prevalent haemodialysis patients: Baseline cohort data from the FITNESS study.** Clin Kidney J. 2021; 15(1):145-52.

11. Chowdhury R, Peel NM, Krosch M, Hubbard RE. **Frailty and chronic kidney disease: A systematic review.** Arch Gerontol Geriatr. 2017; 68:135-42.

12. Zhang F, Wang H, Bai Y, Zhang Y, Huang L, Zhang H. **Prevalence of physical frailty and impact on survival in patients with chronic kidney disease: A systematic review and meta-analysis.** BMC Nephrol. 2023; 24(1):258.

13. Lee HJ, Son YJ. **Prevalence and associated factors of frailty and mortality in patients with end-stage renal disease undergoing hemodialysis: A systematic review and meta-analysis.** Int J Environ Res Public Health. 2021; 18(7):3471.

14. Dent E, Morley JE, Cruz-Jentoft AJ, Woodhouse L, Rodríguez-Mañas L, Fried LP, et al. **Physical frailty: ICFSR International Clinical Practice Guidelines for Identification and Management.** J Nutr Health Aging. 2019; 23(9):771-87.

15. Jiang S, Zhou Y, Zhang N, Zhang S, Xie Y, Qiu Q, et al. **Prevalence and risk factors of pre-frailty and frailty in hemodialysis patients in central China.** Sci Rep. 2024 Dec 28; 14(1):30660.

16. Xiang Y, Tong JL, Qian W, Deng P. **Global prevalence of frailty in hemodialysis patients: A systematic review and meta-analysis.** Front Med (Lausanne). 2025; 12:1722657.

17. Li J, Xiao W, Wang L, Zhang M, Ge Y. **The prevalence of frailty among older adults with maintenance hemodialysis: A systematic.** BMC Nephrol. 2025; 26(1):10.

18. Guo Y, Tian R, Ye P, Luo Y. **Frailty in older patients undergoing hemodialysis and its association with all-cause mortality: A prospective cohort study.** Clin Interv Aging. 2022; 17:265-75.

19. Arshad AR, Shakireen N, Ullah S, Sohail M. **Clinical determinants of frailty in end-stage renal disease.** J Coll Physicians Surg Pak. 2022; 32(11):1506-08.

20. Liu H, Tao M, Zhang M, Zhou Z, Ni Y, Wang Q, et al. **Construction of frailty and risk prediction models in maintenance hemodialysis patients: A cross-sectional study.** Front Med (Lausanne). 2024; 11:1296494.

21. Cheng M, He M, Ning L, Gan H, Liu H, Liu Q, et al. **Association between frailty and adverse outcomes in patients undergoing maintenance hemodialysis: A systematic review and meta-analysis.** Ren Fail. 2024; 46(2):2367716.

22. Farrah D, Hammad SS, Awwad A, Alnadi SA, Al-Btoush A. **Protein-energy wasting risk in end-stage renal disease patients undergoing haemodialysis and patients' adherence to dietary recommendations in Jordan: A cross-sectional study.** BMJ Open. 2025; 15(3):e094530.

23. Mağden K. **Evaluation of frailty levels in hemodialysis patients.** Istanbul Med J. 2025; 26(2):162-66.

24. Bossola M, Mariani I, Antocicco M, Pepe G, Di Stasio E. **Frailty, All-Cause Mortality, and hospitalization in patients on maintenance hemodialysis: A systematic review and meta-analysis.** J Clin Med. 2025; 14(14):4914.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	Sania Amjad: Data collection, data analysis, drafting.
2	Kiran Nasir: Conception and design, methodology, critical revisions.
3	Ruqaya Qureshi: Proof reading.
4	Murtaza Dhrolia: Critical revisions, methodology.
5	Aasim Ahmed: Data entry.