

Prevalence of frailty in incident haemodialysis patients

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ABSTRACT

Introduction: Frailty is a syndrome characterised by reduced physiological reserve and increased vulnerability to complications, falls, and mortality. In Spain, the elderly haemodialysis population is increasing, with reported frailty prevalence ranging from 26% to 73%, depending on the assessment instrument used.

Objective: To assess the prevalence of frailty in incident haemodialysis patients using the FRAIL scale.

Materials and Method: We conducted a prospective descriptive study from November 2024 through March 2025 using convenience sampling. Fifty-one incident haemodialysis patients were included. Demographic data, renal disease aetiology, diabetes mellitus, and vascular access were collected. Frailty was assessed using the FRAIL scale (five items: fatigue, resistance, ambulation, comorbidity, and weight loss), classifying patients as frail (>3 points), pre-frail (1–2 points), or non-frail (0 points).

Results: Mean age was 68.76 ± 12.18 years; 74.5% were men. The most frequent aetiology was unknown (25%). Overall, 64.7% of patients were frail, 29.7% pre-frail, and 5.9% non-frail. The most frequent impairments were reduced resistance (76.5%), fatigue (64.7%), and weight loss (58.8%). Diabetes mellitus was significantly associated with frailty ($p=0.012$). No significant differences were found according to age, sex, body mass index, place of origin, vascular access, or urgent dialysis initiation.

Conclusions: The combined prevalence of frailty and pre-frailty reached 94.4%. The FRAIL scale proved to be a rapid and useful tool for early detection, facilitating the implementation of preventive interventions. Multicentre studies with larger sample sizes are needed to confirm these findings.

Keywords: frailty; haemodialysis; chronic kidney disease; elderly patients; vascular access; diabetes mellitus.

RESUMEN

Prevalencia de la fragilidad en pacientes incidentes en hemodiálisis

Introducción: La fragilidad es un síndrome caracterizado por la disminución de la reserva fisiológica y mayor vulnerabilidad a complicaciones, caídas y mortalidad. En España, la población anciana en hemodiálisis está en aumento, con prevalencias de fragilidad del 26-73% según el instrumento de medida.

Objetivo: El objetivo fue evaluar la prevalencia de fragilidad en pacientes incidentes en he-modiálisis mediante la escala FRAIL.

Material y Método: Estudio descriptivo prospectivo realizado entre noviembre de 2024 y marzo de 2025, con muestreo incidental. Se incluyeron 51 pacientes incidentes en hemodiálisis. Se recogieron datos demográficos, etiología de la enfermedad renal, diabetes mellitus y acceso vascular. La fragilidad se evaluó con la escala FRAIL (cinco ítems: fatigabilidad, resistencia, deambulación, comorbilidad y pérdida de peso), clasificando a los pacientes como frágiles (>3 puntos), prefrágiles (1-2) o no frágiles (0).

Resultados: Edad media: $68,76 \pm 12,18$ años; 74,5% hombres. La etiología más frecuente fue no filiada (25%). El 64,7% fueron frágiles, el 29,7%, prefrágiles, y el 5,9%, no frágiles. Las alteraciones más frecuentes fueron problemas de resistencia (76,5%), fatigabilidad (64,7%) y pérdida de peso (58,8%). La diabetes mellitus se asoció significativamente con fragilidad

($p=0,012$). No se hallaron diferencias con edad, género, índice de masa corporal, procedencia, acceso vascular o inicio urgente.

Conclusiones: La prevalencia combinada de fragilidad y pre-fragilidad alcanzó el 94,4%. La escala FRAIL demostró ser un instrumento rápido y útil para la detección precoz, lo que facilita la implementación de intervenciones preventivas. Se precisan estudios multicéntricos y con mayor tamaño muestral para confirmar estos resultados.

Palabras clave: fragilidad; hemodiálisis; insuficiencia renal crónica; pacientes ancianos; acceso vascular; diabetes mellitus.

INTRODUCTION

Frailty is defined as a syndrome characterised by reduced physiological reserve and increased vulnerability to illness and death¹. In patients undergoing dialysis, frailty is associated with adverse clinical outcomes such as increased mortality, falls, hospitalisations, vascular access failure, and deterioration in quality of life²⁻⁶. It has also been identified as an independent predictor of adverse events in chronic kidney disease⁷⁻⁹, with a negative impact on functional independence¹⁰ and quality of life¹¹.

In Spain, the proportion of elderly patients initiating renal replacement therapy continues to rise¹². The prevalence of frailty in this population ranges from 26% to 73%, depending on the assessment tool used¹³⁻¹⁷. Among patients on dialysis, between 41% and 67% meet criteria for frailty, representing a 5–7% higher prevalence than in the general population^{4,7-13}.

In this context, systematic assessment of frailty at the initiation of dialysis is a clinical necessity. To this end, our centre has implemented the FRAIL scale, a brief and validated questionnaire that enables early detection of this syndrome.

The objective of the present study was to determine the prevalence of frailty in incident haemodialysis patients using the FRAIL scale.

MATERIAL AND METHOD

Study Design and Population

We conducted a prospective descriptive study between November 2024 and March 2025 in the haemodialysis unit of *Hospital Universitario Virgen del Rocío* (Sevilla, Spain). Convenience sampling was used, including all patients who initiated renal replacement therapy with haemodialysis during the study period. The final sample included a total of 51 patients.

Variables and Instruments

Frailty was assessed using the FRAIL scale, a validated tool¹⁸⁻²⁰ consisting of five items: fatigue, resistance (ability to climb stairs), ambulation, number of comorbidities, and weight loss >5% in the previous year (Appendix 1). Patients were classified into 3 categories:

- Frail (>3 points)
- Pre-frail (1–2 points)
- Non-frail (0 points)

Additional variables collected included demographic data (age, sex, weight, height, body mass index), clinical variables (aetiology of renal disease, presence of diabetes mellitus), and variables related to vascular access at the start of dialysis.

Data Collection Procedure

Data were obtained from the health records and from interviews conducted on the same day dialysis was initiated, during the admission consultation. All information was coded and stored in secure databases accessible only to the research team.

Ethical Considerations

All participants provided written informed consent prior to inclusion. Personal data were processed in accordance with the General Data Protection Regulation (EU Regulation 2016/679) and Organic Law 3/2018, ensuring lawfulness, transparency, confidentiality, and pseudonymisation. Results are presented in aggregated form, with no individual patient identification. The study complied with the principles of the Declaration of Helsinki.

Statistical Analysis

Descriptive statistics were performed. Categorical variables were expressed as absolute and relative frequencies, and quantitative variables as mean \pm standard deviation or median (P25–P75), depending on distribution assessed by the Kolmogorov–Smirnov test.

Group comparisons were conducted using the chi-square test or Fisher's exact test for categorical variables, and Student's t-test/Welch test or Mann–Whitney U test for quantitative variables, as appropriate. Statistical significance was set at $p<0.05$.

Analyses were performed using PASW Statistics version 18.0 (SPSS Inc., Chicago, IL) at the Research Support Unit of *Hospital Universitario Virgen del Rocío*.

RESULTS

A total of 51 incident haemodialysis patients were included. The mean age was 68.76 ± 12.18 years, and 74.5% were male ($n=38$). Baseline characteristics are shown in **table 1**.

Table 1. Baseline characteristics of the study sample.

Age (years)	–	68.76±12.18
Sex	Male	74.5% (n=38)
	Female	25.5% (n=13)
Diabetes mellitus	–	47.1% (n=24)
Weight (kg)	–	78.0±17.69
Height (cm)	–	163.0±11.95
BMI	Underweight	3.9% (n=2)
	Normal weight	27.5% (n=14)
	Overweight	23.5% (n=12)
	Obesity	45.1% (n=23)
Referral source	ACKD clinic > 6 months	56.9% (n=29)
	ACKD clinic < 6 months	5.9% (n=3)
	No prior nephrology follow-up	19.6% (n=10)
	Peritoneal dialysis	7.8% (n=4)
	Kidney transplant	9.8% (n=5)
Vascular access at initiation	Native AV fistula	33.3% (n=17)
	Tunnelled catheter	21.6% (n=11)
	None	43.1% (n=22)
	Prosthetic graft	2.0% (n=1)

kg: kilogram; cm: centimetres; CKD: chronic kidney disease; ACKD clinic: clinic for advanced chronic kidney disease management.

Regarding the aetiology of renal disease, the most frequent cause was unknown origin (25.5%; n=13), followed by diabetic nephropathy (19.6%; n=10) and other causes (19.6%; n=10). Remaining aetiologies are shown in table 2.

Table 2. Aetiology of renal disease.

Unknown	25.5% (n=13)
Diabetic	19.6% (n=10)
Other	19.6% (n=10)
Vascular	15.7% (n=8)
Pyelonephritis / Tubulointerstitial nephropathy	9.8% (n=5)
Glomerulonephritis	5.9% (n=3)
Polycystic kidney disease	2.0% (n=1)
Systemic diseases	2.0% (n=1)

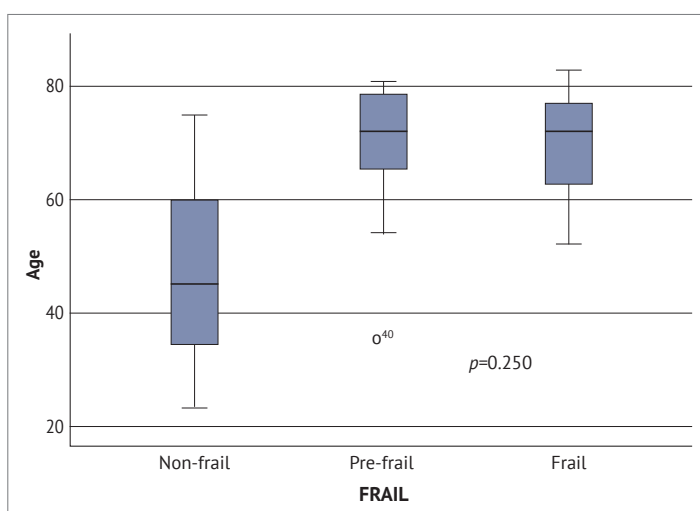
*EDTA codes 1994–1995 and corresponding groupings, extracted from the 2006 Report, Basic Module, Chronic Renal Failure Subsystem, Andalusian Health Service, Regional Government of Andalusia. Data missing for 67 patients.

Frailty assessment using the FRAIL scale showed that 64.7% (n=33) of patients were frail, 29.4% (n=15) were pre-frail, and 5.9% (n=3) were non-frail. Item-specific results are shown in table 3.

Comparative analysis revealed no significant differences with respect to age ($p=0.250$; figure 1), sex ($p=0.937$), body mass index ($p=0.658$), type of vascular access ($p=0.696$), or urgent initiation of dialysis ($p=0.522$). However, the presence of diabetes mellitus was significantly associated with frailty ($p=0.012$).

Table 3. Items evaluated by the FRAIL Scale.

Fatigue	No	35.3% (n=18)
	Yes	64.7% (n=33)
Resistance	No	23.5% (n=12)
	Yes	76.5% (n=39)
Ambulation	No	49.0% (n=25)
	Yes	51.0% (n=26)
Comorbidity	No	82.4% (n=42)
	Yes	17.6% (n=9)
Weight loss	No	41.2% (n=21)
	Yes	58.8% (n=30)

**Figure 1.** Age according to frailty status.

DISCUSSION

Frailty is a geriatric syndrome whose prevalence among haemodialysis patients is particularly high. In our cohort, 64.7% of patients were classified as frail and, when pre-frailty was also considered, the proportion increased to 94.4%. These figures greatly exceed those reported in the general population and fall within the upper range of values described in dialysis populations.

These findings are consistent with previous research. Moreno et al.²¹ in their cohort of 93 patients, reported frailty in 50.47%, with higher 12-month mortality (43.24% vs 20.51%; $p=0.033$) and higher hospitalisation rates (51.35% vs 43.59%; $p=0.498$). Similarly, Moreno-Useche et al.²² described a prevalence of 54.55% using the FRAIL scale. Barbosa et al.⁵ identified frailty in 36.5% of 137 incident dialysis patients and found it to be associated with a hospitalisation rate of 22.6% and a 2.88-fold higher risk of hospital admission over 9 months (HR, 2.880; 95%CI, 1.361–6.096; $p=0.006$). Together, these results reinforce the strong

association between frailty and adverse outcomes in the dialysis population.

Of note, the lack of consensus regarding the optimal tool for frailty assessment. Although the Fried phenotype is the most widely used, its complexity limits routine clinical application²³. Modified versions have been applied in patients with chronic kidney disease with variable success, and numerous alternative frailty scales have been developed for the general population²³⁻²⁵. The FRAIL scale, validated in different settings²⁶⁻²⁸, represents a practical and rapid alternative, facilitating its implementation in haemodialysis units. In our study, its use allowed easy identification of frail and pre-frail patients, supporting its applicability in this clinical context.

Another relevant finding was the absence of an association between frailty and age in our sample. Although non-frail patients were younger on average (45 years vs 72 and 71 years), the difference did not reach statistical significance. This is consistent with the findings of McAdams-DeMarco et al.⁸, who reported that up to 35.4% of patients with kidney disease under 65 years of age were frail according to Fried criteria. These data suggest that frailty in renal disease may manifest early and independently of chronological age.

Regarding vascular access, we found no significant association with frailty. However, previous studies have demonstrated meaningful relationships. Chen et al.⁶, in a cohort of 313 patients, found that 40.3% were frail and 29.4% were pre-frail. Cox regression analysis showed that frail patients had a 2.2-fold higher risk of vascular access-related events compared with non-frail patients (HR, 2.205; 95%CI, 1.377–3.532; $p=0.001$). Similarly, Chao et al.²⁹ reported that frailty was associated with a higher risk of vascular access failure (HR, 2.63; 95%CI, 1.03–6.71; $p=0.04$). These findings suggest a possible pathophysiological link mediated by endothelial dysfunction, oxidative stress, and low-grade inflammation, which warrants further investigation in studies with greater statistical power.

Our study has several strengths, including a high patient response rate. This is partly attributable to the FRAIL scale being quick and easy to administer and to its capacity to focus interventions on affected domains. However, it also has limitations, notably its single-centre design and small sample size, which may have limited the detection of associations and group differences. Despite this and the limited generalisability of our findings, the study provides valuable insight into the utility of the FRAIL scale for identifying frail and pre-frail patients initiating dialysis in our unit.

Early identification of frailty may allow the implementation of interventions to prevent or delay its progression, with the aim of reducing adverse events. Such interventions may include exercise programmes to increase strength and nutritional supplementation to prevent weight loss¹⁸⁻²⁰. Moreover, use of the FRAIL scale helps identify the domains

requiring intervention and facilitates the development of surveillance protocols based on the patient's classification.

In conclusion, the FRAIL scale enabled effective assessment of frailty among incident haemodialysis patients in our unit, revealing a high proportion of frail and pre-frail individuals at dialysis initiation. Identification of these high-risk patients allows for personalised interventions, more accurate prognostic counselling, and improved decision-making regarding the risks and benefits of commencing dialysis.

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Conflicts of interest

None declared.

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Anexo 1. 5-item FRAIL scale**FRAIL SCALE**

FATIGUE: During the past 4 weeks, how much of the time did you feel tired?

- 1 = All of the time
- 2 = Most of the time
- 3 = Some of the time
- 4 = A little of the time
- 5 = None of the time

Responses 1 or 2 are scored as 1 point; all other responses are scored 0 points.

RESISTANCE: Do you have any difficulty climbing 10 steps by yourself, without resting and without any assistance?

- Yes =1 point
- No =0 points

AMBULATION: By yourself and without using any aids, do you have any difficulty walking several hundred metres?

- Yes =1 point
- No =0 points

COMORBIDITY: For 11 conditions, the patient is asked:

Has a doctor ever told you that you have (each of the following conditions)?

The conditions are: hypertension, diabetes, cancer (excluding minor skin cancer), chronic lung disease, myocardial infarction, congestive heart failure, angina pectoris, asthma, arthritis, stroke, and kidney disease.

- 5 to 11 conditions =1 point
- 0 to 4 conditions =0 points

WEIGHT LOSS:

- What is your current weight with clothes on but without shoes? (Current weight)
- One year ago (month/year), what was your weight with clothes on but without shoes? (Weight 1 year ago)

$$\frac{\text{"Weight 1 year ago"} - \text{Current weight}}{\text{"Weight 1 year ago"}} \times 100$$

If the result is >5, this indicates weight loss > 5%=1 point.

If the result is ≤5, =0 points.



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