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Recovery time analysis of a haemodialysis session

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ABSTRACT

Introduction: Post-dialysis fatigue is a common symptom in haemodialysis patients. They describe it as feeling exhausted and having to rest or take a nap.

Objective: To analyse recovery time after a haemodialysis session and identify related factors.

Material and Method: This was a cross-sectional, prospective observational study conducted in March 2023, including patients who had been on chronic haemodialysis for more than one month. We studied demographic variables, treatment time, dialysis shift, time on renal replacement therapy, ultrafiltration volume, intra-dialysis complications, sleep quality, means of transport, travel time, frailty scales, dependence, fatigue questionnaire, and post-dialysis recovery time estimated by the patient. The data were obtained from the clinical history and the Versia® computer support.

Results: Thirty-nine patients were included, 26 men, mean age 66.12±13.41 years, time on renal replacement therapy 100.17±140.30 months, duration of haemodialysis session 248.07±12.80 minutes, ultrafiltration volume 2311.33±733.83 ml, post-dialysis recovery time 92.69±97.93 minutes. 64.10% used an ambulance, sleep quality was poor or fair in 43.58%, intradialytic complications in 15.38%, Barthel 91.897±20.41, pre-frail or frail in 94.9%, mean fatigue questionnaire score was 18.92±7.93.

Conclusions: Haemodialysis can be fatiguing for patients; however, recovery time varies greatly between patients. The mean recovery time was 1.5 hours, which was found to be related to the level of dependency.

Keywords: chronic kidney disease; haemodialysis; fatigue; dependency; frailty.

RESUMEN

Análisis del tiempo de recuperación de una sesión de hemodiálisis

Introducción: La fatiga post-diálisis es un síntoma común en los pacientes de hemodiálisis, que describen como sensación de agotamiento y cansancio, teniendo que descansar o tomar una siesta.

Objetivos: Analizar el tiempo de recuperación después de una sesión de hemodiálisis e identificar factores relacionados.

Material y Método: Estudio observacional transversal y prospectivo, realizado en marzo de 2023, incluyendo a los pacientes que llevaran más de un mes en programa de hemodiálisis crónica. Se estudiaron variables demográficas, tiempo de tratamiento, turno de diálisis, tiempo en tratamiento sustitutivo renal, volumen de ultrafiltración, complicaciones intradiálisis, calidad del sueño, medio de transporte, tiempo de desplazamiento, escalas de: fragilidad, dependencia, cuestionario de fatiga (cansancio) y tiempo de recuperación post-diálisis estimado por el paciente. Los datos se obtuvieron de la historia clínica y del soporte informático Versia®.

Resultados: Se incluyeron 39 pacientes, 26 hombres, edad media 66,12±13,41 años, tiempo en tratamiento sustitutivo renal 100,17±140,30 meses, duración de la sesión hemodiálisis 248,07±12,80 minutos, volumen de ultrafiltración 2311,33±733,83 ml, tiempo de recuperación post-diálisis

92,69±97,93 minutos. El 64,10% usaban ambulancia, la calidad del sueño era mala o regular en el 43,58%, presentaron complicaciones intradiálisis el 15,38%, Barthel 91,897±20,41, eran pre-frágiles o frágiles el 94,9%, la puntuación media del cuestionario de fatiga fue 18,92±7,93.

Conclusiones: La hemodiálisis tiene un efecto de cansancio en los pacientes, sin embargo, existe una gran variabilidad en el tiempo de recuperación entre pacientes. El tiempo medio de recuperación de los pacientes fue de hora y media, encontrando relación con el nivel de dependencia.

Palabras clave: enfermedad renal crónica; hemodiálisis; fatiga; dependencia; fragilidad.

INTRODUCTION

Fatigue is a common symptom in patients undergoing haemodialysis (HD) and is associated with an increased risk of cardiovascular disease, mortality, depression, and impaired quality of life[1].

It is defined as a subjective sensation of weakness, lack of energy, and tiredness that interferes with an individual's ability to perform daily activities[2].

The aetiology of fatigue is multifactorial and includes biological processes (disease- and treatment-related effects), psychosocial factors, and behavioural signs[3].

Fatigue is frequently experienced by patients undergoing haemodialysis and has a negative impact on their quality of life. These patients exhibit reduced levels of physical activity, low functional capacity, and generalised muscle weakness, resulting in an overall sensation of fatigue. Mental fatigue is characterised by lack of concentration and difficulty maintaining attention under certain conditions, whereas physical fatigue involves muscle weakness[4].

According to Bossola et al., two additional fatigue patterns related to dialysis session timing have been described in this patient population: intradialytic fatigue, which develops or worsens immediately before the dialysis session and persists throughout treatment, and post-HD fatigue, which develops or worsens after the end of the dialysis session and may persist for several hours[5].

This post-HD fatigue is experienced by most patients after dialysis sessions and has been described as a feeling of exhaustion and weariness, requiring rest or a nap within five hours following dialysis[6].

Currently, the prevalence of post-dialysis fatigue (PDF) ranges from 20% to 86%[7]. Two recently published meta-analyses estimate a prevalence of 61% and 60.5%, with significant inter-country variation[8,9].

Although PDF is a common symptom, recovery time varies widely between patients and is influenced by multiple factors (ultrafiltration volume, sleep quality, blood pressure, etc.)[7]. This exhaustion profoundly affects both quality of life and the ability to perform daily activities[10].

These considerations led us to explore this topic to clarify its causes and potential management strategies and to identify factors that may contribute to reducing post-dialysis fatigue.

The objective of this study was to analyse recovery time after an HD session and identify related factors.

MATERIALS AND METHODS

Study Design and Period

We conducted an observational, cross-sectional study with prospective data collection during March 2023.

Population and Sample

Inclusion criteria were: patients aged ≥18 years with chronic kidney disease on maintenance HD for more than 1 month at *Complejo Asistencial Universitario de León* (León, Spain). Patients unable to complete the questionnaires or who discontinued treatment before data collection was completed were excluded.

The variables analysed included demographic data, treatment duration (minutes), dialysis shift (morning–afternoon), months on HD, ultrafiltration volume, intradialytic complications, sleep quality (good, fair, poor), means of transport (ambulance, bus, car), travel time from hospital to home, and patient-estimated post-dialysis recovery time. As in previous studies, patients were asked the open-ended question: "How long do you think you need to recover from your haemodialysis session?"[10,11].

Measurement Instruments

- Fatigue Assessment Scale (FAS)[12]: A self-administered 10-item questionnaire with a 5-point Likert scale ranging from 1=never to 5=always. Five items assess physical fatigue and five assess psychological fatigue. Scores <22 indicate normal fatigue levels, 22–34 mild to moderate fatigue, and ≥35 severe fatigue.
- FRAIL Scale[13]: A 5-item questionnaire assessing fatigue, resistance, ambulation, comorbidity, and weight loss. Scores range from 0–5; 1–2 indicates pre-frailty and ≥3 frailty.
- Barthel Index (BI)[14]. Measures functional capacity for ten basic activities of daily living (BADL), providing a quantitative estimate of independence.

All assessments were conducted individually and directly by the investigators, with an average administration time of approximately 15 minutes per patient.

Data Analysis

Qualitative variables were expressed as absolute values and percentages; quantitative variables as mean and standard deviation. Normality was assessed using the Shapiro–Wilk test. Pearson's correlation coefficient was used to examine linear associations between quantitative variables; the chi-square test was applied for qualitative variables; Student's t-test and ANOVA were used for quantitative comparisons. Statistical significance was set at $p<0.05$ with a 95% confidence interval. Data were obtained from electronic medical records and the Versia® information system. Data collection was performed using Microsoft Excel and analysed with JASP software.

Ethical Considerations

Written informed consent was obtained from all participants, ensuring voluntary participation and confidentiality. The study adhered to the Declaration of Helsinki and complied with current ethical and legal requirements in biomedical research, in accordance with Regulation (EU) 2018/1725 and Spanish Organic Law 3/2018 on data protection and digital rights.

Table 1. Sample description (quantitative variables).

		Total (n=39) (mean±SD)	Women (n=13) (mean±SD)	Men (n=26) (mean±SD)
Age (years)		66.12±13.41	62.53±13.14	67.92±13.43
HD session duration (min)		248.07±12.80	246.92±9.90	248.65±14.18
UF volume (ml)		2,311.33±733.83	2,174.07±909.67	2,379.96±637.68
Travel time (min)		30.82±25.07	28.61±25.81	31.92±25.14
Time on HD (months)		100.18±140.30	133.23±147.26	83.65±136.60
Fatigue	Fatigue–Total	18.92±7.93	18.92±7.48	18.92±8.28
	Fatigue–Mental	9.38±4.37	10.00±4.67	9.07±4.27
	Fatigue–Physical	9.53±4.42	8.92±4.59	9.84±4.39

Table 2. Sample description (qualitative variables).

Variable		n	Percentage
Type of Transport	Ambulance	25	64.10%
	Bus	2	5.10%
	Car	12	30.80%
Sleep Quality	Good	22	56.41%
	Fair	10	25.64%
	Poor	7	17.95%
Intradialytic Complications	None	33	84.62%
	Hypotension	3	7.69%
	Cramps	3	7.69%
Barthel Index	Independent	29	74.35%
	Mild	1	2.57%
	Moderate	6	15.37%
	Severe	2	5.14%
	Total	1	2.57%
Frailty	Non-frail	2	5.13%
	Pre-frail	32	82.05%
	Frail	5	12.82%
Fatigue	Normal	29	74.35%
	Mild/Moderate	8	20.51%
	Severe	2	5.14%

RESULTS

The sample included a total of 39 patients, with a mean age of 66.12±13.41 years, of whom 66.6% (n=26) were male. A total of 61.54% received dialysis during the morning shift and 38.46% during the afternoon shift. The mean Barthel Index score was 91.897±20.41, and 25.65% (n=10) exhibited some degree of dependence. **Tables 1** and **2** describe the general characteristics of the sample and the results of the administered scales.

The mean recovery time following haemodialysis was 92.69±97.93 minutes (range:,0–240 minutes), with men reporting 76.15±93.42 minutes and women 125.76±102.01 minutes. **Figure 1** illustrates the distribution by time intervals. Mean recovery time according to dialysis shift was 80.62±87.55 minutes for the morning shift and 112±113.08 minutes for the afternoon shift.

When correlating post-haemodialysis recovery time with the quantitative variables studied, no statistically significant associations were observed **(table 3)**.

No associations were found between post-haemodialysis recovery time and the qualitative variables studied, except for the Barthel Index: patients with some degree of dependence required longer recovery times than independent patients (150±98.99 *vs* 72.93±91.04 minutes; p=0.021).

DISCUSSION

In this study, the proportion of patients with chronic fatigue in our unit was lower than that reported in previous publications. In our series, fatigue affected 26% of patients, compared with 61% reported in a recent meta-analysis by Dou J. et al.[8].

Advanced age and poorer sleep quality were associated with chronic fatigue; 80% of patients over 70 years presented fatigue, although this did not reach statistical significance. This is understandable, as disease perception, coping mechanisms, self-efficacy, and physical condition progressively decline with age[9,10].

PDF is a very common symptom among HD patients, and recovery time varies widely. In this study, 61.5% experienced PDF, a proportion similar to that reported by other authors,

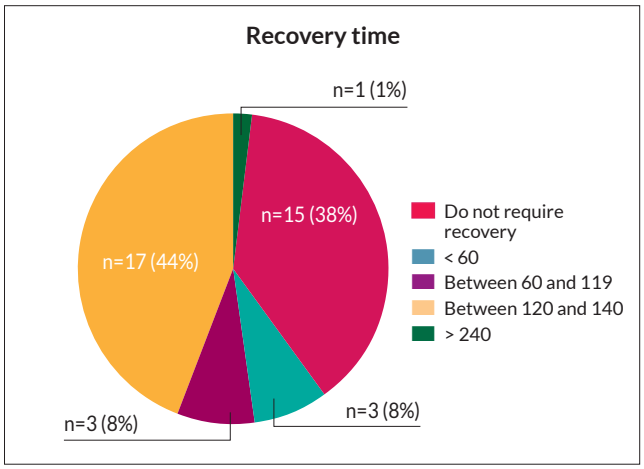

Figure 1. Recovery time (in minutes).

Table 3. Sample description (qualitative variables).

	Recovery time	
	Pearson's r	p-value
Age (years)	0.074	0.656
HD session duration (min)	−0.065	0.694
Ultrafiltration volume (ml)	0.119	0.469
Travel time (min)	−0.256	0.116
Time on HD (months)	−0.134	0.417
Fatigue–Total fatigue	0.154	0.350
Fatigue–Mental fatigue	0.205	0.211
Fatigue–Physical fatigue	0.073	0.658

although the mean recovery time was shorter (90 minutes) compared with previously reported ranges of 180–300 minutes[9,15-20]. Of note, a high proportion of patients (38.5%) reported needing no recovery time. Fitzpatrick et al., analysing recovery time in 86 adults (mean age 55 years), reported only 7% with no recovery time[21].

This result may be biased by the exclusion of patients unable to complete questionnaires, as poorer health status could increase recovery time.

Another factor that may influence the perceived recovery time is the dialysis shift. It is possible that patients attending afternoon sessions underestimate their recovery time due to the schedule of returning home. However, in this study, the mean recovery time of patients dialysed in the morning was lower than that of those in the afternoon (80.62±87.55 vs 112±113.08 minutes). This finding is inconsistent with the literature, as some authors report longer recovery times in the afternoon shift[22,23], whereas others report longer recovery in morning-shift patients[10,15]. We believe this discrepancy may be due to morning-shift patients sleeping during the haemodialysis session, as most must wake early to attend hospital; however, this variable was not specifically assessed in this study. Consistent with other reports, no relationship was found between advanced age and recovery time[19].

Another finding was that recovery time in men was shorter than that reported by women, consistent with previous studies[25,25]. Recent research indicates that women are more likely to experience unpleasant symptoms such as fatigue, exhaustion, and post-HD energy fluctuations than men[10].

In line with other publications, no relationship was found between advanced age and recovery time[19].

In the search for factors associated with post-dialysis fatigue, we analysed dialysis parameters, treatment duration, and ultrafiltration volume, but no causal relationship could be established. Review of the literature reveals conflicting results: some studies report associations, while others, as in this study, do not[9,14-18].

No statistically significant association was found with other variables such as travel time home or mode of transport. Unlike other studies, no differences were found with respect to time on renal replacement therapy or frailty[21].

A noteworthy finding was the association between degree of dependence and recovery time. This contrasts with the findings of Figueiredo et al., who reported no association[15].. In our study, patients with some degree of dependence required longer recovery time; it is possible that travel duration and mode of transport exacerbate fatigue.

The absence of association between recovery time and variables such as patient age, dialysis duration, and ultrafiltration volume is important when counselling patients on the choice of treatment modality. Patients should be informed about the existence of PDF, although the recovery time required by each individual is highly variable and difficult to predict[19].

Limitations

One limitation of this study is that the impact of fatigue on patients' quality of life was not evaluated, despite evidence that fatigue affects quality of life[1]. Additional limitations include the small sample size and the single-centre design.

Practical Implications

A simple and easily answered question such as *"How long do you think you need to recover from your HD session?"* can be readily integrated into routine HD care and provides valuable information regarding patients' health status and individual treatment burden.

Based on these findings, PDF affects more than half of patients on HD, with a mean recovery time of approximately 90 minutes. No causal relationship was identified with the studied variables except for degree of dependence. The sensation of fatigue is subjective and may be influenced by other unmeasured somatic, psychological, environmental, and biochemical factors.

Conflicts of interest

None declared.

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