



Post-dialysis fatigue and survival in patients on chronic hemodialysis

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Post-dialysis fatigue is a very distressing symptom, described as feeling tired and in need of rest or sleep after the dialysis session. The frequency of post-dialysis fatigue is high, ranging between 50.5 and 85% [1]. The aim of the study here reported was to determine whether post-dialysis fatigue is associated with an increased risk of mortality in prevalent patients on chronic hemodialysis.

All prevalent chronic hemodialysis patients referring to the hemodialysis units of the Fondazione Policlinico Universitario “A. Gemelli” IRCCS of Rome, Hospital “Carlo Urbani” of Jesi, Hospital “Civile” of Senigallia, Hospital “Umberto Parini” of Aosta, and Department of Medicine, Nephrology and Dialysis Unit, SS Annunziata Hospital, “G.

d’Annunzio” University, Chieti, between November 2015 and October 2020 were considered eligible. All patients were receiving conventional 4-h bicarbonate hemodialysis, three times a week. The assessment of post-dialysis fatigue was conducted according to the recommendations by Sklar et al. [2, 3]. Each patient was interviewed during one regularly scheduled treatment. Patients were considered as suffering from post-dialysis fatigue if they spontaneously offered this complaint when asked the open-ended question: “Do you feel fatigued after dialysis?”. If the answer was yes, each patient was invited to rate the intensity, duration, and frequency of post-dialysis fatigue from 1 to 5, with 1 being the lowest and 5 the highest score of intensity, duration, and frequency. Intensity was defined as the magnitude of fatigue, duration as the length of time that fatigue lasted, and frequency as the number of times that fatigue happened. The recovery time after the hemodialysis session was calculated according to Lindsay et al. [4]. Briefly, patients were invited to answer the following question: “How long does it take you to recover from a dialysis session?”. Responses were subsequently converted into minutes. The pre-specified endpoint was all-cause death. All patients were followed up prospectively for up to 65 months after the assessment of fatigue. Statistical analysis was performed by using the SPSS (Statistical Package for Social Science, version 20). All data were first analyzed for normality of distribution using the Kolmogorov–Smirnov test of normality. Continuous variables were expressed as mean \pm SD or median (25–75th percentile), categorical variables were displayed as frequencies and the appropriate parametric (ANOVA) or non-parametric test (χ^2 test and Friedman ANOVA) was used to assess the differences between subgroups. Univariate survival analysis was performed using the Kaplan–Meier method to examine the relationship between potential predictor variables and death. Variables associated with mortality were included

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as potential confounders in the multivariate Cox regression analysis.

Two hundred sixty-one patients were included in the study. Of these, 156 patients suffered from post-dialysis fatigue and 105 did not. The characteristics of these two groups are shown in supplementary material (Table S1). At the update in October 2020, after a mean follow up of 50.6 months (range 2.6–65), 129 patients had died. While age was significantly associated with survival, survival did not differ between patients with and without post-dialysis fatigue at the initial interview ($P=0.939$; Fig. 1). Cox regression analysis, including the presence of fatigue and age, confirmed age as the only significant predictor of survival ($B=0.057 \pm 0.010$, $P<0.001$) (Table S2). The median score (min–max) of intensity of post-dialysis fatigue was 3 (1–5), of frequency was 4 (1–5), and duration was 3 (1–5). Survival did not differ significantly among patients stratified according to PDF intensity ($P=0.739$), frequency ($P=0.410$), and duration ($P=0.273$). We then summed the scores of intensity, duration, and frequency into a “Sum Score” (median 11). Patients were dichotomized at the median; once more, survival did not differ significantly between the two groups ($P=0.761$). The median (min max) recovery time after the hemodialysis session was 220 min (60–420 min). No survival difference was found dichotomizing the patients at the median recovery time (Kaplan–Meier $P=0.241$).

Overall, our results show that survival is similar in patients on chronic hemodialysis with and without post-dialysis fatigue. Patients with post dialysis fatigue were significantly older than those without; however,

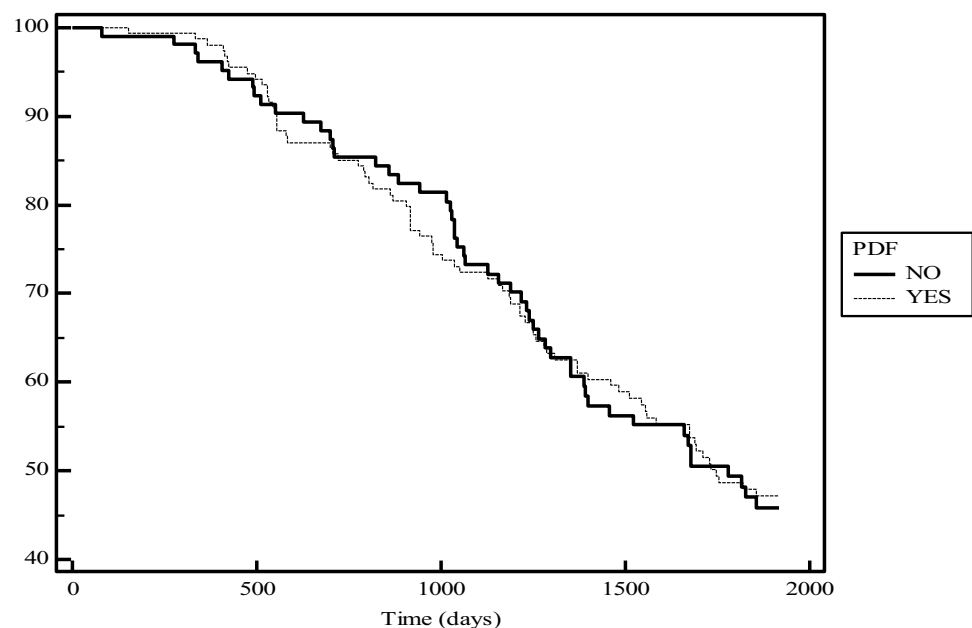
patients with and without PDF did not differ regarding other demographic, clinical, and laboratory variables. The present study also shows that survival does not differ significantly among patients stratified according to the intensity, duration, and frequency of post dialysis fatigue or stratified according to the Sum Score of intensity, duration, and frequency. This is, in some way, an unexpected result if we consider that presence and characteristics of post-dialysis fatigue have been associated with functional disability, and with an increased risk of mortality. Another finding of the present study is that recovery time does not influence survival in our patients on chronic hemodialysis. This result disagrees with the study of Rayner et al. who demonstrated that patients reporting a recovery time greater than 12 hours had a 22% higher rate of first hospitalization and a 47% higher mortality rate than patients reporting a recovery time between 2 and 6 hours [5]. However, the association with mortality was attenuated when adjusting for covariates. In conclusion, at least in our cohort on chronic hemodialysis, post-dialysis fatigue and time of recovery after the dialysis session are not associated with mortality, thus underlining also the need for further studies on this important issue.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s40620-021-01141-8>.

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Fig. 1 Kaplan–Meier survival analysis, according to the presence of post-dialysis fatigue (log-rank χ^2 : 0.005; DF: 1; $P=0.939$)



Declarations

Conflict of interest None of the authors has conflicts of interest.

Ethical approval The study complies with the guidelines for human studies and the research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki.

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