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The relationship between low serum magnesium levels and frailty among hemodialysis patients in the West Bank: a cross-sectional study

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Background and Aims: Chronic kidney disease (CKD) is a progressive decrease in kidney function that needs renal replacement therapy. Hemodialysis is a type of renal replacement therapy that improves and enhances hemostasis. Patients with CKD will face multiple comorbidities, including frailty; it's a physiologic state of increased vulnerability to stressors that results from decreased physiologic reserves or dysregulation of numerous physiologic systems. Magnesium deficiency is a known risk factor for protein energy wasting, which is closely related to frailty among CKD and end-stage renal disease patients.

This study aims to investigate the relationship between low serum magnesium levels (hypomagnesemia) and frailty among hemodialysis patients in the West Bank, where it will specifically examine the association between hypomagnesaemia and the hemodialysis process, as well as the correlation between frailty and hypomagnesemia among hemodialysis patients.

Method: A cross-sectional study was conducted from January 2024 to January 2025 at Najah National University Hospital (NNUH), Nablus, Palestine, a tertiary care center with a dialysis department where 269 individuals undergo hemodialysis treatment; 252 of them participated after implementation of exclusion criteria. Frailty was assessed by using the 5-item Frail scale, classified into frail, pre-frail, and non-frail. Blood samples were drawn from patients before the hemodialysis session to assess magnesium levels and other laboratory variables.

Results: Frailty was assessed using the 5-item frail scale. Among our study population, 53 patients (21.0%) were non-frail, 119 patients (47.2%) were pre-frail, and 80 patients (31.7%) were categorized as frail. These findings reveal the high prevalence of frailty among dialysis patients. Among our participants, 177 (70.2%) patients had normal magnesium levels, while 66 (26.1%) had high levels, and only 9 (3.6%) had low levels. Magnesium levels correlated significantly with frailty ($P = 0.048$). Among those with low magnesium levels, out of 9 patients, 3 (1.2%) were non-frail and 6 (2.4%) were frail. Among those with normal magnesium levels, out of 177, 126 (50%) were non-frail and 51 (20.2%) were frail. For those with high magnesium levels, out of 66, 43 (17.1%) were non-frail and 23 (9.1%) were frail. Several other variables were significantly associated with frailty, including unemployment ($P = 0.003$), chronic lung disease ($P = 0.042$), myocardial infarction ($P = 0.022$), arthritis ($P = 0.01$), history of hospital admission during the past 3 months ($P = 0.049$), and the frequency of exercise and frailty ($P = 0.001$).

Conclusion: Hypomagnesemia is associated with increased frailty among hemodialysis patients, so regular monitoring and supplementation may improve the health status and reduce the risk of developing frailty among hemodialysis patients. Doing further investigations on how magnesium supplementation affects developing frailty, and more research is required.

Keywords: Chronic kidney disease, End stage renal disease, Frailty, Frail scale, Hypomagnesemia, Hemodialysis.

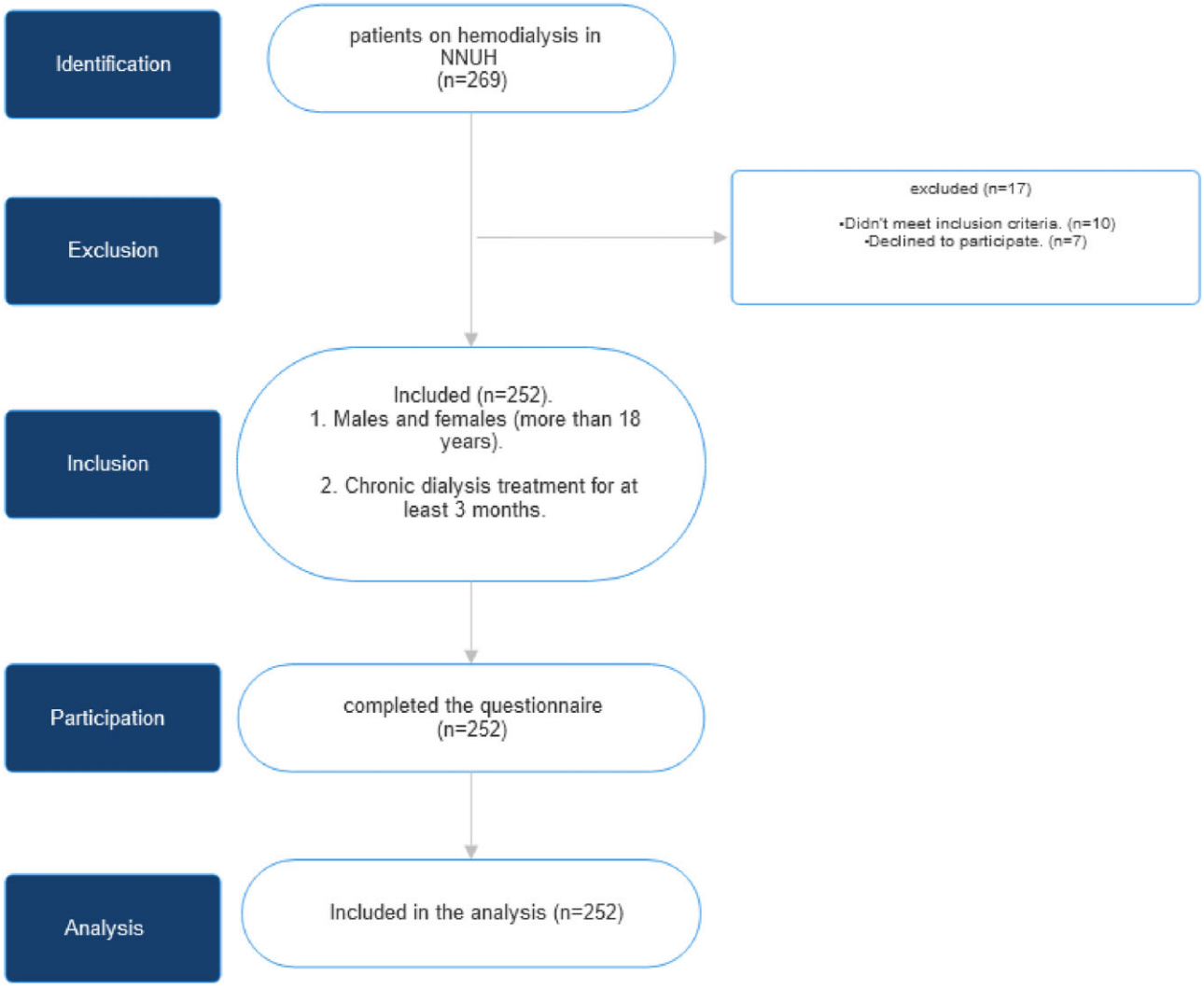

Figure 1: Participants flow chart.

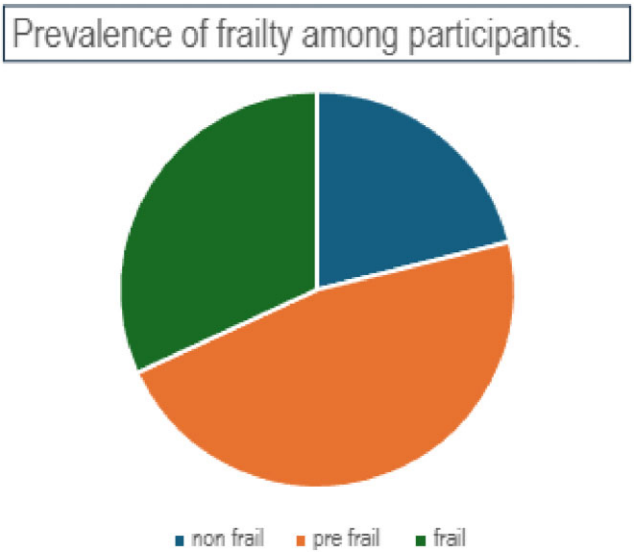

Figure 2: Prevalence of frailty among hemodialysis patients.

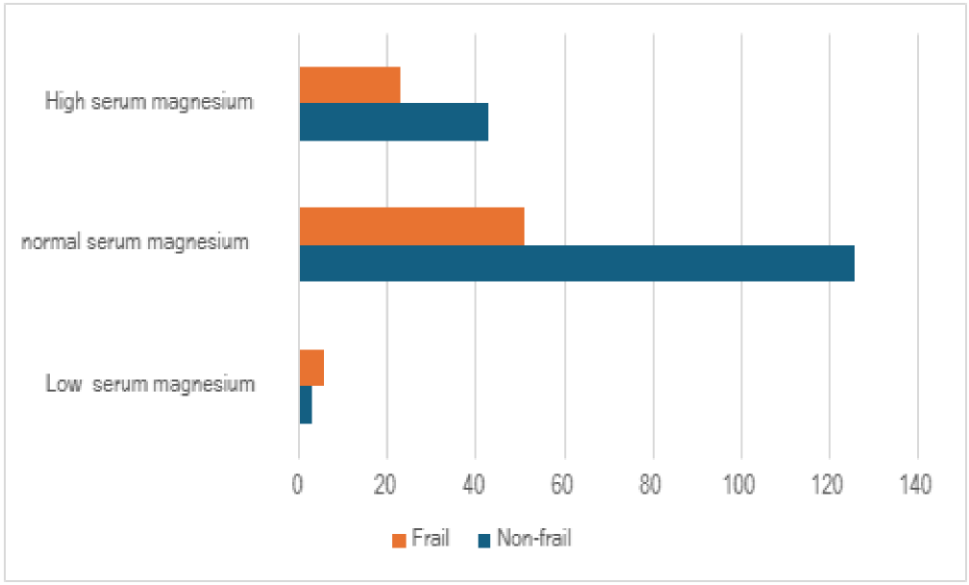

Figure 3: Serum magnesium levels and frailty.