

# Mild hyponatremia is associated with functional and cognitive decline in chronic hemodialysis patients.



Linda Shavit MD, Inga Mikeladze, Carmit Torem, Itzchak Slotki MD  
Adult Nephrology Unit, Shaare Zedek Medical Center, Jerusalem, Israel

## INTRODUCTION

A high incidence and adverse outcomes of cognitive impairment in dialysis patients have recently become recognized.

Most dialysis patients are vasculopath, suffering from high rates of hypertension, diabetes, markedly elevated levels of inflammatory markers and homocysteine, vascular endothelial dysfunction and carotid atherosclerosis, all of which contribute to vascular cognitive impairment

The aim of our study was to evaluate laboratory and demographic factors that influence cognitive function in chronic hemodialysis patients during a 2 year period and to determine potentially modifiable laboratory parameters that are independently associated with progressive cognitive decline in this patient population.

## METHODS

- Subjects were adult patients undergoing chronic in-center hemodialysis in Shaare Zedek Medical Center
- Cognitive Function Tests: modified Mini Mental State (3MS), Trailmaking Tests A (Trails A) and B (Trails B).
- The 3MS test has a maximum score of 100; global cognitive impairment was defined as a score < 80.
- Impaired executive function was defined as a Trails A score less than 75 seconds and Trails B less than 180 seconds
- The 15-item Geriatric Depression Scale (GDS) was used to assess symptoms of depression. The Activities of Daily Living (ADL) test was used to assess global functional status. Severity of pruritus, chronic pain and sleep disturbances were assessed and recorded using a visual analogue scale (VAS). All tests were performed on a midweek dialysis day during the hemodialysis session.

**Table 3 Cognitive and executive function test results, GDS scores, and VAS for pruritus, chronic pain and sleep disturbances during two years period**

Number of patients Year	56 2010	43 2011
	M (SD)	M (SD)
3MS	73.2 (23)	70.88 (24.93)
Trial A	79 (19)	82 (15)
Trial B	2.9 (0.4)	2.9 (0.52)
GDS	5.5 (3.9)	5.3 (3)
ADL	82 (26)	81 (23)
ADLS	3 (3)	2.9 (2.9)
VAS for pain	3.4 (3.2)	3.7 (2.6)
VAS for pruritus	2.3 (2.7)	1.6 (1.7)
VAS for sleep	1.2 (1.9)	1.7 (1.9)

## RESULTS

**Table 2 Laboratory parameters.**

Patients	N = 56
Hemoglobin, g/dL	11.3 (1.2)
Sodium, mEq/L	137 (3.1)
Potassium, mEq/L	5.07 (0.6)
Calcium, mg/dL	8.9 (0.7)
Phosphorus, mg/dL	4.9 (1.2)
PTH, pg/mL	339 (318)
Plasma urea nitrogen, mg/dL	59 (17)
Creatinine, mg/dl	8.7 (2)
CRP, mg/dL (reference range 0.3-5.0)	1.28 (2.1)
Albumin, g/dL	4.03 (0.39)
Glucose, mg/dL	122 (51)
Kt/V	1.31 (0.22)

**Table 4 Distribution of severely impaired cognitive, functional tests and depression in the study population**

Number of patients Year	56 2010	43 2011
3MS		
<80	28 (50%)	24 (56%)
>80	28 (50%)	19 (44%)
Trial A (severe disturbance)	40 (71%)	32 (74%)
Trial B (severe disturbance)	51 (91%)	35 (81%)
GDS		
No signs of depression	25 (46%)	15 (35%)
Suspected depression†	21 (38%)	24 (56%)
Depression †	9 (16%)	4 (9%)
ADL		
Independent	28 (50%)	15 (35%)
Moderate dependence	18 (33%)	20 (47%)
Severe dependence	10 (18%)	8 (18%)

## DATA ANALYSIS

Univariate analysis demonstrated significant correlations between dementia and age, female gender, education, poor executive and functional status and use of antidepressants and benzodiazepines. Low 3MS was associated with inadequate dialysis dose (Kt/V <1.2, p 0.023), high plasma phosphorus levels (P > 6 mg/dL, p 0.034) and hyponatremia (Na < 135 mEq/L, p 0.001), but this finding was not statistically significant after adjustment for age, gender and education.

However, a statistically significant association between hyponatremia and impaired ADL (p 0.043) was detected by multivariate analysis. In addition, mortality was increased significantly only in patients with impaired ADL (p 0.002), but not low 3MS or hyponatremia

## CONCLUSIONS

A high prevalence of global cognitive and executive impairment was detected in our hemodialysis cohort. We found an association between mild chronic hyponatremia and impaired functional status. Whether treatments aimed at modifying hyponatremia could mitigate functional decline or mortality remains to be elucidated.