# Γνωσιακή λειτουργία στη ΧΝΝ: επιδημιολογικά στοιχεία

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# Ορισμός

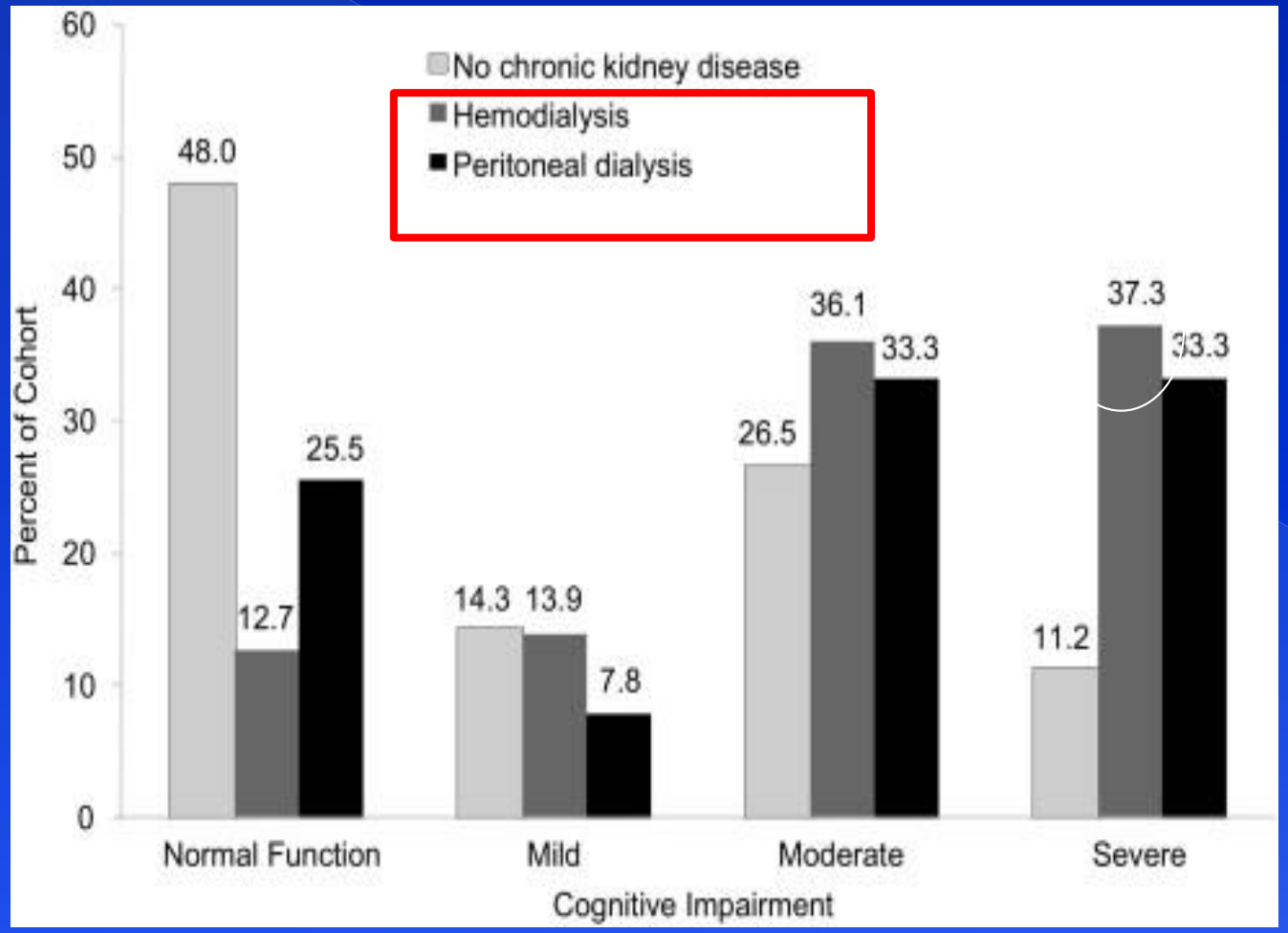
**Η γνωσιακή διαταραχή είναι ένας όρος που υποδηλώνει την ύπαρξη ενδείξεων επηρεασμού ενός ή περισσότερων από τους ακόλουθους τομείς της γνωσιακής λειτουργίας: μνήμη, εκτελεστική λειτουργία, προσοχή, ταχύτητα επεξεργασίας πληροφοριών, κινητική αντιληπτική ικανότητα ή γλωσσική δεξιότητα**
**(Van Sandwijk et al,2016, Drew et al, 2019).**

**Συνεπώς, ένα άτομο που πάσχει από CI αντιμετωπίζει δυσκολίες να θυμάται, να μαθαίνει νέα πράγματα, να διατηρεί την προσοχή ή να αποφασίζει, επηρεάζοντας αρνητικά την καθημερινή του ζωή**
**(Joseph et al, 2019).**

# Cognitive impairment in hemodialysis patients is common

A. M. Murray, D. E. Tupper, D. S. Knopman, D. T. Gilbertson, S. L. Pederson, S. Li, G. E. Smith, A. K. Hochhalter, A. J. Collins, R. L. Kane

First published July 24, 2006, DOI: https://doi.org/10.1212/01.wnl.0000225182.15532.40




The prevalence of cognitive impairment in people with CKD ranges from 10 to 40% , with the highest in those receiving hemodialysis where approximately half of patients (50%) undergoing dialysis have moderate to severe cognitive impairment

# Chronic Kidney Disease and Cognitive Impairment in the Elderly: The Health, Aging, and Body Composition Study

Manjula Kurella,* Glenn M. Chertow,* Linda F. Fried,† Steven R. Cummings,*‡ Tamara Harris,§ Eleanor Simonsick,§ Suzanne Satterfield,‖ Hilsa Ayonayon,* and Kristine Yaffe*

Η γνωστική δυσλειτουργία ακολουθεί την ΧΝΝ

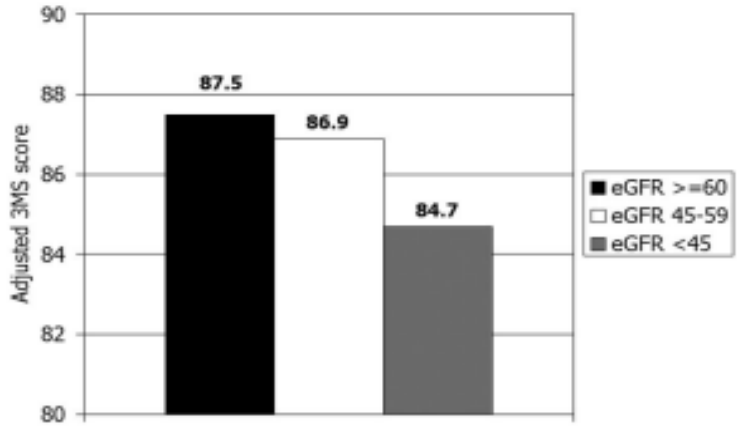



*Figure 1.* Adjusted baseline Modified Mini-Mental State Exam (3MS) scores by estimated GFR (eGFR). Note: Scores adjusted for age, race, gender, and education. $P < 0.01$ for trend.

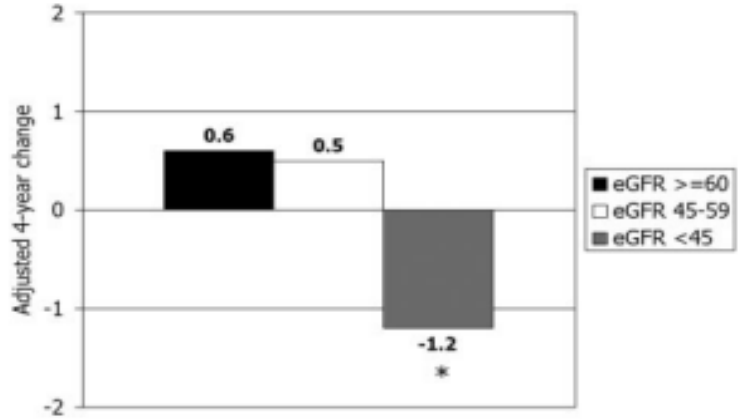



*Figure 2.* Adjusted 4-yr change in 3MS scores by eGFR. Note: Scores adjusted for age, race, gender, and education. $^*P < 0.01$ for comparison with eGFR ≥60 ml/min per 1.73 $m^2$ and eGFR 45 to 59 ml/min per 1.73 $m^2$.

CKD is associated with an increased risk for cognitive impairment in the elderly that cannot be fully explained by other well-established risk factors. Studies aimed at understanding the mechanism(s) responsible for cognitive impairment in CKD and efforts to interrupt this decline are warranted.

# Cognitive Impairment in CKD: Pathophysiology, Management, and Prevention

David A. Drew, Daniel E. Weiner, Mark J. Sarnak

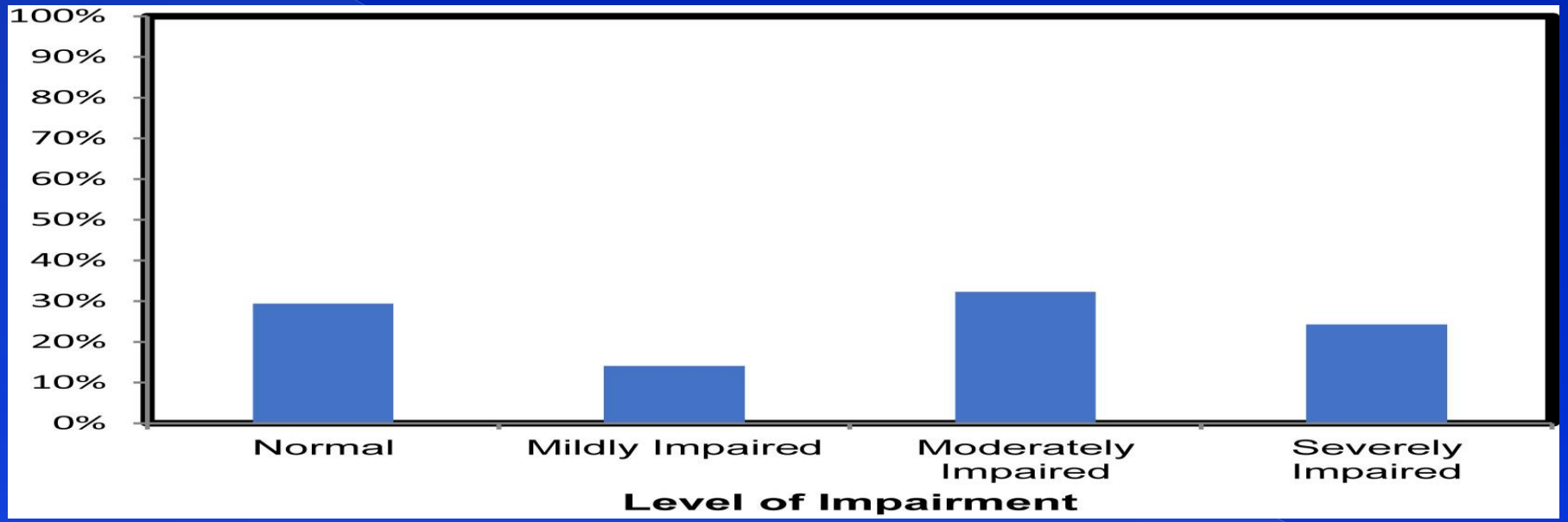



**Figure 1.Cognitive impairment in dialysis patients.** A comprehensive battery of neurocognitive tests was administered in the first hour of hemodialysis to 314 patients and cognitive impairment was defined using methodology based on that described by Murray et al.[8]

Only 30% of hemodialysis patients had intact cognitive performance, while more than half had moderate or severe cognitive impairment. Extracted from data reported in Sarnak et al.[3]

Int Urol Nephrol
DOI 10.1007/s11255-013-0450-y

NEPHROLOGY - ORIGINAL PAPER

# Risk factors for cognitive dysfunction in CKD and hypertensive subjects

Rigas G. Kalaitzidis · Despina Karasavvidou · Athina Tatsioni · Olga Balafa · Kosmas Pappas · Giorgos Spanos · Sigkliti-Henrietta Pelidou · Kostas C. Siamopoulos

**Table 3** Multivariate analysis of non-dialysis population

| Cognitive tests | Factor | OR (95 % CI) | *p* |
|---|---|---|---|
| MMSE | Stages | 2.46 (1.81–3.34) | <0.001 |
| | Age (years) | 1.06 (1.02–1.09) | 0.001 |
| | DM | 4.27 (1.88–9.75) | 0.001 |
| | PTH | 1.01 (1.00–1.01) | 0.010 |
| Clock test | Stages | 1.92 (1.23–2.99) | 0.004 |
| | Age (years) | 1.07 (1.03–1.11) | 0.001 |
| | DM | 4.48 (1.86–10.83) | 0.001 |
| | PTH | 1.92 (1.23–2.99) | 0.004 |
| IADL | Stages | 1.75 (1.26–2.45) | 0.001 |
| | Age (years) | 1.11 (1.05–1.16) | 0.000 |
| | DM | 7.64 (3.12–18.73) | 0.000 |
| | UTPR | 1.00 (1.00–1.00) | 0.047 |

**Ο Κίνδυνος για τη ΓΔ αυξάνεται κατά 2.5 φορές με κάθε αλλαγή σταδίου**

The main finding of the study was that in every CKD stage the risk of CO/DY increased more than twofold

Received: 24 September 2012/Accepted: 12 April 2013 Springer Science + Business Media Dordrecht 2013

Berger *et al. BMC Medicine* (2016) 14:206
DOI 10.1186/s12916-016-0745-9

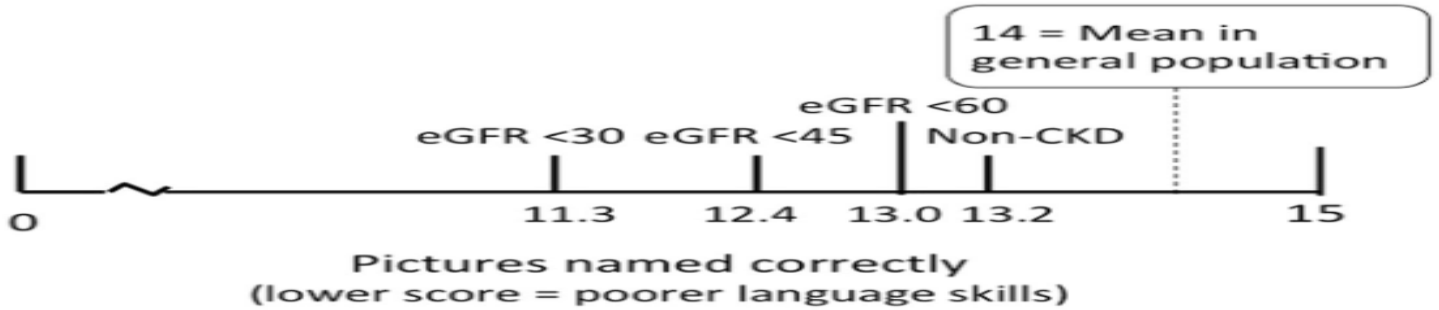
BMC Medicine

RESEARCH ARTICLE Open Access

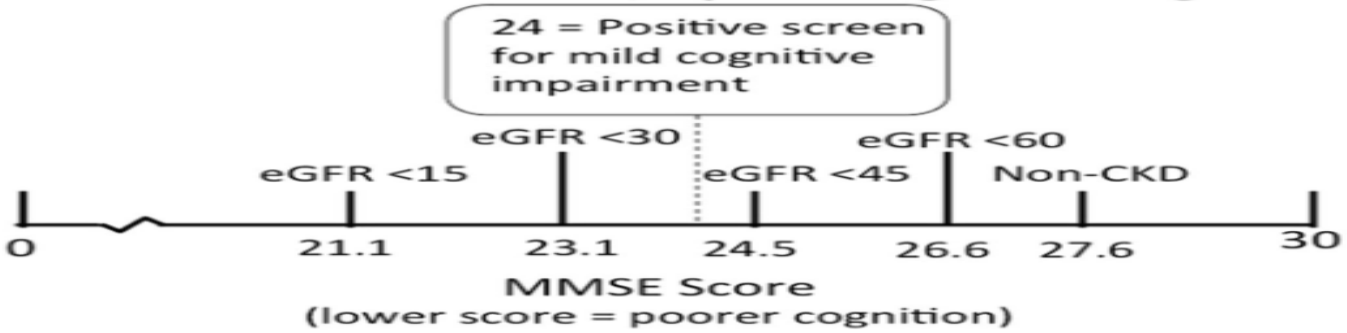
# Cognition in chronic kidney disease: a systematic review and meta-analysis

Israel Berger[1*], Sunny Wu[1], Philip Masson[1], Patrick J. Kelly[1], Fiona A. Duthie[2], William Whiteley[2], Daniel Parker[3], David Gillespie[2] and Angela C. Webster[1,4*]

**b. Estimated difference in 15-item BNT score, representing Language**




**c. Estimated difference in MMSE score, representing Global Cognition**



Journal of Nephrology (2022) 35:931–942
https://doi.org/10.1007/s40620-021-01170-3

ORIGINAL ARTICLE

# Assessment of cognitive impairment and related risk factors in hemodialysis patients

Hristos Karakizlis[1,2] · Katharina Bohl[3] · Jannis Ziemek[4] · Richard Dodel[3,4] · Joachim Hoyer[1]

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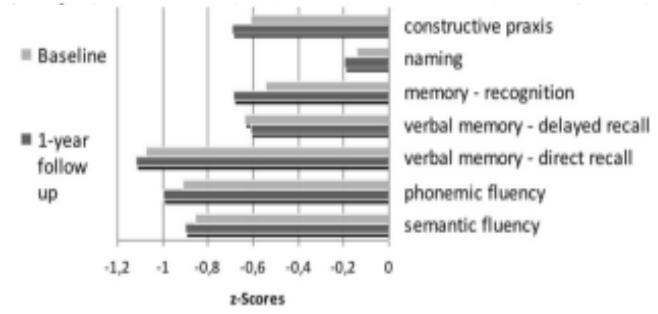
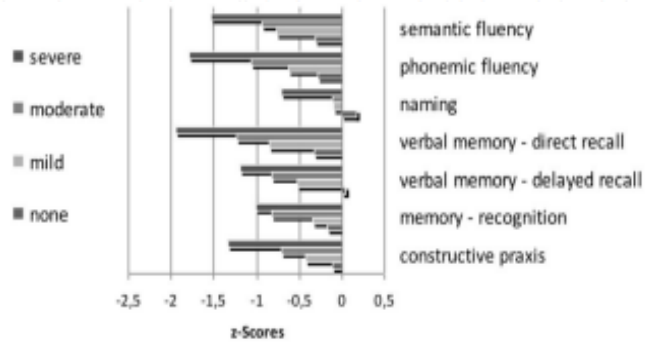
## Abstract

**Background** Cognitive impairment in hemodialysis patients has been acknowledged over the last years and has been reported in up to 80% of patients. Older age, high prevalence of cardiovascular risk factors, such as stroke and transient ischemic attack, uremia, and multiple metabolic disturbances represent the most common factors for cognitive impairment in hemodialysis patients.

**Methods** We conducted a prospective cohort study on 408 patients from 10 hemodialysis centers in the regional government district of Middle Hesse (Germany). Patients underwent a neuropsychological test battery consisting of five tests, in addition to a phonemic fluency test, to assess cognitive profile. The patients were classified as no cognitive impairment or mildly-, moderately- or severely-impaired cognitive function, depending on the degree of impairment and number of domains where the deficit was determined. We analyzed the cognitive profile and the change in performance over time in hemodialysis patients based on their cognitive status at baseline vs. 1-year follow-up.

**Results** Of 479 eligible patients, 408 completed all tests at baseline. Only 25% (n = 102) of the patients had no cognitive impairment. Fourteen per cent (n = 57), 36.5% (n = 149), and 24.5% (n = 100) of patients showed mild, moderate, and severe impairment, respectively. In patients with cognitive impairment, all cognitive domains were affected, and impairment was significantly associated with depression and education. The most impaired cognitive performance was immediate memory recall, and the best performance was found in naming ability. No significant change was observed after 1-year follow up in any domain.



Nephrol Dial Transplant (2020) 35: 10–17
doi: 10.1093/ndt/gfz051
Advance Access publication 9 April 2019

# Mild cognitive impairment and kidney disease: clinical aspects

Davide Viggiano [1,*], Carsten A. Wagner [2,*], Peter J. Blankestijn[3], Annette Bruchfeld[4], Danilo Fliser[5], Denis Fouque[6], Sebastian Frische[7], Loreto Gesualdo[8], Eugenio Gutiérrez[9], Dimitrios Goumenos[10], Ewout J. Hoorn[11], Kai-Uwe Eckardt[12], Samuel Knauß[13], Maximilian König[12], Jolanta Malyszko[14], Ziad Massy[15], Dorothea Nitsch[16], Francesco Pesce[8], Ivan Rychlík[17], Maria Jose Soler[18], Goce Spasovski[19], Kathryn I. Stevens[20], Francesco Trepiccione[1,21], Christoph Wanner[22], Andrzej Wiecek[23], Carmine Zoccali[24], Robert Unwin[25,26,†] and Giovambattista Capasso [1,21,†]

**Table 1. Prevalence of MCI and dementia in different populations**

| Population | Prevalence of MCI (%) | Prevalence of dementia (%) | References |
|---|---|---|---|
| Healthy subjects | 7–26 | 13 | [41–43] |
| Early CKD (Stage 3) | 14 | Unknown | [39, 44] |
| Late CKD (Stage 4 and 5) | 16–38 | Unknown | [45, 46] |
| Haemodialysis | 26–60 | 15–36 | [47, 48, 51] |
| Peritoneal dialysis | 35 | 3.9–31 | [42, 49, 51] |
| Transplantation | (Only studies comparing pre–post transplant scores) | 22 | [50] |

**Table 2. Morphological, functional and pathogenetic features of MCI-CKD**

| Feature | MCI general population | MCI-CKD | References |
|---|---|---|---|
| Pathogenesis | Unknown | Uraemic (neuro)toxins | |
| Tractography | Lower connectivity of the basal nucleus | Internal capsule demyelination | [74, 75, 77] |
| MRI | Reduced amygdala and hippocampus grey matter | Deep white matter demyelination | [58, 70, 73, 76, 78, 80] |
| EEG | Altered cortical synchronization at alpha frequencies | Altered cortical synchronization at delta frequencies | [67–69] |
| Animal models | Cortical atrophy, damage to the cholinergic system | Normal neural architecture | [81–83] |

Review Article

# Screening of Cognitive Impairment in the Dialysis Population: A Scoping Review

Aye San[a] Balaji Hiremagalur[a] Wendy Muircroft[b] Laurie Grealish[a, c]

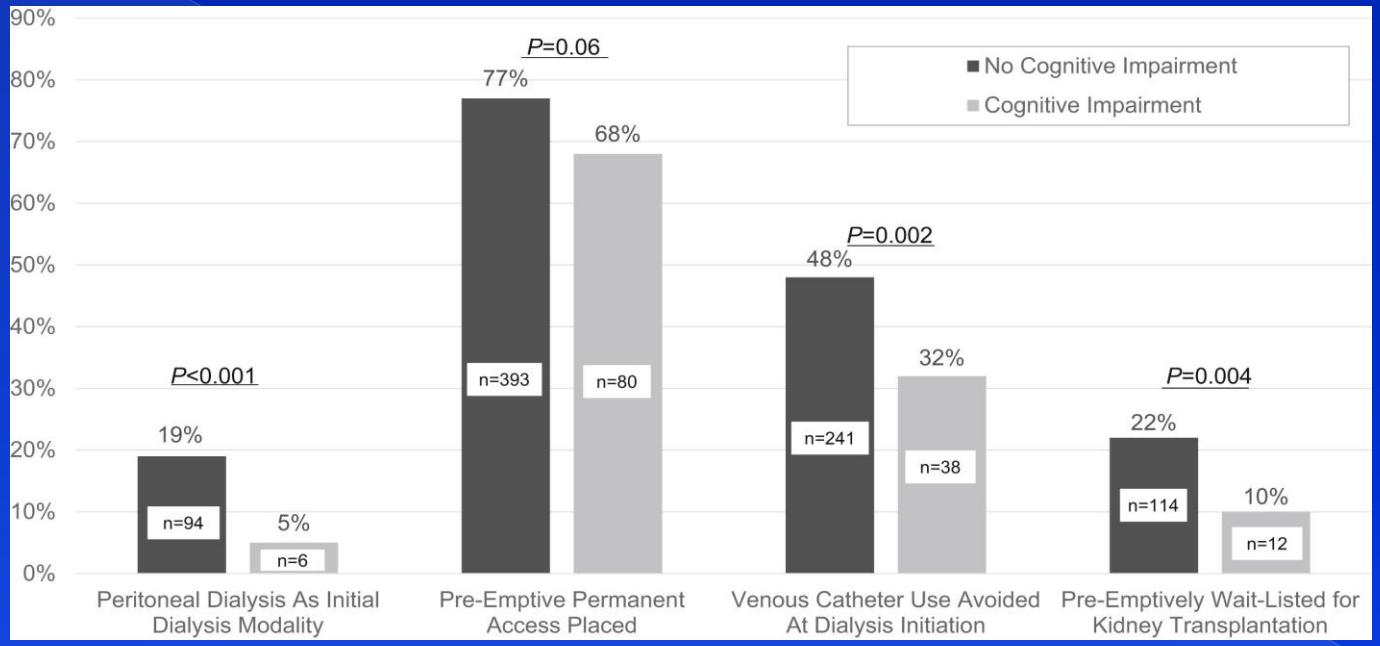
[a]Gold Coast Health, Southport, QLD, [b]Southern Adelaide Palliative Service, Adelaide, SA, and [c]Menzies Health Institute Queensland and School of Nursing and Midwifery, Griffith University, Southport, QLD, Australia

**Table 2** (continued)

| Reference (first author) and country of study | Study groups | Sample | | | Exclusion criteria of interest | | | | Screening tools | Prevalence based on screening test | Assessment timing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | size | age, years | gender, M/F | advanced dementia | cerebro-vascular disease | psychiatric disease | lack of language fluency | | | |
| Harciarek [21], 2012, Poland | HD<br>C | 49<br>30 | 47.9±12.01<br>47.23±10.21 | 27/22<br>22/8 | E | E | E | E | MMSE | MMSE HD: baseline: 28.57±0.98; 1st follow-up: 28.59±0.99; 2nd follow-up: 28.56±0.96 | 24 h after the last dialysis |
| Huang [22], 2008, Taiwan | HD | 147 | group I: 68±8.46; group II: 57.51±12.64 | 61/86 | NR | NR | NR | NR | MMSE | MMSE scores NR | shortly before dialysis session |
| Isshiki [23], 2014, Japan | PD<br>C | 18<br>60 | 67.5±6.9<br>71.5±8.3 | 12/6<br>28/32 | NR | E | NR | NR | MMSE | MMSE 27 or more: 14 (78%); 24–26: 3 (17%); 25 or less: 1 (5%) | not applicable |
| Jung [24], 2013, South Korea | HD<br>PD<br>C | 29<br>27<br>12 | 55.8±8.7<br>52.4±11.6<br>44.7±10.7 | 13/16<br>14/13<br>11/1 | E | NR | E | NR | MMSE | MMSE <24: HD: 7 (24.1%); PD: 3 (11.1%) | off dialysis, minimum 1 h from last dialysis treatment |
| Kalaitzidis [25], 2013, Greece | HBP<br>CKD I, II<br>CKD III<br>CKD IV<br>HD<br>PD | 96[b]<br>160[b] | 53±1.51<br>50.2±11.8<br>63.1±9.4<br>64.1±12.2<br>60.4±13.8<br>58.6±15.7 | 62/35[b]<br>15/4[b]<br>20/9[b]<br>33/14[b]<br>17/14[b]<br>20/13[b] | NR | E | E | NR | MMSE | NR | on HD patients before dialysis session middle of the week |
| Kalirao [26], 2011, USA | PD<br>HD<br>C | 51<br>338<br>101 | 57.5±14.8<br>71.2±9.5<br>68.5±9.6 | 34/17<br>183/155<br>44/57 | NE | NE | E | E | 3MS | 3MS raw scores: PD: range 93–100, SD 6.7; HD: range 83–100, SD 8.6; C: range 94.3–100, SD 5.7 | during off-dialysis time, with an interval of at least 2 h from the time of last dialysis |
| Kang [27], 2012, USA | HD<br>PD<br>CKD | 70<br>17<br>82 | 52.6±14.6 | 110/59 | E | E | E | NR | 3MS | 3MS: total: 91.7±7.4; SDB: 90.5±7.9; non-SDB: 92.8±6.8 | HD: morning of a non-dialysis day at home |
| Kato [28], 2012, Japan | HD<br>CKD<br>C | 57<br>26<br>17 | 69.4±3.8<br>66.6±14.7<br>66.6±4.1 | 29/28<br>18/8<br>5/12 | NR | NR | NR | NR | MMSE | HD: 27.4±2.4; CKD: 25.8±2.4; C: 28±2 | NR |
| Kitaguchi [29], 2011, Japan | HD | 37 | 68.9±4.1 | 16/21 | NR | NR | NR | NR | MMSE | MMSE 27.1±2.4 | NR |
| Kobayashi [30], 2014, Japan | HD | 54 | 67.8±11.3 | 33/21 | NR | E | NR | NR | MMSE | MMSE 28 or more: 34 (63%); 25–27: 13 (24%); 24 or less: 7 (13%) | NR |
| Kutlay [31], 2001, Turkey | HD | 84 | mean: 42 | 47/37 | NR | NE | NE | NR | MMSE | mild impairment (MMSE 18–23): 18 (21%); moderate to severe impairment (MMSE <18): 9 (11%) | at various times: before, during, after, and at intervals; immediate beginning and termination of dialysis avoided |
| Leinau [32], 2009, USA | HD | 109 | 61±10 | 71/38 | NE | NR | NR | E | MMSE | CI reported to be present in 41 (38%); breakup of the scores not provided | midweek, after the dialysis treatment was underway |

# Cognitive Impairment in Non–Dialysis-Dependent CKD and the Transition to Dialysis: Findings From the Chronic Renal Insufficiency Cohort (CRIC) Study

Meera N. Harhay, Dawei Xie, Xiaoming Zhang, Chi-yuan Hsu, Eric Vittinghoff, Alan S. Go, Stephen M. Sozio, Jacob Blumenthal, Stephen Seliger, Jing Chen, Rajat Deo, Mirela Dobre, Sanjeev Akkina, Peter P. Reese, James P. Lash, Kristine Yaffe, Manjula Kurella Tamura Lawrence J. Appel, Harold I. Feldman, Alan S. Go, Jiang He, John W. Kusek, Panduranga Rao, Mahboob Rahman Meera N. Harhay, Dawei Xie, Xiaoming Zhang, Chi-yuan Hsu, Eric Vittinghoff, Alan S. Go, Stephen M. Sozio, Jacob Blumenthal, Stephen Seliger, Jing Chen, Rajat Deo, Mirela Dobre, Sanjeev Akkina, Peter P. Reese, James P. Lash, Kristine Yaffe, Manjula Kurella Tamura Lawrence J. Appel, Harold I. Feldman, Alan S. Go, Jiang He, John W. Kusek, Panduranga Rao, Mahboob Rahman American Journal of Kidney Diseases Volume 72 Issue 4 Pages 499-508 (October 2018)




**Proportion of CRIC Participants with ESRD outcomes, Stratified by Pre-dialysis Cognitive Function. Figure displays p-values for the unadjusted associations between pre-dialysis cognitive impairment, defined by age-based cut-off scores on the Modified Mini Mental State Examination, and ESRD transition outcomes.**

# COGNITIVE IMPAIRMENT IS ASSOCIATED WITH INCREASED MORTALITY IN HEMODIALYSIS PATIENTS

Evgeniy Shcherbakov1 and Mikhail Pyatchenkov2

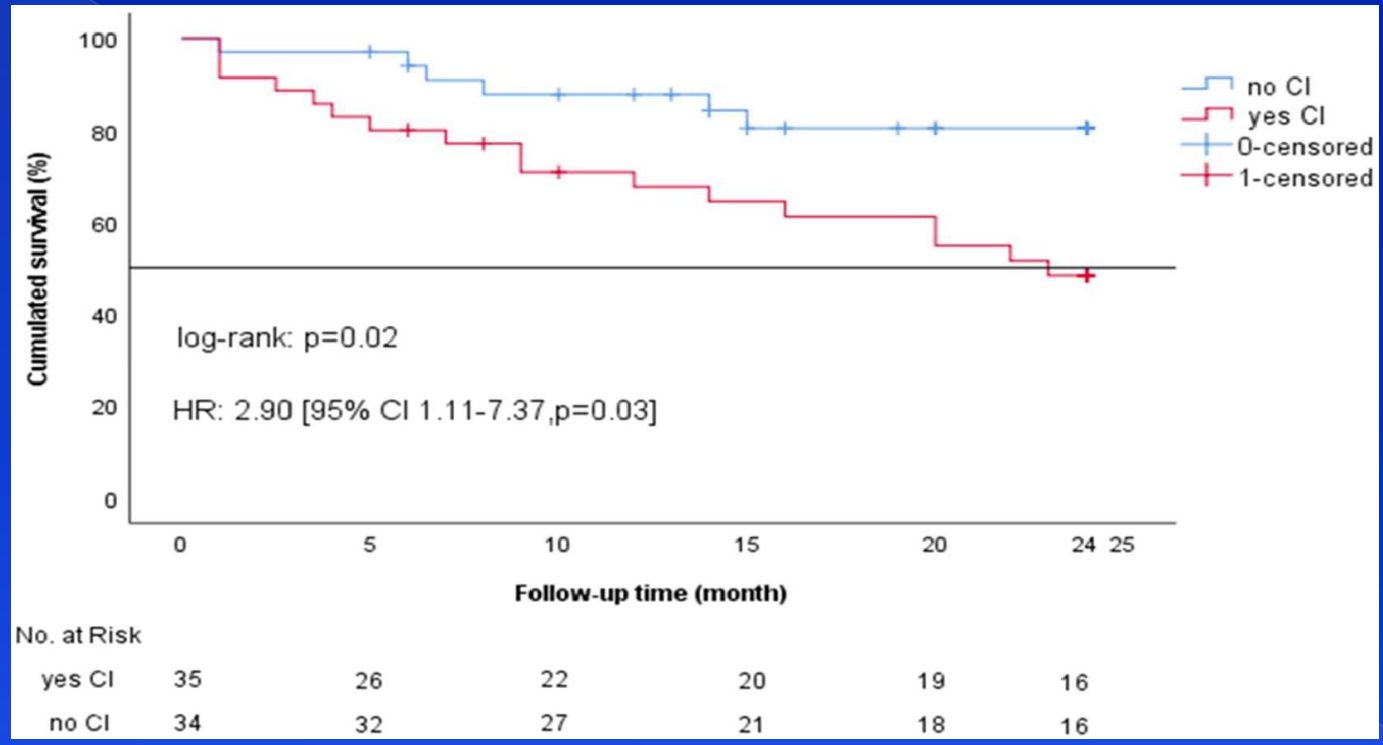



**Figure 1:** Kaplan-Mayer curves characterizing overall survival depending on the presence or absence of cognitive ...

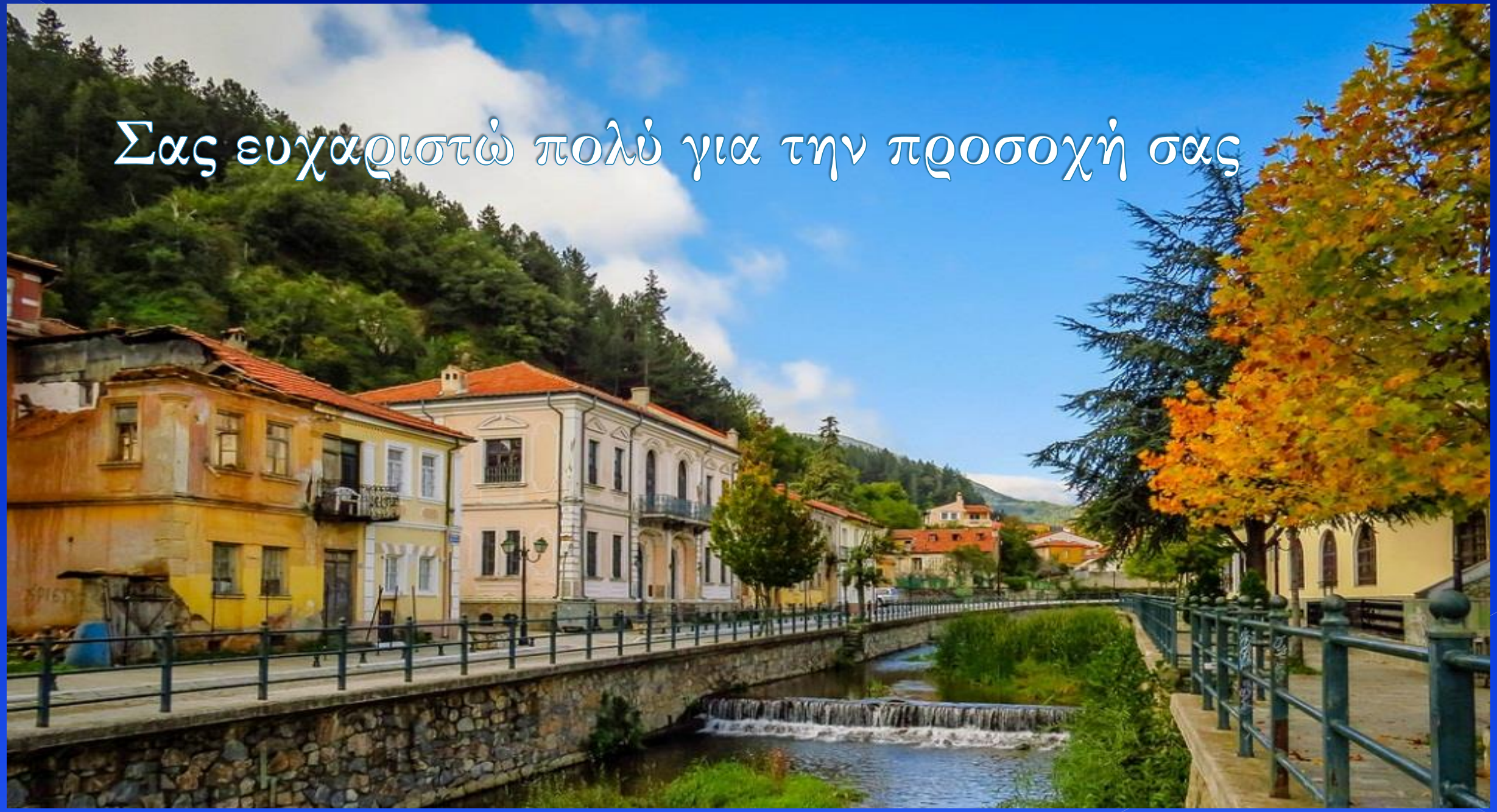
*Nephrol Dial Transplant*, Volume 38, Issue Supplement_1, June 2023, gfad063d_6715, https://doi.org/10.1093/ndt/gfad063d_671

# Συνοψίζοντας….

Οι ασθενείς σε όλα τα στάδια της Χρόνιας Νεφρικής Νόσου έχουν μεγαλύτερο κίνδυνο εμφάνισης άνοιας ή οποιασδήποτε μορφής γνωσιακής εξασθένησης σε σύγκριση με το γενικό πληθυσμό.

Ο επιπολασμός των γνωσιακών διαταραχών στη ΧΝΝ μπορεί να κυμαίνεται από 10 % έως 40% ανάλογα με τη διαγνωστική μέθοδο που χρησιμοποιείται και το στάδιο της ΧΝΝ.

Οι αιμοκαθαιρόμενοι ασθενείς στην πλειοψηφία τους εμφανίζουν κάποιο βαθμό γνωστικής δυσλειτουργίας.


Σας ευχαριστώ πολύ για την προσοχή σας